A little-known law on the root and syllable structures of Proto-Indo-European

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1. This paper focuses on a constraint that can be observed in the structure of Proto-Indo-European (PIE) roots: namely, that two sonorants are not permitted at the end of a root.

This law is not entirely unknown, but references to it in the specialist literature are very limited. It only appears in a few PIE handbooks, and one can even find root reconstructions that contravene this law. This relative neglect is all the more surprising since the law affected not just the PIE root structure but its syllable structure as well, as I will try to demonstrate.

Let us begin with the known version of the law: that is, the law referring to PIE roots. It can be formulated as follows:

A PIE root cannot end in two sonorants:

$†√ *…eRR$

$R = \{l, r, m, n, i̯, u̯\}$

Consequently, roots like $†√*kelm-$, $†√*d^heir-$, $†√*tern-$ … are not permitted.

Note that this is valid for the basic structure of the root, i.e., for a full grade where the sonorants follow the root vowel *e* and are functioning as consonants. In zero grades two sonorants may be found at the end of a root if one of them is functioning as the syllable nucleus (*un*, *iu̯*, *ru*, etc.[1]). Formulated in a different way, we can establish that *two non-syllabic sonorants cannot appear at the end of a root*.

2. This law on the root structure was already noted by Ferdinand de Saussure. In his famous *Mémoire sur le système primitif des voyelles dans les langues indo-européennes* (SAUSSURE 1879) he pointed out, with his customary perspicacity, that PIE had no roots finishing in *in*, *un*, *ir*, *ur*, etc., and he established that this absence was due to the fact that the root vowel (in those days reconstructed as **a*) took only one "sonantic coefficient" (*i̯, u̯, r, l, m, n*) after it:

> L'absence de racines en *in, un; im, um; ir, ur* (…) est un fait si frappant qu'avant de connaître la nasale sonante de M. Brugman [*sic*] il nous semblait déjà qu'il créât entre les rôles de *i, u*, et de *n, m, r*, une remarquable similitude. En effet cela suffirait à établir que la fonction de *a* et la fonction de *i* ou *u* sont totalement différentes. Si *i, u*, étaient, au même titre que *a*, voyelles fondamentales de leurs racines, on ne comprendrait pas pourquoi celles-ci ne finissent jamais par des

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[1] As we will see below, the tendency to syllabify as the nucleus the second of two sonorants from the left (known as the Osthoff-Meillet-Schindler rule) explains the scarce number of examples of sequences of two sonorants in which the first one acts as nucleus (type *un*, *ur*, etc.)

phonèmes qui, à la suite de *a*, sont fort communs. Dans notre conception, cela s'explique simplement par le fait que *a* ne prend qu'un seul coefficient sonantique après lui. (SAUSSURE 1879: 125)

The law was also stated in a cursory way by Antoine Meillet in the first edition of his *Introduction à l'étude comparative des langues indo-européennes* (MEILLET 1903). Here also it refers only to root structures:

Dans les exemples 1, 3 et 4, le groupe final *kt* suffit à réveler la présence d'un élargissement ; car une racine ne se termine pas par deux occlusives, non plus que par deux sonantes. (MEILLET 1903: 148; cf. MEILLET 1937: 176)

Meillet is speaking about *élargissements* (extensions) of roots. The examples 1, 3 and 4 mentioned in the paragraph refer to roots apparently finishing in *-kt-* which can be connected with otherwise identical roots finishing in *-k-* alone, so that *-t-* would simply be an *élargissement*. Meillet reinforces this interpretation by appealing to a law of prohibition of two stops at the end of a PIE root, and then, in passing, he introduces the constraint on two sonorants. Incidentally, I should stress two important points in this statement. Firstly, it is circular to argue that if a root ends in two stops, the second one cannot properly be part of the root because a root cannot end in two stops. Secondly, and more significantly, the situation regarding two sonorants at the end of a root is not exactly comparable because as a consequence of what has already been observed, there could be hardly any examples of sonorant extensions following a root final sonorant; perhaps the only possible exception is *deį+ų-*, on which see below, 8.

