Sievers' Law as Prosodic Optimization

Paul Kiparsky
Stanford University

1. Germanic prosody. The early Germanic languages are characterized by fixed initial stress, free quantity, and a preference for *moraic trochees*, left-headed bimoraic feet consisting either of two light syllables (LL) or of one heavy syllable (H).[1] The two-mora foot template places indirect constraints on syllable structure, by making it hard to accommodate three-mora syllables, as well as one-mora syllables in contexts where they cannot join another one-mora syllable to form a two-mora trochee. Syllable structure is also constrained more directly by a preference for simple onsets, which entails an avoidance both of hiatus and of syllable-initial consonant clusters. Processes of syllabification, deletion, shortening and lengthening in the Germanic languages favor those quantitative and syllabic patterns that fit these prosodic conditions, and repair those that do not.[2] It is not always possible to satisfy all of the preferences at the same time, however, and so the morphophonology must adjudicate between their conflicting demands. While the preferences themselves are invariant, the languages diverge in how they resolve contradictions between them. Some stretch the prosodic limits by allowing excess segments to be accommodated by overlength or resolution, others delete segments (e.g. glide deletion, high vowel deletion), adjust vowel length to fit the template, or tolerate hiatus. For example, a long *ja-stem* such as /herdi-/ with a vocalic ending, say /herdi-a/,[3] presents a prosodic quandary to which the languages respond with three different compromises:

(1) a. Proto-Germanic: **hir.ði.a* (hiatus)
b. Gothic: *herd.ja* (a three-mora syllable)
c. Old Icelandic: *hir.ða* (deletion of *j*)

Optimality Theory (Prince and Smolensky 1993) claims that a grammar is nothing but a ranking of constraints which determines how such conflicts are negotiated within a particular linguistic system. Taking this theory as a basis, I present an analysis of Sievers' Law and related effects in Germanic, showing how the prosodic divergence of the early Germanic dialects can be seen as resulting from different rankings of the same prosodic constraints. I propose an analysis that derives the vowel/glide alternations as part of the prosodic parsing of the language, and in addition predicts a pattern of syllabification for CR clusters that is confirmed by a hitherto unnoticed feature

[1] On moraic trochees in the context of foot typology consult Kager 1993a, 1993b, Hayes 1995; Hanson and Kiparsky 1996 propose an analysis of resolved moraic trochees.

[2] Mester 1994 analyzes iambic shortening and several allomorphy phenomena in Latin as responses to the rhythmic requirements of moraic trochees.

[3] I use /-a/ as shorthand for any ending beginning with a vowel other than *i*; the actual form of any particular suffix of course differs depending on the language.

of scribal practice. In proto-Germanic, the foot structure constraint outranked the onset requirement, with the consequence that Sievers' Law operated more extensively there. In Scandinavian and in Old English, the same foot structure constraints come to outrank a class of Faithfulness constraints, triggering glide deletion and resulting in a different syllabification pattern. The form that West Germanic gemination takes in Old High German, Old Saxon, and Old English provides independent evidence of these three respective stages of prosodic development.

Sievers' Law alternations may be observed in several categories of Gothic morphology, most importantly in *ja*-stem nouns and in weak verbs of the first class. Stem-final *i-/j-* combines with suffixal *-i* into *ji* after light stems and into *ī* (spelled *ei*) after heavy stems:

(2)

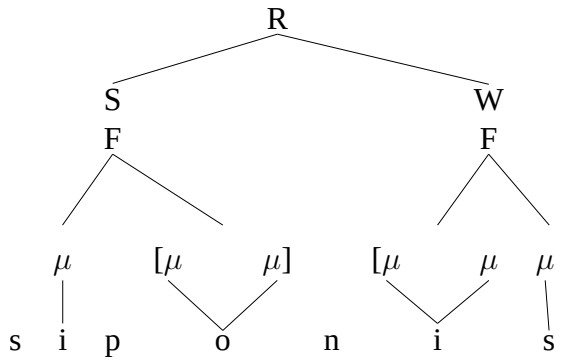
	Light	Heavy	
Gen.Sg.	har.j+is	her.di+is	ră.gĭ.ni+is
3.Sg.Pres.	nas.j+iþ	soo.ki+iþ	ri.qi.zi+iþ

Note: In citing Gothic words, I use Roman type for phonological transcriptions, and italics for transliterations. Where necessary, I supply breves and macrons to show vowel quantity, "." to mark syllable divisions, and "+" to mark morpheme boundaries.

Earlier works generally approached the *i/j* alternation purely from the perspective of syllable theory (see Murray 1988 for insightful discussion and review of the literature). Three recent studies have drawn on ideas from metrical phonology to relate Sievers' Law to Germanic foot structure, thereby bringing the longer stems into the picture, albeit in rather different ways.

