BRILL

INDO-EUROPEAN LINGUISTICS 6 (2018) 271–303

brill.com/ieul

On the relative sonority of PIE /m/

Nicholas Zair
Cambridge University
naz21@cam.ac.uk

Abstract

Cooper (2013: 11–12, 2015: 317–320) suggests that /m/ was less sonorous in PIE than /l/, /r/, and /n/. This article discusses the evidence proposed for this analysis and puts forward some further evidence, of differing degrees of strength, from Sanskrit, Oscan, Venetic, Celtic and Greek. It concludes that there is some evidence for a lower sonority of /m/ than /l/, /n/ and /r/ in Greek and Sanskrit, but that the evidence for other languages is inconclusive. There are a number of instances in which /m/ patterns with plosives rather than the other sonorants in a number of other contexts, whose relevance to questions of sonority, however, is not clear. Overall, it is plausible that /m/ may have had a lower sonority than the other sonorants in PIE, but this is not necessarily the explanation for all its odd behaviour relative to the other sonorants in PIE and its descendant languages.

Keywords

sonority – proto-Indo-European – /m/ – sonorants – Sanskrit – Oscan – Venetic – Celtic – Greek

1 Introduction

Proto-Indo-European had a class of sonorant consonants consisting of two liquids /l/ and /r/, two nasals /m/ and /n/ and two glides /w/ and /j/. In general, in the relevant contexts, these tend to pattern as a group. Thus, for example, they have in common the trait of being able to act as the nucleus of a syllable and they appear nearer the nucleus of the PIE root than an obstruent, if present. Thus, a root of the structure TReRT, where T represents any obstruent and R any

sonorant, is permitted, but not RTeTR.[1] However, as pointed out by Schindler (1977: 56–57), there are a number of phonological or morphological categories in which /m/ does not act as would be expected of the other sonorants, which will be discussed in Sections 3 and 4.[2]

On the basis of this observation, and with the addition of some other evidence, Cooper (2013: 11–12, 2015: 317–320; already raised as a possibility by Kobayashi 2004: 91–96) suggests that /m/ is lower in sonority than /n/, and sets up the following sonority hierarchy for PIE: vowels >> /w/, /j/, /l/, /r/, /n/ >> /m/ >> obstruents. This is to say that the vowels are more sonorous than the glides, liquids and /n/, which in turn are more sonorous than /m/, which is more sonorous than the obstruents. As will be discussed in Section 2, it seems likely that this is a typologically unusual sonority hierarchy, and it is not clear whether Cooper really means to assert that /w/ and /j/ are equally as sonorous as the liquids (and /n/).[3] A more standard version of the sonority hierarchy is the one asserted by Byrd (2015: 135–178) for PIE, whereby nasals are less sonorous than liquids, and liquids are less sonorous than glides, giving a hierarchy vowels >> /w/, /j/ >> /r/, /l/ >> /m/, /n/ >> fricatives >> plosives. This would fit better with the more commonly established (and arguably universal: Clements 1990: 295–296) sonority sequence vowels >> glides >> liquids >> nasals >> obstruents.

Cooper's proposal of lower sonority for /m/ arises, to some extent, from the Optimality Theoretical framework which he uses to model the PIE syllable (Cooper 2015), which works on the idea of possible output forms of an underlying string of phonemes being compared according to their well-formedness relative to a ranked series of constraints. In order to explain cases like Latin *dormiō* < **dr̥mi̯e/o-*, not ˣ*drm̥i̯e/o-* (§ 3.1) and accusative singulars like **-im*, **-um* and **-r̥m* not ˣ*-i̯m̥*, ˣ*-u̯m̥*, ˣ*-rm̥* (§ 3.2),[4] he creates two constraints, *Pk/m ("no /m/ as syllable peak"), and *Pk/n ("no /n/ as syllable peak") in place of *Pk/Nasal

1 Except **-Hi̯-* and **-Hu̯-* are permissible at the end of a root.

2 Schindler also observes the non-syllabification of /n/ in nasal presents, e.g. in **i̯ung-* > Latin *iungō* 'join' rather than expected ˣ*i̯u̯n̥g-*, and of cases like **triōm* > Greek τριῶν 'three (gen. pl.)', rather than expected ˣ*tr̥i̯ōm*. He recognises the latter as having a straightforward analogical explanation (after sequences of the shape **tri-C-*); the former may also be analogical (Cooper 2013: 12 fn. 10), or be explained under a more sophisticated understanding of PIE syllabification processes (as in Byrd 2015: 135–178; Cooper 2015: 306–317).