Winfred P. Lehmann formulated the law again in his *Proto-Indo-European Phonology* (LEHMANN 1952), borrowing it from Meillet's Introduction:[2]

A root cannot contain two successive resonants; /teyw/ is impossible. If there seems to be such a root, e. g. /moyn-/ in Lat. *commūnis* < *commoinis*, the root must be /moy/ and /n/ must be part of the suffix (Introduction 157). (LEHMANN 1952: 17)

Note, in any case, that Lehmann seems to extend the law to *any* sequence of two sonorants inside a root, independently of their position in the root.

Oswald Szemerényi also included the law in his handbook on *Indo-European Linguistics* (SZEMERÉNYI 1996):

Furthermore, the nucleus of the root, i. e. the vowel, may not be followed by two sonants or two stops: thus e.g. *teurk-* and *tekt-* are impossible. If nevertheless such a sequence seems to occur, there is a morpheme boundary between the two sonants or stops: Lat. *mūnus* from *moinos is not formed from a root *moin-*, but

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[2] Here the page number (157) refers to the eighth edition [1937] of Meillet's *Introduction* (MEILLET 1903).

from *moi-/mei- (cf. Skt. mayatē 'exchanges') with the suffix -nos as in fēnus, facinus. (SZEMERÉNYI 1996: 99)

As can be seen, Szemerényi's example owes a great debt to Lehmann's.

In some handbooks this constraint on root structures is not explicitly stated, but it is implicitly assumed. This is the case of ADRADOS/BERNABÉ/MENDOZA (1996: 14) and TICHY (2009: 37).

The law appears in two studies of verbal stems with nasal infix: PUHVEL (1960: 31), where it is used to explain the non-existence of †ḱel̥- besides *ḱleu̯-, and GARCÍA TEIJEIRO (1970: 30, 44, 54–55), who follows Puhvel on this point. However, both these works were based on Benveniste's theory of PIE root structure, a theory that has little support today; probably for this reason, these approaches to the law have not received a great deal of attention.

In summary, then, the application of this law to root structure is not entirely unknown, but in general its presence in the literature is very limited. For instance, it does not appear in the recent handbooks by BEEKES-DE VAAN (2011), CLACKSON (2007), FORTSON (2009) or MEIER-BRÜGGER (2003)[3].

3. As proof of how this law has been largely ignored by many Indo-Europeanists, I shall show three examples:

The first example comes from the handbook by Clackson just mentioned. This author reconstructs a root *deyw- [i. e., *dei̯u̯-] as an alternative form of *dyew-, without noticing that *deyw- contravenes the prohibition of two non-syllabic sonorants at the end of a root (CLACKSON 2007: 66).

A second example can be found in the Lexikon der indogermanischen Verben (LIV): All the roots reconstructed in the Lexikon observe the law, except one: *bʰer̥u̯- 'boil':

*bʰer̥u̯- 'sieden, wallen'

Präsens: *bʰér̥u̯-e-   lat. feruō, -ere 'sieden, wallen'

                                  kymr. berw- 'sieden, wallen'

Iterativ: ?*bʰor̥u̯-éi̯e-   [lat. frueō, -ēre 'sieden, wallen'

(LIV 81)

This is a curious example: its appearance in the LIV shows that the authors were not aware of the law; nevertheless, they reconstructed only one root with two sonorants in the final position, which seems to support that the law was (almost) universal.

The third and last example is also striking: it comes from the very recent book on the PIE syllable by Andrew Byrd (BYRD 2015). In his treatment of the Osthoff-Meillet-Schindler rule,

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[3] In Meier-Brügger's handbook the absence is less striking, because morpho-phonological aspects of PIE reconstruction are hardly considered there at all.

which states that any sequence *RR in PIE was syllabified as RR̥, Byrd affirms that this syllabification is the result of the fact that RR, both in roots and in suffixes, is systematically the zero grade of a sequence RVR (BYRD 2015: 175). I will come back to the Osthoff-Meillet-Schindler rule later, but the most interesting feature of this treatment is the fact that Byrd finds in LIV a single case in which RR does not come from RVR: precisely the abovementioned root *bʰerṷ-. Byrd dismisses this counterexample by interpreting ṷ as a root extension (BYRD 2015: 175, n. 108).

What surprises me is that this gives the impression that Byrd had no previous knowledge of the law.