2. Dresher & Lahiri 1991 discuss Sievers' Law in the course of making their case for the claim that the older Germanic languages parse words by means of a rhythmic unit which they christen the *Germanic foot*. This foot consists of a (minimal) Strong branch containing at least two moras, followed by a Weak branch containing at most one mora. When the word-initial syllable is short, and only then, the second syllable is included in the Strong branch to satisfy its bimoraic minimum (the phenomenon of *resolution*). Such words as *sōkeis* (HH), *manageis* (LLH), and *sipōneis* (LHH) therefore each constitute two Germanic feet, as shown in the following metrical structure which I reproduce from their article:

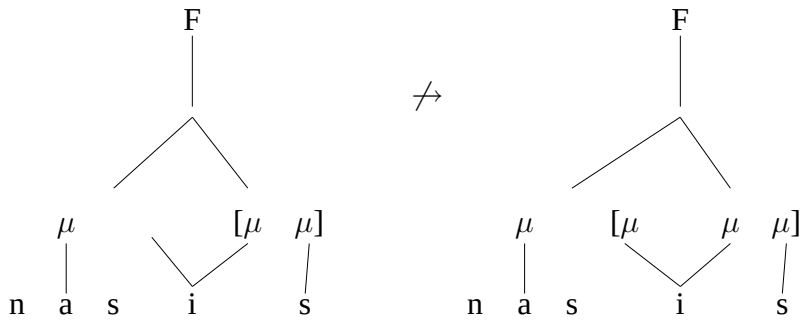
(3)



Dresher and Lahiri treat Sievers' Law as a vocalization of *j* to *i* after tautosyllabic consonants. The vocalized *i* then merges with a following *i* into *ī*, e.g. /soo.kj+is/ → soo.ki.is → soo.kiis (= *sokeis*). To block vocalization in light stems, Dresher and Lahiri capitalize on their special metrical structure. In their analysis, a disyllabic word with an initial light syllable constitutes the first (Strong) branch of a Germanic foot all by itself (the second branch being in this case empty).

They accordingly posit a constraint that the second part of the first branch of a Germanic foot may not be strengthened. Therefore, the derivation in (4) is blocked, and *nasjis* (rather than **naseis*) is derived:

(4)



Dresher and Lahiri do not say why precisely the second half of the first branch of a Germanic foot should be exempt from strengthening. In other languages it is a favorite spot for strengthening processes: Scandinavian vowel balance (Riad 1992) is a case, as are similar lengthenings of Finnish (Kiparsky 1981), where the foot structure is comparable to Germanic.[4] Typologically, then, the constraint is unexpected.

The vocalization rule gives the wrong result when the consonant-*j* sequence is followed by a vowel other than *i*, as in *hairdja, sokjan*. Although Dresher and Lahiri do not discuss such cases, they would presumably either have to restrict vocalization to the context before *i* (missing the generalization that it applies only where contraction is applicable to its output), or to have its results undone by a later glide-formation rule everywhere else, e.g. /harj+a/ → haria → *harja*.

The assumption that prevocalic Cj clusters in Gothic are onsets conflicts with the fact that Cj- does not occur word-initially. As Dresher and Lahiri themselves point out, it is also at odds with the scribal practice of the Gothic manuscripts, where medial consonant clusters, including those ending in *j*, are divided before the last consonant (Schulze 1908):

(5) a. V.CV: *da|ga, si|juþ*
b. VC.CV: *hil|pan, fraþ|jand*
c. VCC.CV: *skohs|la, haft|jandans*
d. VCCC.CV: *waurst|wa, gabairht|jau*
e. VCCCC.CV: *waurstw|ja, fulhsn|ja*

The importance of this study lies in the fact that it brings together a wide range of Germanic phonological processes, of which Sievers' Law is only one, under a coherent perspective grounded in metrical theory. Although I believe I can improve on their treatment of Sievers' Law and related phenomena without resorting to the Germanic foot, a complete reanalysis of their material remains a challenge for proponents of more standard foot inventories.

[4]West Germanic gemination would be lengthening of the second half of the first branch of a *disyllabic* Germanic foot, in Dresher and Lahiri's terms.

3. Calabrese (1994) starts from the opposite assumption about Cj sequences in Gothic, namely that postconsonantal *j* is always vocalic in the initial syllabification, e.g. /nasjan/ → na.si.an (→ *nasjan*). As evidence for this initial syllabification he cites the fact that the consonant clusters that occur before *j* (for examples, see (5)) are the same as those that occur before vowels, and that many of them do not occur before other consonants. But any gains that the proposed syllabification might achieve in capturing this distributional generalization are offset by new idiosyncrasies that it in turn introduces: *(1)* that *j* is the only onset before which no coda is permitted in the initial syllabification (since *ja.bai, ba.joþs* are fine, why should we not have *har.ja, har.jos*?), *(2)* that *i* is the only vowel that syllabifies this way (why *ha.ri.is but not *ban.ja.ai, for which Calabrese's rules predict a trisyllabic form?).