3 Cooper's other references to the sonority hierarchy through the book assume glides are more sonorous than liquids, and indeed liquids than nasals (e.g. Cooper 2015: 6, 187). Even after splitting *Pk/Nasal into separate constraints he continues to rank *Pk/n higher than *Pk/Liquid and *Pk/Glide at Cooper (2015: 318), which implies a hierarchy vowels >> /w/, /j/ >> /l/, /r/ >> /n/ >> /m/ >> obstruents.

4 Here and elsewhere I use superscript ˣ preceding words or parts of words which are not reconstructed, or words which are not attested (and are predicted not to exist).

("no nasal as syllable peak"), with *PK/m ranked higher than *PK/n, due to lower sonority of /m/ than /n/. If we accept Cooper's model of PIE syllabification, therefore, and higher ranking of *PK/m is necessary for the model to work, this in itself is an argument for lower sonority of /m/ (on the assumption that ranking of *PK/ constraints in fact correlates with relative sonority; Cooper 2015: 187–188).

However, other models of PIE syllabification attempt to explain some of the apparent peculiarities involving /m/ without using different ranking of /m/ relative to /n/. For example, according to Keydana (2008 [2010]), the apparent rightmost sonorant syllabification rule in a sequence *-*CRRC*- is in fact the result of a constraint that disfavours coronal sonorants in a syllable coda, the result being that *$\hat{k}u̯n̥.b^{h}is$ is preferred to ˣ$\hat{k}un.b^{h}is$ because the latter produces a coronal sonorant in a coda. When there is no possibility of a coronal sonorant in the coda, the nucleus is chosen on the basis of relative sonority. If this explanation were correct (though see the criticisms of Cooper 2015: 174–180), the acc. sg. in *-*im*, *-*um* and *-$r̥m$ would be exactly as expected, without requiring /m/ to have a lower relative sonority than /n/ (so long as we assume a sonority hierarchy glides >> liquids >> nasals).

Alternatively, Byrd (2015: 167–177), as part of his overall conception of the PIE syllable, posits a synchronic stratal situation for PIE, with syllable assignment before and after a syncope rule; after this syncope both syllables and moras are preserved as far as possible, so that original (and underlying) *$men.te̯im$, whose second syllable contained three elements after the onset (and hence had three moras) became *$men.tim$ after syncope, with the same number of syllables and two mora-bearing elements in the second syllable rather than ˣ$men.ti̯n̥$, with one mora, or ˣ$men.ti.m̥$, with three syllables.

It is beyond the scope of this article to address in detail the advantages and disadvantages of the various OT-based models of PIE syllabification which have been proposed in the last few years (at monograph length in the case of Cooper and Byrd). Nor do I wish to propose my own model of how PIE syllabification works. It is clear that it is possible to construct a grammar which will produce the observed behaviour of /m/ in the accusative singular without this relying on a lower sonority of /m/ relative to /n/, so that if one accepts such a grammar, lower sonority of /m/ is neither necessary for, nor supported by, the grammar. But this does not necessarily mean that Cooper is wrong in suggesting a lower sonority for /m/, since he provides arguments for it that lie outside his particular theory of syllabification (which is indeed not the context of his discussion in Cooper 2013: 11–12).

The purpose of this article is to assess the evidence that Cooper has proposed (which I do in § 3.1, 3.2, 3.3, 4.1, 4.2, 5.1), and to make explicit the princi-

ples by which we can judge the usefulness of this evidence for assessing the relative sonority of /m/ in PIE. In addition, I will adduce some further evidence, of differing degrees of strength, from Sanskrit, Greek, Oscan, Venetic, and Celtic (§ 4.3, 5.2, 5.3, 5.4). Leaving aside the question of ranking in Cooper's OT approach, the arguments pertaining to the relative sonority of /m/ may be assessed with reference to principles of judging sonority discussed in Section 2, particularly the Sonority Sequencing Principle (SSP). In Section 3, I discuss cases where /m/, despite being in a position to act as the syllable nucleus according to the standard rules of PIE syllabification, does not do so; where a glide or another sonorant is in the vicinity, it is this that then acts as a nucleus, even though it is not expected to according to the traditional rules of PIE syllabification. In Section 4, the SSP is used to to consider whether the positions /m/ can take in the margins of the syllable relative to /n/ suggest that it has a lower sonority. In Section 5, I will note a number of instances of /m/ patterning with obstruents against /n/ (and the liquids), which, however, cannot be shown to be directly connected with variation in sonority.[5] In considering the question of sonority, I aim, as far as possible, to use concepts within phonological theory which are commonly held and which I think are necessary to addressing the question.[6]