4. But in my opinion, it is more significant that this constraint on the root structure does not seem to have been transferred to the analysis of the PIE root structure. As KEYDANA (2004) rightly pointed out, the domain for any constraint on the PIE root structure is, in fact, the PIE syllable. In other words, the reconstruction of PIE roots can help us to understand what the PIE syllable structure was like. This is the idea developed by Keydana, although he himself failed even to mention the constraint that is the subject of our own paper.

If one accepts Keydana's view, then one must conclude that the constraint on the sonorants at the end of a PIE root was a constraint on the PIE *syllable coda*. This can be formulated thus:

The coda of a PIE syllable cannot have two sonorants.

　　　† VRR₍σ₎]

To my knowledge, the absence of this law on PIE syllables in the literature is almost total. We cannot take SCHWYZER (1934–1939: 238–239) as a precedent. Certainly, he stated a constraint on PIE syllables where two sonorants were implied, but his constraint is clearly different from the law studied here: Schwyzer said that PIE did not know syllables with the structure C + *i* (or) + Liquid (nasal) + Consonant (Ci/uRC), as *kirk, kurk*, etc. unlike Greek, where these structures were possible. Rather surprisingly, as examples for these syllable structures in Greek, he gave words like κίρκος, φύλλον, where the syllables are not Ci/uRC but simply Ci/uR! In any case, if one is actually speaking of Ci/uR syllables, it is not true to say that they did not exist in PIE (cf. *ṷungénti, *linkᵘénti, *méntim*, etc.), as Meillet already noted in his review of Schwyzer's book (MEILLET 1934: 54).

In fact, in this review, MEILLET (1934: 54) recalled the law and stated clearly that it was a principle relating to PIE root structure, not to PIE phonetics, thus releasing PIE syllable structures from this constraint:

> il ne s'agit pas d'une théorie relative au phonétisme européen [*sic*], mais d'un principe relatif à la structure des racines indo-européennes. (MEILLET 1934: 54)

The sole author I know who seemed to apply the constraint to PIE syllable structure was SCHMITT-BRANDT (1973: 15–16). Schmitt-Brandt postulated that forms like *dieṷs* or *ĝᵘen-

came from *deiu̯s, *ĝeu̯n- as the result of a metathesis due to a PIE restraint that did not allow two sonorants to be in contact in the same syllable:

> Bei Wurzeln auf Sonant (Halbvokal, Liquida oder Nasal), an die eine sonantische Erweiterung antrat, wurde die Metathese auch dann erforderlich, wenn die beiden Sonanten in den Silbenauslaut gerieten, *denn zwei Sonanten in direkter Nachbarschaft, die derselben Silbe angehören, duldet das Indogermanische nicht.* (SCHMITT-BRANDT 1973: 15; italics are mine)

However, an attentive reading of Schmitt-Brandt's statement shows that he extends the constraint to *any* pair of non-syllabic sonorants in contact, *both at the onset and at the coda of a syllable.* This is confirmed by a further example of the constraint given by Schmitt-Brandt: roots with a zero grade RiT, like *likᵘ-, always had a full grade ReiT (*lei̯kᵘ) because a form Ri̯et (†li̯ekᵘ-), in which two non-syllabic sonorants would be in contact at the onset, was prohibited.

But this extension of the constraint to the onset is clearly contradicted by the existence of sequences such as *u̯r-, *u̯l-, *u̯i̯-, *mr-, *ml-, *mi̯- at the beginning of PIE roots and, subsequently, PIE syllables (cf. TICHY 2009: 37). In conclusion, Schmitt-Brandt did not give a fully correct account of the constraint discussed here.

To my knowledge, recent works on PIE syllables do not pay attention to this constraint. In general, the Osthoff-Meillet-Schindler system of PIE syllable parsing is followed, which means that in any sequence RR a syllabification RR̥ is assumed, independently of the context in which the sequence appears and from the relative sonority of the two segments involved (cf. COOPER 2015: 68). If Osthoff-Meillet-Schindler's parsing is followed, one will not find any sequences RR at the end of a syllable. But accepting the Osthoff-Meillet-Schindler rule has some unfortunate consequences, as we will see.

5. Before tackling the law as applied to syllables, it is important to point out that our constraint is not generally valid among the world's languages: there are languages that admit a syllable end VRR_σ], others that do not admit it at all, and others only for certain sonorants. For instance, in Spanish there are no syllables like †/term/, †/kalm/, but there are a few syllables ending in glide plus nasal: *veinte* 'twenty' /bejn.te/, *aunque* /awŋ.ke/ 'although'. In Standard Classical Latin the prohibition seems to have been widespread, and only in an exceptional way and as a poetic license do we find examples such as *dein* measured as one syllable.