Also, Calabrese's argument from the distribution of clusters does not take into account the fact that the clusters that occur before *j* and vowels are the same as those that occur in word-final position and before *s*; they must therefore be recognized as possible coda sequences anyway:

(6) a. *huggr+jan, maurþr+jan, swistr+jus, gabairht+jan, fulhsnj+a, ufarswaggw+jan, sa(g)gq+jan, waurstw+ja, walw+jan*

b. *hunsl+a, swistr+uns, maurþr+a, bagm+e, garehsn+ais, rohsn+ai, triggw+os, saggw+im, waurstw+a, wilw+an*

c. *hunsl, swumfsl, maurþr, -bagm, garehsn, rohsn, triggw, waurstw, walw*

d. *figgr+s, swistr+s, bagm+s, garehsn+s, rohsn+s, triggw+s, saggw+s*

From the data in (6) we can see that the distribution of the clusters in question is no evidence that prevocalic *j* is initially syllabic. The principal generalization is actually that *these clusters occur in stem-final position*. Gothic endings are either zero or begin with *-s, -j,* or vowels, and for that reason, stem-final clusters occur either word-finally or before *-s, -j,* or vowels. There are, of course, further distributional restrictions, but none, as far as I can see, have a bearing on the syllabification of *j*.[5]

If we set aside his claim that prevocalic *j* is vocalic in the initial syllabification, Calabrese's analysis has much in common with that of Dresher and Lahiri. Like them, he proposes a contraction rule by which vocalized *i* merges with a following *i* into $\bar{\imath}$. And like them, he uses foot structure to block this merger in light stems such as *nasjis*. His footing algorithm, though, differs both in its output and in the theory it assumes. Though too complicated to reproduce here, its effect is easy to summarize: it makes a word-initial heavy syllable into a foot by itself, and groups a word-initial light syllable with the following syllable into a disyllabic foot (e.g. [LH]..., [LL]..., [H]L..., [H]H...). He assumes that only one foot is assigned at the left edge, on the grounds that Gothic has no secondary stress (although he does not say how he knows that). This is the same structure that would be derived from a non-iterative parsing into moraic trochees with resolution (Hanson and Kiparsky 1996). Calabrese then proposes that the coalescence of adjacent nuclei does not operate across foot boundaries, leaving a hiatus which is then resolved by glide formation. This yields the contrast between light stems in (7a) and heavy stems in (7b,c):

(7) a. Gen.Sg. /hari+is/ → [ha.ri].is → *har.jis* (not **ha.reis* because *i.i* does not coalesce into $\bar{\imath}$ across foot boundary)

[5] In a paper now in preparation I present evidence for a constraint that requires Gothic stems to end in a weak mora, that is, either a consonant or a long vowel.

b. Gen.Sg. /herdi+is/ → [her].di.is → *her.deis* (coalescence is free to apply)

c. Gen.Sg. /ragini+is/ → [ra.gi].ni.is → *ra.gi.neis* (coalescence is free to apply)

Calabrese's closely reasoned study also makes some interesting historical conjectures about the Germanic and Indo-European origins of Sievers' Law, which I will briefly comment on below after presenting my own proposal.

4. Riad 1992:58 posits no abstract syllabifications which are later modified by rules sensitive to foot structure. Instead, Riad's syllabification algorithm itself operates under the control of a superordinate prosodic requirement. In the spirit of Optimality Theory *avant la lettre*, it directly assigns the syllable structure that best fits the word prosody, obviating the need for "initial syllabifications" followed by resyllabifications. Riad derives Gothic syllable structure, including the Sievers' Law alternation, from the interaction of the two-mora requirement (9a) with the parsing procedure (9b).

(8) a. *Prokosch's Law:* The stressed syllable contains two moras.

b. *Syllabification algorithm:*

- Map $[.\mu\mu]_\sigma$ left-to-right, such that the first mora of every syllable coincides with a sonority maximum, and such that all syllables receive onsets.
- The onset principle has precedence over the sonority principle in non-initial syllables.

The way this works is shown in (9) by the same examples as before:

(9) a. Gen.Sg. /hari+is/ → *har.jis* (not **ha.reis* because the first syllable would have just one mora)

b. Gen.Sg. /herdi+is/ → *her.deis*, /ragini+is/ → *ragi.neis* (by left-to-right mapping; **herd.jis*, **ragin.jis* would result from right-to-left mapping)

The novelty of Riad's approach, then, is that it makes a prosodic category of the language the *target* of syllabification, rather than the *domain* of extraneous conditions imposed upon the process. This idea is conceptually extremely attractive, and I will adopt it in my own proposal. On the empirical side, though, Riad's solution shares a problem with the Dresher-Lahiri analysis and adds one of its own. Because it makes no provision for Prokosch's Law to be overridden by general syllable structure constraints, it predicts syllabifications like **hair.dja*, **dō.mjan*. And does not capture the prosodic parallelism between H- and LL-stems, since it derives *hair.deis* by Prokosch's Law, whereas for *ma.na.geis* it relies on the stipulation that syllabification proceeds from left to right.[6]

The three studies reviewed here constitute a major step forward and have certainly raised the discussion to a new level. My own effort builds on all of them, and like them tries to explain Sievers' Law on the basis of the Germanic prosodic system, and to relate it to the phonology of the other Germanic languages. It has perhaps most in common with Riad's, and I will indeed formulate it explicitly as a set of ranked violable constraints.