These three types of evidence are not of equal value: those in Sections 3 and 4 provide evidence which is directly linked with the concept of sonority, while that in Section 5 simply observes similarity in some developments of /m/ with other sounds believed to have lower sonority than sonorants, but without reference to the SSP or other concepts connected with it; therefore, it is less certain that the observed phenomena have to do with relative sonority as opposed to some other factor. Within each type of evidence, the individual items will be examined to see how reliable they are. In Section 6 I assess the value of the evidence for the lower sonority of /m/, and briefly consider what this means for models of Indo-European syllabification.

I conclude that much of the evidence is inconclusive, but there may be some evidence for a lower sonority of /m/ than /n/ in Greek and Sanskrit, and hence perhaps in PIE. In addition, there are a number of instances in which /m/ was

5 For some further examples of this sort from Indic see Kobayashi (2004: 91–96).

6 For example, a major issue is the question of the relationship between the essentially phonological concept of sonority (discussed in Section 2) and its phonetic reality, with some claiming that sonority is not a valid concept. Naturally, those who believe this will not find the present discussion useful. I start from the position that Cooper's suggestion of a lower sonority of /m/ should be considered in its own terms. Likewise, I assume the existence of the syllable and the mora.

'peculiar' in patterning with plosives rather than the other sonorants in a number of other contexts, whose relevance to questions of sonority is not clear.

2 Sonority

The idea that certain (classes of) phonemes are more or less sonorous than others is a standard (though not entirely uncontroversial) part of the toolbox of linguistic theory: Parker (2011) provides a relatively recent account of the evidence for sonority, from which the following description is largely drawn. A major part of the evidence comes from the Sonority Sequencing Principle, which asserts that syllables have only a single nucleus, which is the position of maximum sonority, and that sonority must increase from the margins of the syllable to the nucleus (i.e. sonority increases from the edge of the onset to the nucleus, and then declines towards the edge of the coda).

Which segments can occupy the nucleus varies between languages: many, such as Latin, permit only vowels, others (e.g. Vedic Sanskrit) also allow liquids, some allow vowels, liquids and nasals (e.g. English, as in the final syllable of *button*, *rhythm*, *bottle*, and, in rhotic dialects, *butter*), and, very rarely, some allow obstruents as well as all the foregoing (e.g. Imdlawn Tashlhyt Berber). A hierarchy in sonority, with vowels the most sonorous and obstruents the least sonorous elements, is implied both by the cross-linguistic frequency of each class of segment as syllable nucleus (all languages permit vowels; very few permit obstruents), and by the generalisation that, if a less sonorous segment is permissible in the nucleus, so will be all the more sonorous segments (although this is not a universal, since there are languages which allow syllabic nasals but not liquids).

In addition to the hierarchy of syllable nucleus, a similar pattern emerges in the cross-linguistic tendency for the shape of the margins of syllables to show an ordering similar to that of the hierarchy found in syllable nuclei. Thus, in general, most languages seem to prefer syllables in which obstruents are further away from the nucleus, with nasals, liquids and glides placed nearer to the nucleus. Thus, a syllable of a shape like /tront/, in which there is an increase in sonority from the onset towards the nucleus and then a decrease from the nucleus to the coda, shows this pattern and is in agreement with the SSP, whereas structures of the type /rtu/ or /utr/ should not be permissible within a single syllable.

Many languages follow the SSP for all tautosyllabic consonant sequences. However, it is not uncommon for languages to allow syllables of a shape which does not conform to the SPP, at least on the surface; for example, Santa María

Qiegolani Zapotec apparently contains monosyllabic words like [wkìt] 'game' (Parker 2011: 1164). More common are violations involving fricatives, particularly /s/ (as in English: *spill*, *skill*, *still* etc.).[7] Scholars differ on the extent to which exceptions to the SSP in syllable structure are to be considered problematic.[8] Perhaps the most common view is that defined by Parker (2011: 1164): the "SSP is a strong universal tendency but has exceptions" (similarly Clements 1990: 290). Nonetheless, even if it is not followed by all languages in its strict sense, it can allow lesser regularities to be identified: for example, no language exists which allows syllable-initial liquid plus obstruent sequences (against the SSP) but not obstruent plus liquid sequences (following the SSP), while there are languages that allow obstruent plus liquid sequences but not liquid plus obstruent.