Conversely, in Standard English we find words such as *film*, *charm*, *born*, *brown*, *mind*, *mail*, *contain*, etc. where there is no constraint on VRR_σ]. The only operating principle is the sonority hierarchy, so that the first sonorant must be more sonorous that the second one. This principle blocks syllables as †/kaml/, †/kalr/ or †/berw/, while it permits *earl* /ɜːrl/. However, in some variants of English, not all the sonorant sequences permitted in Standard

English are allowed, so that epenthesis is introduced. This is the case of Irish English (HICKEY 2007: 307–308):

film /fɪlm/   >   [fɪ.lɪm]

Significantly, in many languages the constraint on two sonorants at the coda is independent from the number of consonants that are permitted in that position. Of course, languages that only admit one consonant in the coda, such as Japanese (cf. PARADIS 1988: 94), or that admit no consonant in that position, such as Maori (cf. HARLOW 2006: 71), will never have two sonorants there. But in other languages where two or many consonants can be in the coda, RR$_\sigma$] is prohibited. This is the case of Latin, where syllables such as /leks/, /sunt/ or even /urps/, /arks/ with two or three consonants after the nucleus are allowed, at least in word-final syllables, but as mentioned above, RR does not appear in that position, not even in word-final syllables. This means that, for these languages, the reason for this constraint is not the number of segments but rather the need for a greater contrast of sonority between the two segments following the nucleus.

PIE seems to have been one of these languages where RR$_\sigma$] was prohibited but other combinations of CC were permitted. This is shown by reconstructed forms such as *$h_1$sént, *nók^{u}ts.

In the following pages we will see certain phenomena that are closely related to this constraint on syllable structure.

6. I think that this constraint allows us to see the Osthoff-Meillet-Schindler rule on syllabification of sonorants in a totally different way. OSTHOFF (1881: 285f.) and, probably independently, MEILLET (1903: 105–107) established the principle that, when a sequence of two sonorants is found in PIE, it is the second from the left that becomes the syllable nucleus (RR > RR̥). SCHINDLER (1977: 56) refined their statements by specifying that this rule operates "from right to left", i.e., from the end of the word towards the beginning, and that it acts in a cyclical way. As MAYRHOFER (1986: 163) pointed out, Schindler's account would explain the different syllabification of *ĝu̯n̥.b^{h}is vs. *ĝu.nos:

Die Regel findet sich bei SCHINDLER (1977: 56) und lautet:

$$\begin{bmatrix} + \text{ son} \\ - \text{ syll} \end{bmatrix} \rightarrow \begin{bmatrix} + \text{ syll} \end{bmatrix} \Big/ \begin{bmatrix} - \text{ syll} \\ \# \end{bmatrix} \underline{\quad\quad} \begin{bmatrix} - \text{ syll} \\ \# \end{bmatrix}$$

Mit der wesentlichen Anweisung „iterativ von rechts nach links".

In Praxi bedeutet dies: stehen z. B. */ĝ/, */u̯/, */n/ vor dem Morphem *{-os}, so wird */n/ unsilbisch realisiert, */u̯/ silbisch; also */ĝunós/ ,des Hundes‘, gr. κυνός, ved. śúnaḥ. Vor *{-b^{h}is} wird */n/ → [n] [sic], */u̯/ bleibt, also *ĝu̯n[sic]b^{h}is ,mit den Hunden‘, altindoar. śvabhíḥ. Ohne Beachtung der Iterationsrichtung hätte *ĝ-u̯-n-b^h- zu falschem †ĝunb^{h}is geführt. (MAYRHOFER 1986: 163)

However, Osthoff-Meillet-Schindler's rule does not explain why we have */mén.tim/ instead of †/mént.i̯m/, which would be the form predicted by the rule, cf. */ph₂.te.rm̥/. Aware of this difficulty, Mayrhofer puts forward the "morphological significance" of -*m* as the cause of this violation of the rule ("Die morphologische Bedeutung von -*m* und -*n*- [*scilicet* in *i̯ungenti*, cf. infra] war gewiß die Ursache dieser Ausnahmen", MAYRHOFER 1986: 163). But this is an absurd explanation, clearly contradicted by */ph₂.te.rm̥/, where no "morphological significance" prevents *m* from being syllabified as nucleus.