[6]Calabrese, on the other hand, assumes right-to-left syllabification because of cases like *juggs* "yoke"; for Riad these follow from the onset requirement.

5. The constraint system. The key assumptions of my proposal are as follows:

(10) a. Words are parsed into moraic trochees, and stress falls obligatorily on the first syllable.

b. Words are syllabified so as to minimize sequences which cannot be so parsed, namely initial sequences of a light syllable followed by a heavy syllable, and superheavy (three-mora) syllables.

c. The foot constraints can be waived for word-final syllables. I will simply assume that word-final consonants need not count for assessing quantity (they can be "extrametrical").[7]

Here is how the key examples will work out under this regime. It will be seen that the foot structure is essentially the same as Calabrese's, but it iterates rather than stopping after the first foot. Prosodic structure is assigned directly, without resyllabification or even any procedural steps, and the relation between footing and syllabification is very simple.

(11) a. Gen.Sg. /hari+is/ → *[har].[jis]* (not **ha.reis* because [LH] cannot be exhaustively parsed into moraic trochees: parsed as [L][H], the first foot is too short, parsed as [LH], it is too long)

b. Gen.Sg. /herdi+is/ → *[her].[dei]s* (**herd.jis* cannot be parsed as a moraic trochee because it has a non-final three-mora syllable)

c. Gen.Sg. /ragini+is/ → *[ra.gi].[nei]s* (**ra.gin.jis* cannot be exhaustively parsed into moraic trochees)

I will assume the following system of constraints.[8]

(12) a. FAITHFULNESS. Segments are not to be inserted or deleted *(ia ↛ *ii, *i, *aa, *a, *iCa)*. Unviolated in the cases considered here.

b. *Cj-. Consonant+yod clusters may not form onsets. Unviolated.

c. ONSET. This constraint bars syllables that lack an onset. Word-internally, the effect is to prohibit hiatus. Where glide formation and contraction can apply, the constraint is unviolated in the native vocabulary, and even in loans, Greek *ια* is often replaced by Gothic *ja*, e.g. *Μαρία* > *Marja*, *Ἀντιόχεια* > *Antiokja* (Braune and Ebbinghaus 1961, Calabrese 1994). The dominant FAITHFULNESS constraint prohibits removing hiatus by deletion or epenthesis, however, and hiatus therefore occurs even in the native vocabulary in cases like *aiauk* [e.auk] "increased", and /fi+an/ → [fi.an] *(fian, fijan)* "hate".[9] In initial position as well, onsetless syllables occur because FAITHFULNESS allows no way of eliminating them.

[7] In fact, it is sufficient to assume just that the satisfaction of the foot constraints in non-final feet has priority, but I will not pursue this refinement here.

[8] Syllabification is assumed to be predictable (with well-known marginal exceptions not relevant here, such as *iupa* vs. *juggs*). In input forms, /i/ and /u/ here denote segments unspecified (or arbitrarily specified) for syllabicity. Thus I write /hari/ for [harj-] ∼ [hari-]. The actual underlying representation would be /harI/ (I unspecified for syllabicity) if we assume underspecification, and /harj/ (by lexicon optimization) if we do not. Tautosyllabic *ii* and *ij* are assumed to be the same thing. Both amount to a long nucleus $[\mu_s|\mu_w]_\sigma$ with the melody /i/.

[9] The two spellings are in free variation in the Gothic manuscripts; I assume that both represent the same pronunciation and count as hiatus. This maintains the generality of the FAITHFULNESS constraint; since there is no evidence of a contrast between *ija* and *ia* in any of the older Germanic languages I provisionally make the same assumption for all of them.

d. FOOT-FORM: Parse the word into moraic trochees (allowing for final C-extrametricality or the equivalent, see (10c).) Consequence: avoid *[⌣ —] and three-mora syllables. Violated when higher-ranked constraints so require.

Ranked as given, these constraints account for the Sievers' Law alternations:[10]

(13)

	Candidates	FAITHFULNESS	*.Cj	ONSET	FOOT-FORM
Gen. /herdi+is/	her.djis		*		
	her.di.is			*	
☞	her.diis				
	herd.jis				*
Gen. /hari+is/	ha.rjis		*		
	ha.ri.is			*	
	ha.riis				*
☞	har.jis				
Gen. /managi+is/	ma.na.gjis		*		
	ma.na.gi.is			*	
☞	ma.na.giis				
	ma.nag.jis				*
Dat.Sg. /herdi+a/	her.dii	*			
	her.dja		*		
	her.di.a			*	
☞	herd.ja				*
Inf. /fi+an/	fan	*			
	fjan		*		
☞	fi.an			*	