One way to allow the SSP to come closer to being a linguistic universal is to argue that it applies at a linguistic level below the surface (particularly if exceptions occur at the start or end of the word). Extraneous consonants can be claimed to be extrasyllabic (being licensed only by the prosodic word) or form a partial syllable of their own (e.g. forming an onset but no nucleus or coda). In English, for example, as is commonly the case in other languages, /s/ is permitted to break the SSP (and a number of other constraints on onsets) in words like *spring*, *scrape*, *straight*, and various explanations, including versions of extrasyllabicity, for this are presented in Goad (2011). But these explanations are also used when /s/ is not involved: for example, Cho & King (2003) invoke what they call semisyllabicity for SSP-violating sequences in Georgian, Polish and Bella Coola. Vaux & Wolfe (2009) provide an overview of arguments for this type of extraneous segments, which they call "appendices": an example is the closed-syllable shortening which takes place in English *dreamt* [drɛmt] ← /dre:m-t/ but not in *dream* [dri:m] ← /dre:m/, which suggests that a word-final consonant is extrasyllabic.

It seems to be particularly common for extrasyllabicity to apply at the word-margins, such that evidence for SSP-violating onsets based on segment se-

7 Whether fricative plus plosive sequences are considered a reversal of sonority or merely a sonority plateau depends on the fineness of the proposed sonority hierarchy.

8 Henke, Kaisse & Wright (2012), for example, argue that the ordering seen in the SSP (and its exceptions) is epiphenomenal, being (at least in part) due to the audibility of sequences of sounds, i.e. the robustness of the acoustic cues of individual sounds when following or preceding other sounds. Thus, segments in sequences which provide robust cues tend to be maintained, while those with weak cues are lost. According to this model, the SSP is a descriptive rather than an organising principle, so exceptions are not problematic and do not need to be explained away. Cho & King (2003), on the other hand, maintain that the SSP is universal and, at some level, unviolable; this is also implied by the discussion of Vaux & Wolfe (2009).

quences found at word beginning are to be treated carefully as evidence for acceptable syllable onsets in a particular language. However, some scholars would also allow the possibility of extrasyllabic segments within the word.[9] For example, /s/ in English words like *extra* [ɛkstrə], *obstacle* [ɒbstəkəl], and *conscript* [kɒnskrɪpt] counteracts the rule that final consonants in VVC and VCC rhymes must be coronals which share a place with the following onset (e.g. *shoulder* [ʃəʊldə], *antler* [antlə]), for which extrasyllabicity is a possible explanation (Goad 2011).

Although Parker (2011: 1177) attempts to give a universal sonority hierarchy running to 17 ranks, it is doubtful that any language uses all the possible points on the scale. Languages generally telescope some of the ranks, so that the most commonly used hierarchy in the phonological literature is one which includes only vowels, glides, liquids, nasals and obstruents (e.g. Clements 1990: 295–296, Parker 2002: 57–86).[10] As far as I am aware, no thorough typological research has been carried out on relative sonority, but Cooper's proposal that /m/ is less sonorous than /n/, /r/ and /l/, which are equally sonorous, is probably rare.[11] Consequently, I will assume that, without specific evidence to the contrary, a

9 I.e. at the edge of the foot, according to Vaux & Wolfe (2009: 125).

10 Although fricatives and plosives are often separated, with fricatives being more sonorous than plosives.

11 However, the phonological literature does provide some instances of a claimed separation of the nasals in terms of sonority. Cooper (2013: 23–24) finds that the Austronesian language Kivila distinguishes /m/ from /n/, /l/ and /r/ in terms of syllabification, but here only /m/ can act as a syllable nucleus, which ought to suggest higher, rather than lower, sonority of /m/ relative to /n/, /l/ and /r/. Steriade (1982: 91–99) envisages a sonority hierarchy for Latin in which /m/ is less sonorous than /n/, but seems not to present any evidence that justifies such a hierarchy. She also notes (Steriade 1988: 92) that Sanskrit roots containing /m/ are less likely to appear in the zero-grade when it is expected than those containing /n/ (which she considers a rule of syncope, whereby an underlying full-grade vowel is deleted when unaccented), and attributes this phenomenon to the lower sonority of /m/. This claim is made more-or-less in passing, and would require in-depth investigation of the philological and comparative details to confirm, which cannot be undertaken here. Zwicky (1972) argues that /n/ is more sonorous than /m/ (which is more sonorous than /ŋ/) in English, and observes a rule which applies to /r/, /l/ and to some extent /n/, but much less to /m/ or /ŋ/. On the other hand, Dineen & Miller (1998) found that the nasals occupied the same place in the sonority hierarchy for American English-speaking adults (but /m/ had lower sonority for children). Tsunoda (2008) claims that /m/ and /ŋ/ are more sonorous than /n/, and that /ɲ/ is more sonorous than /ŋ/, in the Australian language Warrongo (but note the doubts of Byrd 2015: 139 fn. 8). Regarding liquids rather than nasals, Hankamer & Aissen (1974) propose a sonority hierarchy for Pali (and a similar one for Hungarian) which involves separation of the liquids in terms of sonority, with /l/ being less sonorous than /r/, which is also more sonorous than /v/ and /j/.