In fact, the difference between */mén.tim/ and */ph₂.te.rm̥/ is easily explained if one admits that a syllabification such as †/ph₂.term/ was rendered impossible in PIE as a consequence of the constraint on sonorants at the end of a syllable. The syllabification as */ph₂.te.rm̥/ is therefore comparable to the epenthesis /fɪlm/ > /fɪ.lɪm/ in Irish English mentioned above.

From this point of view, *contra* Mayrhofer, */mén.tim/ *is* the regular form and it does not need ad hoc explanations to justify it. This is the expected form when the accusative morpheme *m* is added to the stem *ménti-*. Conversely, */ph₂.te.rm̥/ is the result of a resyllabification triggered by the impossibility of having †/ph₂.term/:

　　ménti + *m*　　*ph₂tér* + *m*

　　/men.tim/　　†/ph₂ᵒ.term/ → /ph₂ᵒ.te.rm̥/

I think that the common treatment of *méntim* as a "strange" or exceptional form is a consequence of Osthoff-Meillet's doctrine that took *i*, *u* to be improper vowels, for the reason that he saw as simple avatars of *i̯, u̯* in the nucleus position. For Meillet, *im, *um, *ir, *ur*, etc. were anomalous structures, as they did not enter into the apophonic system eR/oR/R̥:

> De la règle générale il résulte qu'il n'existait pas en indo-européen de diphtongue constituée par sonante voyelle plus sonante second élément de diphtongue ; quand donc, dans un mot de date indo-européenne, le lituanien a *ir, ur* devant consonne, il ne s'agit jamais d'anciens **i + *r*, **u + *r*, mais toujours d'anciens **r̥*. Les seules exceptions à ce principe proviennent de circonstances morphologiques ; ainsi les verbes à nasale infixée présentent des diphtongues telles que *in : skr. *ri-ñ-cánti* "ils laissent", à côté de *riṇákti* "il laisse", lat. *li-n-quō*, v. pruss. (*po-*)*lī-n-ka* "il reste" ou skr. *kr̥-n-tán* "tournant" (participe présent de *kr̥ṇátti* "il tourne"). (MEILLET 1903: 106; cf. MEILLET 1937: 134–135)

In fact, this doctrine is clearly reminiscent of Saussure's remarks on the absence of PIE roots ending in the likes of *in, ir* mentioned at the beginning of this paper.

But these combinations *did* exist in PIE, in the same way that in PIE the vowels *i, u* existed. As KEYDANA (2004) points out, the set of sonorants generally labelled as R is not homogeneous. Whereas *r, *l* are primarily consonants that can play the role of syllable nuclei, *i̯, *u̯* presuppose the existence of true vowels *i, u,* as typological studies have

convincingly demonstrated[4]. The obsession with placing *$i̯$, *$u̯$ on the same level with *r, *l, *m, *n has therefore led to a consideration of forms like *$méntim$ as strange or exceptional. Actually, a syllable /tim/ was perfectly possible in PIE.

Osthoff-Meillet's doctrine, and also the wish to find one single principle of syllabification for sonorant sequences of any kind, lies behind the answers given to the problem of the different kinds of syllabification found in $k̂u̯n̥.b^his$ vs. $i̯un.gen.ti$. This is a thorny problem, with a long bibliography and with a prominent role in recent monographies on PIE syllable by Byrd (2015) and Cooper (2015). A solution to this problem remains beyond the limits of this paper, but at least it should be pointed out that the allegedly strange form *$i̯ungenti$ offers, like *$mentim$, a straightforward and natural syllabification: /u/ is more sonorous than /n/, so from a typological point of view it is /u/ that is expected to play the role of syllable nucleus. Conversely, *$k̂u̯n̥.b^his$, the form that best fits Osthoff-Meillet-Schindler's rule, appears to be much more anomalous from the point of view of linguistic typology: in this latter form, the syllable nucleus is displaced from the more sonorous /u/ to /n/. In my opinion, it is *$k̂u̯n̥b^his$ that needs to be explained. The joint evidence from *$k̂u̯n̥b^his$ and *$ph_2term̥$ that seems to conform to Osthoff-Meillet-Schindler's rule is no more than a mirage: */ph2.te.rm̥/ is syllabified in this way because [CVRRσ] was prohibited, while in *$k̂u̯n̥b^his$ an alternative syllabification †/k̂un.b^his/ was not only theoretically possible, but would also be expected typologically.