6. HL-stems: an exorcism. In one class of cases my analysis has different empirical consequences. Parsing into moraic trochees predicts that HL-stems pattern with L-stems, and H-stems with LL-stems. The other analyses discussed here instead single out stems with light root syllables from all others, classing not only H-, LL- and LH-stems, but also HL-stems, as heavy. Dresher and Lahiri cite one word formed from a HL stem, 2.Sg **glitmuneis* (HL-) "you shine", for which they predict vocalization by Sievers' Law just like 2.Sg. *sōkeis* (H-) "you seek" and **mikileis* (LL-) "you magnify". On their theory, the third syllable in /[glit.mu.]njis/ is not in the second branch of a Germanic foot, and therefore merger to *[glit.mu.]niis is not blocked. Riad cites the same

[10] As usual, each row shows one candidate output, and the finger points at the winner. The columns show the constraints, left to right in order of dominance. Stars mark constraint violations. To read the table, start with the leftmost column. If there is one unstarred candidate, select it. If there is a tie, discard the others and repeat on the next column until all but one candidate has been eliminated. Subsequent constraints are then irrelevant (marked by shading the row).

form and derives it by framing the bimoraic prosodic target only in terms of the weight of the first syllable. And Calabrese also predicts it in virtue of assigning only one foot at the left edge. This understanding of the context of Sievers' Law follows the handbooks, according to which *j* appears after a short stressed syllable and *i* after a long syllable and after an unstressed syllable (Kieckers 1928, *ó*37, Krause 1953:101).

In fact, **glitmuneis* is a ghost form.[11] There is no evidence that it ever existed, or indeed that HL-stems ever triggered Sievers' Law in Gothic or elsewhere. The extant Gothic texts provide no relevant *ja*-stem examples,[12] and so we may equally well suppose that the form was **glitmunjis*, like *nasjis* "you save". This is what my moraic trochee analysis predicts:

(14) a. *[glit][mun][jis]* (exhaustively parsed into moraic trochees)
b. *[glit]mu[nei]s* (a trapped L, not exhaustively footable)

This prediction is confirmed both by evidence internal to Gothic and by comparative Germanic data. Let us take a brief look at the latter first.

One way to tell glides from vowels is through the process of West Germanic gemination, which in Old English lengthened a syllable-final consonant before *j* but not before *i*. Gemination therefore took place in L-stems, as in (15a), but it did not take place in H-stems, as in (15b), or in LL-stems, as in (15c), because Sievers' Law vocalized the glide to *i* there. And in early Old English, HL-stems of this declension unambiguously go with L-stems in displaying gemination, as the forms in (15d) show (Dahl 1938:74 ff):

(15) a. *kuni+as → kunjas → kunnjas → OE. *kynnes* "kin, kind" (Gen.Sg.)
b. *wiiti+as → OE. *wītes* "punishement"
c. *aðali+as → OE. *æðeles* "nobility"
d. *fastini+as → fastinjas → fastinnjas → OE. *fæstennes* "fortress"; similarly *westenn-* "desert", *nierwett-* "narrowness", *līgett-* "lightning", *īrenn-* "iron"

Evidently, Sievers' Law did not apply in the HL-stems like (15d), which supports the moraic trochee analysis over the alternatives discussed in sections 2–4 above.

7. Consonant-liquid clusters. In order to understand how Gothic itself supports our revised formulation of Sievers' Law we must take a detour into the syllabification of consonant+liquid (CR) clusters. The idea that syllabification is governed by the preference for parsing words into moraic trochees leads to a prediction about them as well. Unlike Cj-, CR- is not barred from onset position, and so a metrically governed syllabification should make medial CR an onset if that avoids a superheavy syllable, and otherwise split it down the middle to avoid a complex onset. The predicted pattern is thus:

[11] The only attested form of this verb is the Nom.Pl. participle *glitmunjandeins* "shining" (Mk. 9.3), which tells us nothing about Sievers' Law. None of the weak verbs of the relevant shape, such as *kaupatjan* "to box on the ear", *lauhatjan* "to strike" (lightning), *swogatjan* "sigh", occur in a criterial form, such as 2.Sg **kaupateis* (predicted by Dresher & Lahiri's theory) or **kaupatjis* (predicted by mine).

[12] That LL-stems go with H- and LH- stems is shown clearly enough by *ja*-stem nouns: *răgĭneis* "adviser", like *hairdeis* "herdsman" and *sĭpōneis* "disciple", versus *harjis* "army". As for HL- stems, nouns in *-areis*, such as *bokareis* "scribe", *laisareis* "teacher", *could* be of that form, but the suffix, borrowed from Latin *-ārius*, may well have retained its long vowel in Gothic (as they certainly did in OHG), in which case they prove nothing.