sonority hierarchy vowels >> glides >> liquids >> nasals >> obstruents is more probable for PIE than Cooper's.

Cooper's (2015: 317–320) hierarchy implies that the liquids and /n/ together occupy a single place in the hierarchy, below that of /m/ (but see fn. 3). Another possible hierarchy would maintain /n/'s expected lower sonority relative to the liquids, while assigning it higher sonority than /m/, to give the following hierarchy: vowels >> glides >> liquids >> /n/ >> /m/ >> obstruents. If Cooper is right about the lower sonority of /m/ but not about grouping /n/ with the liquids, evidence of a lower sonority for /m/ can only come from its behaviour relative to /n/, since we would expect lower sonority for /m/ as a nasal relative to /l/ and /r/ anyway.[12] I will therefore focus on evidence that /m/ is less sonorous than /n/ rather than /l/ and /r/.

It should be observed that /m/ has a much higher functional load in terms of morphological categories containing the phoneme than /n/ does (major categories in which /m/ appears are 1sg. and 1pl. verbal endings, the animate acc. sg. ending, and in *men*-stem nouns and in the noun and adjective suffix *-*mo*-, whereas /n/ appears primarily in *men*-, *r/n*- and *n*-stems and the suffix *-*no*-): consequently it is possible that evidence for a particular phenomenon is available for /m/ but not /n/: this cannot act as proof for a lower sonority for /m/ relative to /n/.

Some of the evidence for the sonority of /m/ used here is demonstrated in enough Indo-European languages that it is generally agreed to have applied at the time of the proto-language (e.g. Stang's Law), but other phenomena are or may be language specific (e.g. Osthoff's Law in Greek, vowel epenthesis in Oscan). Given that sonority hierarchies and syllabification rules are subject to change over time, we must be careful in projecting evidence true of a historically attested language backwards some thousands of years. However, since lower sonority of /m/ than /n/ appears to be typologically unusual, I take it as a rule of thumb that evidence for lower sonority of /m/ in individual languages is more likely to have been inherited than (re)created in the language. Nonetheless, this evidence is not as strong as that which can be more assuredly taken to go back to PIE itself.

12 I suspect that Cooper assumes equal sonority for /n/ and the liquids because of the lack of /nr/ or /nl/ onsets. This may be explained as the result of phonotactic constraints of the type mooted in § 3.1.

3 Non-syllabification of /m/

The traditional formulation of the rules for identification of a syllable nucleus is that laid out by Meillet (1934: 134–136), formalised by Schindler (1977), and canonised in Mayrhofer (1986: 162–163). Starting from the right-hand margin, syllable nuclei are assigned iteratively, with glides, liquids and nasals being underlyingly non-syllabic and acting as a nucleus only when one does not have a syllabic segment to either side of it (i.e. a non-high vowel or a sonorant which has already been allotted to a syllable nucleus). This is the reason for the variation in the status of the /w/ and /n/ in **ḱunos* 'dog' (gen. sg.) > Vedic *śúnaḥ* and **ḱu̯n̥bʰis* 'dogs' (inst. pl.) > Vedic *śvábhiḥ*. In **ḱunos*, the /n/ is adjacent to a vowel, which must form the syllable nucleus, and the /n/ is therefore non-syllabic and forms the onset of the syllable containing /o/. The /w/ finds itself with consonants on either side, thereby becoming the nucleus of a syllable. In **ḱu̯n̥bʰis*, the sequence /wn/ is surrounded by obstruents; since the nucleus-assignment algorithm proceeds from right to left, the /n/ becomes the nucleus, and /w/, now adjacent to the nucleus, remains non-syllabic.