It is not clear to me why *$k̂u̯n̥b^his$ was preferred. Further research is needed to ascertain this question. As a preliminary guess, I suggest that the principle underlying this syllabification was to preserve onset structures of the full grade in the zero grade. If we accept the common internal reconstruction that makes zero grade come from full grade, the difference between *$k̂u̯n̥.b^his$ and *$i̯un.gen.ti$ is parallel to the clear difference between the full grades of the respective stems *$k̂u̯é/ón-$ and *$i̯unég-$. A syllabification /k̂u̯n̥./ in zero grade allows the intact preservation of the onset structure of full grade, /k̂u̯/-, in the same way as a zero grade /i̯ung./ preserves the onset /i̯/- of the corresponding full grade. Certainly, in other forms of zero grade such as *$k̂unos$, the onset is not preserved, but here the pre-vocalic context of the sequence *$k̂un-$ in *$k̂unos$ seems to be determinant, insofar as a syllabification †/k̂u̯nos/ (monosyllabic!) with an onset /k̂u̯n/ was impossible.

7. Another effect of the constraint on sonorants at the end of a syllable can be seen in Stang's law. This is Mayrhofer's formulation:

> Nach der „Lex Stang" gehen die bekannten Kasus zu Diphthongstämmen wie ved. *d(i)yáuḥ* ‚Himmel', *gáuḥ* ‚Rind', nämlich AkkSing ved. *dyā́m* gr. Zῆν, AkkSing ved.

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[4] Cf. also the clear statement of Kuryłowicz (1968) in favour of PIE *i, *u as primary vowels in contrast to *r,* l,* m, *n as primary consonants: "Die Gleichstellung von $i̯$, $u̯$, r, l, m, n bedeutet nicht, daß alle sechs Elemente derselben Klasse angehören. Vielmehr sind i und u Vokale, die in sekundärer Funktion (...) nichtsilbisch werden, während bei r, l, n, m die silbische Funktion sekundär ist" (Kuryłowicz 1968: 202).

gā́m dor. βῶν, AkkPlur ved. *gā́ḥ* dor. βῶς nicht auf die Tilgung von *-u̯-* in dehnstufigen *ēu̯* zurück, da die genannten Kasus im Indogermanischen nicht dehnstufig sind (vgl. gr. πατήρ, aber AkkSing πατέρα, AkkPlur πατέρας). Es sind also neben den dehnstufigen Nominativen **di̯ēu̯s* usw. als grammatisch korrekte Ausgangsformen **di̯eu̯m, *gʷou̯m, *gʷou̯m-s* (…) anzusetzen. Das bedeutet, daß **-u̯m* über **-mm* zu **-:m* sowie daß **-ou̯ms* über **-omms* zu **-ōms* und weiter – durch unabhängig motivierte Regeln – zu **-ōs* geführt hat. Durch diesen assimilatorischen Verlust von **/u̯/* und seine Nebenumstände sind die Phonemketten **/di̯ēm/* = ved. *dyā́m*, **/gʷōs/* = ved. *gā́ḥ* usw. entstanden. (Mayrhofer 1986: 163)

Therefore, this law converts forms such as **di̯eu̯m, *gʷou̯m* in **di̯ēm, *gʷōm*, respectively. What Stang's law does not tell us is why *eu̯m, ou̯m* became *ēm, ōm*. The law studied here does explain why Stang's law took place: †*di̯eu̯m*, †*gʷou̯m* were clear violations of the constraint †VRR$_\sigma$]. Note that the intermediate step **-mm* would also be blocked by this constraint if we accept that †VRR$_\sigma$] is also valid for R$_1$ = R$_2$. We can then assume a process *eu̯m > emm > ēm / ou̯m > omm > ōm*, where the first strategy for resolving the violation of the constraint – an assimilation – led to a result itself violating the constraint, so that as a further step degemination and compensatory lengthening took place.