(16) a. V̄.CRV (V̄C.RV would have an initial three-mora syllable)

b. VC.CRV (VCC.RV would have an initial three-mora syllable)

c. V̆C.RV (V̆.CRV has a complex onset)

Exactly this pattern of syllabification is observed in the syllable divisions at line boundaries in Ambrosianus E (the *Skeireins*) and in Ambrosianus B, the older and more fluently written of the two major Milan manuscripts of the Gothic Bible. After a short vowel, they invariably divide V̆C|RV; after a long vowel and a consonant they normally divide V̄|CRV, VC|CRV:[13]

(17) a. V̆C.RV (9x): *ak|ran, Pait|rau, þaþ|ro, iupaþ|ro (2x), ag|laitei, ag|lom, sik|le, wiþ|rus*

b. V̄.CRV, VC.CRV (8x): *hlei|þrai, bai|trei, Mam|bres, wul|þris, hair|þram, aik|klesjo, An|draias, af|tra*

c. V̄C.RV, VC.CRV (3x): *dauht|rum, broþ|runs, hlut|rans*

The distribution seen in (17a,b) reflects the syllabification predicted by the constraints in (12), given that Gothic allows CR- but not Cj- in syllable onsets (as word-initial clusters independently testify). The style of word division seen in the three examples in (17c) reflects the pattern (5) seen in all other consonant clusters.[14]

These data are taken from Schulze (1908), who assembled them with exemplary care, and recognized that Ambr. B and E syllabify CR clusters differently from the other codices. But Schulze, like all subsequent scholars, missed the effect of syllable weight on their word divisions. Believing the C|R and |CR divisions in (17) to be simply random variants, he speculated (p. 490) that the variation might be due to the influence of late Latin scribal practice, reflecting the ongoing shift of syllable boundaries at that time (*té.ne.brae* → *te.néb.rae*). The fact that the variation is sensitive to syllable weight renders this hypothesis unlikely, since syllable weight did not determine word division in late Latin scribal practice. The most plausible explanation for this distribution is that it reflects the scribes' authentic intuitions about Gothic syllable boundaries.

The *Codex Argenteus* and Ambrosianus A follow a different convention. They never divide CR clusters with C =*tr, kr, dr, gr, br, þr*:[15]

(18) a. V̆.CRV: *Ga|briel, fa|dreina, Pai|trus, þa|þro, wi|þra*

b. VC.CRV: *maur|þreiþ, ganawis|troþs, win|trau, An|draias*

Schulze thought that it was these manuscripts that reflected the genuine syllable structure of Gothic. Noting that many instances where words are divided before CR occur in Greek loans, Hermann (1923:288-290) argued that this is a purely orthographic convention borrowed from Greek. If correct, this would strengthen the case for my claim that the convention followed in Ambr. B and E reflects native intuitions about the language's syllable divisions. The most realistic scenario is probably that the idea of giving CR clusters special treatment came from Greek scribal practice, but was implemented mechanically in the Greek fashion in one set of manuscripts, and was given a

[13]Here it is important to remember that Gothic *ai* spells both short *e*, as in *Paitrus* (Πέτρος) and a long vowel or diphthong, as in *baitrei*.

[14]Perhaps significantly, all three occur within a few pages of each other (2. Corinthians 6.18, 7.11, 9.5).

[15]Before *j*, they naturally divide VCR|jV, e.g. *broþr|jus*, since *rj-* (like all Cj- clusters) is barred from onsets in Gothic.

native twist in the other.[16] In any case, we may conclude that such evidence as can be gleaned from the scribal practice of the Gothic manuscripts points to the same quantity-sensitive syllabification that lies behind Sievers' Law.[17]

The difference between Cj clusters and CR clusters is that Cj is categorically excluded as an onset, and can be vocalized to Ci, while CR is a possible (though not favored) onset, and cannot be vocalized. Thus CR onsets are barred by a weaker (lower-ranked) constraint than other complex onsets. The stronger constraint, here formulated simply as the requirement that an onset cluster must be of the form CR, is crucially dominated only by by the inviolable constraints that rule out impermissible onsets of the language (such as *Cj-), and by the Faithfulness constraints that prevent word-initial onsets from being categorically simplified by deletion (*gl-* $\not\rightarrow$ *g-*, *l-*). The weaker constraint, here formulated as a general ban on onset clusters, is dominated also by the foot structure constraints, yielding weight-determined syllabification of these clusters. Thus it is massively violated in word-initial position, but it still comes into play medially when foot structure is not at issue, e.g. selecting *ak*|*ran* over *a*|*kran*, and *wiþ.rus* over *wi.þrus*.

(19)

Candidates			*.Cj-	.CC- ⊃ .CR-	Foot-Form	*.CC-
/herþram/	☞	her.þram				*
		herþ.ram			*	
/hliiþrai/	☞	hlii.þrai				*
		hliiþ.rai			*	
/wiþrus/		wi.þrus				*
	☞	wiþ.rus				
/iupaþroo/		iu.pa.þroo			*	*
	☞	iu.paþ.roo				
/filusnai/		filu.snai		*		*
	☞	filus.nai			*	
/kukjan/		ku.kjan	*	*		*
	☞	kuk.jan				

Assuming these conclusions are correct, then *iupaþ*|*ro*, divided twice that way in the *Skeireins*, is crucial evidence for Gothic foot structure. Recall that the analyses of Dresher & Lahiri and of

[16]This assumption would also explain why *tw, dw* are not treated like *CR*, but are divided in accord with the general convention illustrated in (5), e.g. *nid*|*wa, weit*|*wodjand*. Phonologically, it is not clear why *Cw* clusters should be syllabified differently from *CR* clusters, but if the orthographic practice is borrowed from Greek, this distinction makes sense because Greek has no *w*. However, the difference between *þr*, which is never divided, and *hr*, which follows the general treatment of clusters, is more surprising, since both are possible onsets in Gothic and neither occurs in Greek. On the other hand, the fact that *sr* is divided is doubly motivated because it is not a possible onset either in Gothic or in Greek.