There are three ways in which /m/, however, does not seem to play the same part in this directionality of nucleus-assignment, with other sonorants acting as the syllable nucleus even where /m/ is the rightmost of two possible sonorant nuclei. If /m/ is indeed of lower sonority than the other sonorants, this would fit with the SSP's requirement that the nucleus of a syllable be the segment with highest sonority. The OT approaches of Keydana (2008 [2010]) and Byrd (2015) explain (some of) these exceptions to the traditional rules, particularly § 3.2, in ways that do not rely on positing lower sonority for /m/. But even if these particular theories are not accepted, there are other ways of explaining the apparent exceptionality of /m/, which are primarily analogical.

3.1 *Latin* dormiō

In the case of Latin *dormiō* 'sleep' < **dr̥m-i̯e/o-* it looks as though, where there are two sonorants surrounded by consonants, it is the leftmost /r/ rather then rightmost /m/ that has been made the nucleus of the syllable, in contradiction of the general rule outlined above (**dr̥m-i̯e/o-* ought to give *ˣdreniō*). It is certain that /n/ does not take part in the same development on the basis of **ḱu̯n̥bʰis*, discussed above, and e.g. **h₁lr̥ngʷʰ-u-* > Vedic *raghú-* 'fast', Greek ἐλαχύς 'small' (rather than *ˣr̥nghú-* and *ˣἔλνγύ-* respectively—though the latter would break the phonotactic constraints of Greek; NIL 243–245).

However, without further evidence for the regular development of **CRmC* it is difficult to be sure that the development in *dormiō* is a general rule rather

than being susceptible to an individual explanation. It is contradicted by a number of cases where it is /m/ that syllabifies, not a preceding liquid. Thus, Byrd (2015: 141 fn. 12) points out Vedic *śrā́myati* 'becomes tired' < **k̂rm̥H-i̯e/o-* (LIV 337–338), and one could add Old Irish *·laimethar* 'dares' < **lami̯e/o-* < **h₃lm̥H-i̯e/o-* (Schumacher 2004: 446–447) rather than **almi̯e/o-* < **h₃l̥mH-i̯e/o-* (or conceivably **limi̯e/o-*; Zair 2012: 29–38), Young Avestan *brāsaṯ* 'wanders around' < ** bʰrm̥H-sk̂e/o-* (LIV 94), and Vedic *rábhate* 'seizes' < **lm̥bʰ-e/o-* (LIV 411–412).[13] Of course, one could always explain these cases of syllabification of /m/ as analogical in one way or another, for example by viewing **lami̯e/o-* as the result of remodelling of **almi̯e/o-* on the basis of parts of the paradigm with a full grade **lem-* < **h₃lemH-*. But one could also explain *dormiō* in a similar way. For example, some versions of PIE would allow for an original *i*-stem verb **dr̥m-(e)i-* behind *dormiō*, in which case it would be expected for the /m/ to remain consonantal (Schrijver 2003). Alternatively, one might assume—in the absence of any evidence in Latin or another language for any stem other than the *i̯e/o-*present—that a stem *dorm-* was generalised from other parts of the verb paradigm in which the root was followed by a vowel (e.g. a 3rd pl. root aorist **dr̥m-ent* or thematic aorist **dr̥m-e/o-*).[14]

3.2 *Accusative singular of sonorant-stems*

Word final **-m* in the accusative singular of acrostatic and proterokinetic *i-*, *u-* and *r*-stems unexpectedly remains consonantal, giving **-im*, **-um*, **-r̥m* rather than expected **-i̯m̥*, **-u̯m̥*, **-rm̥*.

3.3 *Stang's law*

Similarly, /m/ does not vocalise in accusative sg. **-m* and pl. **-ms* even when following necessarily consonantal /j/, /w/ and laryngeals, with subsequent loss of the element before /m/ with compensatory lengthening (Stang's Law), in

13 Cooper explains *rábhate* < **lm̥bʰ-e/o-* by means of higher-ranked constraints: "[t]he nasal **m* is permitted to vocalize in the context of other sonorants when the alternatives would either result in an onsetless syllable …, or involve epenthesis …" (Cooper 2015: 319). The same explanation could also do for expected **h₃l̥mH-i̯e/o-* if word-initial laryngeals were lost early enough. But it would not explain *śrā́myati* < **k̂rm̥H-i̯e/o-*, or *brāsaṯ* < **bʰrm̥H-sk̂e/o-* (since neither **k̂r̥mH-i̯e/o-* nor **bʰr̥mH-sk̂e/o-* would produce an onsetless syllable).