Stang's law is, therefore, another way to deal with the problem of two sonorants at the end of a syllable, different from the case of **ph₂tér-m > */ph₂.te.rm̥/*. If in this latter case the second sonorant is resyllabified as a nucleus, Stang's law solves the problem by assimilating and reducing the group of sonorants, together with a compensatory lengthening. As Mayrhofer states, this alternative solution seemed to be limited to a sequence °*u̯m*. Note the different treatment of the group °*u̯n* in †*neu̯n > *ne.u̯n̥* (> Skr. *náva*, Lat. *nouem*, etc.). Probably the particular treatment of °*u̯m* was due to the labial character of the two segments, which could favor the assimilation.

8. In our study of Stang's law, we have assumed with Mayrhofer an intermediate step **mm*, which would also violate the constraint on two sonorants. This means that the law was also valid for two identical sonorants. If this statement is correct, we can treat Szemérenyi's law in an identical way. This law explains the asigmatic nominatives with long vowel of the *-n, -m, -r, -l* stems as the result of an assimilation. This is the author's formulation of the law:

From the functional standpoint it is clear that all animate (m. f.) stems must formerly have had *-s* as the sign of the nominative, as Martinet has also pointed out. If the stem classes mentioned above [scil. *-n, -m, -r, -l stems*] show lengthening but no *-s*, the conclusion must be that this is a case of compensatory lengthening, i. e. the normal nominative *-ers -ens -ems* or *-ors, -ons, -oms* became *-ēr, -ēn, -ēm* or *-ōr -ōn -ōm*. Similarly in *-s* stems *-es-s* or *-os-s* became *-ēs* or *-ōs*, indicating that in nasal and liquid stems also the development of *-ers* to *-ēr* etc. passed through

the phase *-err* etc., so that the sequence short vowel+long consonant became the sequence long vowel+short consonant. (SZEMERÉNYI 1996: 116)

If one accepts Szemerényi's claim that there was an intermediate step *-rr*, etc., sequences such as *-err* would violate the law of two sonorants at the end of syllable, and the solution would be the same as the one met in Stang's law (*ph₂ter-s > *†ph₂terr > *ph₂tēr*).

9. A similar explanation can be envisaged for the Post Rhotic *d*-Deletion rule as formulated in BYRD (2015):

Post Rhotic d-Deletion

There is at least one reconstructible example of the loss of */d/ after */r/ with C(ompensatory)L(engthening) of the preceding vowel, as seen in */ḱérd/ 'heart' → *ḱḗr (Gk. κῆρ, Hitt. *ker*). (BYRD 2015: 24)

Here we can also assume an intermediate step †*ḱerr blocked by the †VRRσ] constraint and resolved by means of degemination plus compensatory lengthening:

*ḱerd > †*ḱerr > *ḱḗr

10. We can also observe the possible effects of the †VRRσ] constraint in some cases considered as examples of the Asno Law discovered by SCHMIDT (1895) and formulated thus in BYRD (2015):

The Asno Law

The nasal sequence */-mn-/ simplified in word-medial position to a single nasal after long vowels, diphthongs and sequences of short vowel plus consonant (i. e., tautosyllabic */-mn-/). There are two outcomes to this simplification, depending on placement of accent:

*/n/→Ø / σ[m __V́-

*/m/→Ø / σ[__ n V-.

It is for this reason that */m/ is lost in */h₂éḱmnes/ → *h₂áḱnes 'anvil (gen.sg.)' (Skt. *áśnaḥ*, Av. *asnō*), but */n/ in */gᵘʰe/ormnós/ → *gᵘʰe/ormós 'warm' (Lat. *formus*, Skt. *gharmá-*, Arm. *ǰerm*, and Gk. θερμός). Note that the sequence */-mn-/ was maintained after short vowels, as here the sequence in question was heterosyllabic: Gk. πρύμνος 'prominent', Hitt. *šaramna-* 'fore'. (BYRD 2015: 20)

Actually, the Asno Law includes very different contexts in which the sequence *-mn-* is blocked because it would violate PIE syllable structures. Schmidt's statement of two different outcomes depending on accent must be seriously reconsidered. It was based mainly on Vedic accentuation, where analogical processes blurred PIE patterns. A simple look at the examples mentioned by Byrd and drawn from Schmidt's work shows that, if this rule is to be traced back to PIE, a reformulation is in order. Thus, in PIE the genitive of