[17]The Gothic word division facts are mentioned in the previously discussed studies, but each party tends to focus on a different portion of Schulze's evidence, and all are unaware of the weight effect. Murray and Vennemann 1983 argue that medial clusters, including CR, are always syllabified before the last consonant in Gothic; Calabrese (1994:151) on the contrary claims that CR clusters are always onsets in Gothic.

Riad assign HL- stems to the class of heavy stems along with H-, LH-, and HH- stems, whereas mine groups them with rhythmically with L- stems, since the first heavy syllable forms a foot by itself.[18] We now see that the moraic trochee analysis is not only more in harmony with the other Germanic languages, but is supported by Gothic data as well. If syllabification works to secure moraic trochees as proposed above, then the optimal syllabification of *iupaþro* is [iu][paþ][roo], for [iu]pa[þroo] would gratuitously trap a light syllable between two feet, unable to join another syllable and too short to make a foot by itself.

I conclude that medial consonant-liquid clusters provide independent support for the Germanic foot structure in (10). Although CR does not vocalize in Gothic, and is a permissible onset, its syllabification obeys the same constraint system as Cj does. The differences between their treatment follow from the constraint interactions. In long *ja*-stems with nonhigh vocalic endings (such as *hairdja)*, the preferred foot and syllable structure cannot be fully achieved; the excess segmental material *(-d-* in this case) is then squeezed into the coda of the first syllable, yielding a three-mora syllable which breaches the moraic trochee template. Technically, what this means is that the prohibition on Cj- onsets and the Faithfulness constraint that forbids deleting *j* both outrank, and thereby defeat, the constraints on foot structure.

8. Germanic. It is generally assumed that in Germanic, Sievers' Law governed glide/vowel alternations before nonhigh vowels. Where Gothic has a glide both in *har.ja* and in *herd.ja*, earlier Germanic differentiated **har.ja-* and **her.di.a-*, according to the weight of the stem syllable. What this means is simply that the ONSET constraint (12c), which bars hiatus of the type **i.(j)V*, was originally ranked below the FOOT-FORM constraint (12d). The following constraint table, to be compared with (13), shows how this minimally modified constraint ranking derives the proto-Germanic version of Sievers' Law.

(20)

Dat.Sg.	Candidates	FAITHFULNESS	*.Cj	FOOT-FORM	ONSET
/herdi+a/	her.dii	*			
	her.dja		*		
☞	her.di.a				*
	herd.ja			*	
/hari+a/	har.i	*			
	harj.a		*		
	ha.ri.a				*
☞	har.ja				

A dissenting opinion is voiced by Calabrese 1994:179, who holds that Germanic syllabified uniformly **ha.ri.a-*, **her.di.a* with hiatus. If that were true, it would give some plausibility to

[18]Calabrese's analysis comes out wrong too, because he assigns a foot only at the left edge. In any case, his theory, like that of Dresher and Lahiri, predicts no intrinsic connection between foot boundaries and the syllabification of CR clusters.

the "initial syllabification" he proposes for Gothic (see section 3 above). He suggests that Runic inscriptions and Finnish loanwords tend to support this syllabification pattern for Germanic. In the Runic inscriptions, long stems *always* show vocalization, e.g. *raunija*R "challenger" (Stabu), *holtija*R "man from Holt" (Gallehus), *arbija* "inheritance", *arbijano* "heir" (Tune), while light stems are sometimes written with *j*, as in *harja* (Vi), *swabaharja*R (Rö), and sometimes with *i*, as in *gudija* (Nordhuglen), *harija(n)* (Skåäng).[19] If these are the facts, they do not seem to me to support the assumption of consistent Ci.V syllabification.

As loanword evidence for Germanic vocalization after short stems Calabrese cites Finnish *hipiä* "hue" and *upia* "splendid" (standard Finnish *upea)*. These words are however useless as evidence because Finnish allows no labials in codas, so that **hipjä*, **upja* are impossible, and therefore their Germanic *j* would have had vocalize to *i* in Finnish in any case. On the contrary, insofar as its phonotactics allows, Finnish retains *j* in its borrowed Germanic short *ja*- and *jō*-stems: *patja* "mattress", *vitja* "chain", *ahjo* "forge", *teljo* "thwart (boat seat)". The evidence from Finnish loans thus supports the traditional picture of Germanic syllabification assumed in (20).