14 If the strange behaviour of /m/ in Oscan and Venetic discussed in § 5.3 and § 5.4 is connected to sonority, and is characteristic of Proto-Italic, this may be relevant to the question of whether the evidence of this Latin form reflects the PIE situation, as an anonymous reviewer points out to me.

forms like **dḭeu̯-m* > **dḭēm* > Vedic *dyā́m*, Homeric Greek Ζῆν 'sky(-god)', Latin *diem* 'day'; **gʷoṵm* > Vedic *gā́m*, Homeric and Doric Greek βῶν 'ox' (acc. sg.), **gʷoṵms* > Vedic *gā́ḥ* (not **gāvas*), Doric βῶς, Umbrian *buf* (acc. pl.);[15] acc. sg. **-eh₂m* > Greek -ᾱν, acc. pl. **-eh₂ms* > Vedic *-āḥ*, Gothic *-ōs* etc. (Mayrhofer 1986: 163–164, and see also De Decker 2011).[16]

The failure of /m/ to syllabify in § 3.2 and § 3.3 is taken by Cooper to be evidence for the lower sonority of /m/ relative to the other sonorants. This is intuitively easy to understand in the case of § 3.2, where there seems to be a direct choice between two consecutive sonorants as to which occupies the syllable nucleus. We can then assume that the more sonorous is chosen. In the case of Stang's Law, the relationship to sonority is less obvious, since in a sequence **-Vṵm* or **-VHm* there is no alternative sonorant which could occupy the syllable nucleus. In the case of **-Vṵm* this at least produces a licit syllable in terms of the SSP if /m/ is less sonorous than /w/, but we would expect the laryngeals to be of lower sonority than /m/, for three reasons: firstly because laryngeals were probably fricatives like **s* (Zair 2012: 4–7), and we know that /m/ does syllabify in **-sm̥* sequences (as demonstrated by the Greek *s*-aorist 1sg. ending -σα); secondly, because final **-m* does syllabify after a laryngeal in the 1sg. of the thematic optative in Arcadian Greek ἐξελαύνοια, Vedic *bhareya*, Gothic *qimau* < **-oi̯h₁m̥*; thirdly, because in **CṃHC-* sequences it is /m/ which syllabifies (e.g. **dṃh₂-to-* > Greek ἄ-δμητος 'untamed', **ḱe-ḱṃh₂-u̯ōs* > Homeric κεκμηώς 'weary', **ḱṃh₂to-* > Vedic *śāṃtá-* 'calm, appeased'). Indeed it seems likely that laryngeals could never act as a syllable nucleus (Zair 2012: 5–6). Consequently, there seems to be no reason why we would expect the regular result of **-VHm(s)* not to be **-VHm̥(s)* and, even if /m/ does have lesser sonority than /l/, /r/ and /n/, this cannot explain the version of Stang's Law involving **-VHm* (as observed by Byrd 2015: 142).

As stated in Section 1 and above, there are other theories of PIE syllabification which can produce the situation seen in § 3.2. But it is also notable that both it and § 3.3 provide evidence from a particular morphophonological environment, and the non-vocalisation of /m/ in these cases could be explained instead by analogy on the basis of the *o*-stems with acc. sg. **-om*, acc. pl. **-oms*, rather than telling us anything special about /m/ (as acknowledged by Cooper 2015: 317).[17] It ought to be fruitful to consider the other major morpho-

15 The Umbrian ending results from secondarily re-introduced **-ms* > **-ns*.

16 For an argument against the existence of Stang's Law in PIE, see Pronk (2016).

17 An anonymous reviewer points out that it is difficult to constrain the analogy since accusative singulars of consonant stems were (and remained) **-m̥*. But at least in the case

logical category involving word-final /m/, i.e. the 1sg. secondary verbal ending, but this is in the main also susceptible to explanation by analogy. Thus, we have evidence for Stang's Law-style contexts involving *-*VHm* sequences in aorists like *$(h_1e)b^huH$-*m* > Greek ἔφυν 'grew, was born', *$(h_1e)steh_2$-*m* > Vedic *ásthām*, Greek ἔστην 'stood', the athematic optative ending in *-$i̯eh_1m$ in forms like Vedic *dheyām*, Greek θείην, the Latin imperfect suffix *-bam* < *$b^hu̯eh_2m$, etc.[18] In these cases, of course, analogical levelling from the 2nd and 3rd sg. in *-*VHs* and *-*VHt* is highly probable.[19] Consequently, while I accept that Stang's Law took place, in the sense of a development *-*VHm*(*s*) or *-*Vu̯m*(*s*) > *-*V̄m*(*s*), it seems quite possible that the lack of syllabification of the /m/ that led to it is an analogical rather than phonologically regular process.