This syllable structure seems to be directly reflected in Old Saxon. *i* and *j* are both spelled *i*, but from the fact that syllable-final gemination, triggered by a following *j*, is restricted to light stems we can infer that heavy stems had *i* in accord with Sievers' Law; *i/j* is well preserved regardless of syllable weight (Holthausen 1921:62,95):

(21) a. Dat.Sg. *kunnie* "kin", *beddie* "bed" vs. *mākie* "sword", *hwētie* "wheat", *hirdie* "herdsman", *aðalie* "nobility"

b. Inf. *fullian* "fill", *liggian* "lie" vs. *fōlian* "feel", *rūmian* "make room", *lēdian* "lead", *thurstian* "thirst"

This stage could be seen as the result of applying West Germanic gemination to the oldest Germanic prosodic system, that in (20).

Archaic Old High German , on the other hand, shows gemination in both long stems and short stems (Braune-Mitzka 1961, *ó*96, Simmler 1974). The triggering *j* continues to be sporadically written (spelled *i*) before back vowels up to the 9th century (Braune-Mitzka 1961, *ó*118).

(22) a. Dat.Sg. *reinne* "clean", *kunn(i)e* "kin", *suanārre* "judge", Nom.Sg.F. *rīffiu* "ripe", Acc.Sg. *hreinnan* "clean"

b. Inf. *ki-teillanne, ar-teillan* "divide", *hlūtten* "sound", *hōrran* "hear", *slāffan* "sleep", *loupfen* "run", 3.Pl. *gi-heillant* "heal", *lūttant* "sound"

We can thus say that West Germanic gemination in Old High German testifies to a prosodic system that resembled the Gothic system in (13) in having *j* after both heavy and light stems. Thus, OHG *kunnie, (h)reinne* correspond to Gothic *kun.ja, hrain.jai*.[20] In fact, the OHG/Gothic parallellism goes further. There is also OHG scribal testimony to quantity-sensitive syllabification of medial *CR*, of exactly the same type as in Gothic. The normal practice of the oldest manuscripts, such as

[19]Springer 1975 argues that the latter cases reflect an orthographic convention stemming from a time when prevocalic *i* after heavy stems had been lost (see (24) below), and there was no longer any need to distinguish in writing between *i* and *j* in that position. It is also possible that syllabic *i* was extended from heavy stems to light stems in certain morphological categories (see Murray 1988, Ch. 6).

[20]Compare Snyder 1987 on the special relationship between OHG and Gothic in the lexical domain.

the *Abrogans* and the Monsee fragments, is to divide clusters before the last consonant. But here too medial *CR* gets special treatment. Schulze (1908:408, fn.) notes several examples in the latter manuscript where words are divided *before CR*:

(23) ga ni drit, for drono, hun grita, gamar trotan, tem ple, tem ples, an|dremo, hun|gragan

Tellingly, in every such instance the cluster is preceded either by a heavy syllable or by two light syllables — in other words, by a moraic trochee.

Lutz 1986, using data from Wetzel 1981, shows that the same effect of syllable weight on word division in CR clusters holds for Old English.[21] According to Lutz, word divisions after short accented syllables are predominantly CV̆C|RV, while after long syllables and short unaccented syllables they are predominantly CV̄|CRV, CVC|CRV, CVCV|CRV. (For the latter case, Lutz' breakdown of the data does not distinguish between LL- stems, such as *weredre*, where I predict CV̆CV̆|CRV, and HL-stems, such as *hāligra*, where I predict CV̄CV̆C|RV.) A noteworthy fact about Old English is that *st* shows the same sensitivity to syllable weight.

Old English and Scandinavian enforce the Germanic foot structure even more aggressively than Gothic and continental West Germanic. They do not accommodate excess segments in either onsetless or extralong syllables, but delete them outright, thereby enforcing the prosodic structure that the other dialects merely prefer. Technically, what this means is that the foot structure constraints get ranked above the Faithfulness constraints. The best-known manifestation of this system is that *y* is deleted after heavy syllables and after two light syllables: precisely where it could not be syllabified without exceeding the bounds of the permitted syllable and foot structure. For Old Icelandic, for example, we have:

[21] In writing my paper I was unaware of these studies. Thanks to the kindness of Tomas Riad, I received a copy of Lutz' paper just in time to cite her findings here, which so nicely confirm my own.

(24)

Nom.Pl.	Candidates	*.Cj	ONSET	FOOT-FORM	FAITHFULNESS
/hirþi+ar/	hir.þjar	*			
	hir.þi.ar		*		
	hirþ.jar			*	
	☞ hir.þar				*
/niþi+ar/	ni.þjar	*			
	ni.þi.ar		*		
	☞ niþ.jar				
	ni.þar				*

The next episode in the evolution of Germanic prosody is the modification of the system by a series of syncope processes. While gemination applies just after short vowels in Old English and Old Saxon but independently of syllable weight in Old High German, syncope obeys the same quantitative restrictions everywhere. I hope to show elsewhere how the difference in syllable structure arising from the constraint reranking outlined above explains why that is the case.

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