In summary, there are a number of reasons to doubt that the observations in § 3.2 and § 3.3 tell us anything very much about the sonority of /m/ compared to the other PIE sonorants. Moreover, even if we were to accept them at face value as a purely phonological development, it is not clear that they applied only to /m/ in the absence of examples reflecting equivalent contexts involving /n/. The right environments could only be found, in principle, in neuter *n*-stems to roots ending in laryngeals or a glide (**Ceu̯-n*, **CeH-n*), or in *u̯er/n*-stems in lan-

---

of the *i*-, *u*-, *r*- and diphthong-stems there was a preceding segment which could be a syllable nucleus, like the *o*-stems, but not the consonant-stems.

18 And conversely, Vedic *ábhuvam*, which may point to *$(h_1e)b^huH$-*m̥*, can have generalised the ending from other aorists.

19 In theory, another possible piece of evidence for syllabification of /m/ in Stang's Law contexts could be a number of aorists to roots of the shape **Ceu̯*- which have a 1sg. in -α in Greek, including ἔχεα, Homeric ἔχευα 'poured' < *$\hat{g}^heu̯$-, Homeric ἔσσευα 'chased, drove, set in motion' < *$k^{w}i̯eu̯$-, Ionic ἔκηα 'kindled, burnt' < *$keh_2u̯$-. Some have seen these as root-aorists, and Homer does preserve root aorists in the middle voice of some of these verbs (ἔχυτο, ἔσσυτο). In this case, the 1sg. of e.g. ἔχεα would come directly from *$\hat{g}^heu̯$-*m̥*. However, since intervocalic *u̯* is lost in all dialects of Greek, the Homeric stem χευ- would have to have been produced by analogy with other parts of the paradigm prior to the generalisation of the alpha-thematic aorist endings (e.g. 2nd. sg. *$(e)\hat{g}^heu̯$-*s* > *ἔχευς, 3rd sg. *$(e)\hat{g}^heu̯$-*t* > *ἔχευ). It is more likely that the non-middle aorists reflect secondary *s*-aorists, in which forms like ἔχευα and ἔσσευα which appear to retain *u̯* in fact reflect the Aeolic treatment of the sequence *-u̯s- > *-u̯h-, which metathesises and then develops to -u̯u̯- : so *$(e)\hat{g}^heu̯sm̥$ > *$ek^heu̯ha$ > *$ek^heu̯a$ > *$ek^heu̯u̯a$ > ἔχευα. By comparison, the non-Aeolic form ἔχεα is the result of loss of **h* in the sequence *-*hu̯*- with compensatory lengthening, giving *$ek^heu̯a$ > *$ek^hēu̯a$ > *$ek^hēa$ > ἔχεα (with shortening of *$\bar{e}$ before another vowel). For this analysis, and earlier bibliography, see Harðarson (1993: 188–194) and now also Willi (2018: 309–310). Consequently, these forms do not necessarily reflect Stang's Law environments.

guages which generalised zero grade of the oblique suffix (**CeC-un*), and these formations are infrequent or possibly non-existent.

4 Arguments from syllable structure and the SSP

4.1 *Word-initial /mn/*

Root-structures where root-initial /m/ is followed by another sonorant, of the type **mleu̯h$_2$-* (Vedic *bravīti* 'say', LIV 446–447), **mreĝ^h-* (Latin *breuis* 'short', NIL 497–499) and **mneh$_2$-* (Homeric Greek μνάομαι 'be mindful of', LIV 447), are permissible in PIE, whereas there are no roots beginning with sequences like **rl-* or **nm-*. If a strong version of the SSP is assumed to have operated in PIE, this is problematic unless /m/ had a lower sonority than the other sonorants. However, while most PIE syllables do conform to the SSP, there are apparent exceptions—although these fall into a relatively small number of types. Insofar as we can take root-structure to be a proxy for syllable structure (which is likely to overgenerate rather than undergenerate licit structures, for reasons discussed in Section 2 and below), we find that the fricatives /s/ and the laryngeals **h$_1$*, **h$_2$*, **h$_3$* can appear on either side of plosives, as demonstrated by **(s)g^{w}es-* 'extinguish' (LIV 541–543), **h$_2$teu̯g-* 'terrify' (LIV 286), **ksneu̯-* 'sharpen' (LIV 373), **th$_2$eu̯s-* 'be quiet' (LIV 642–643); two plosives are also permitted in an onset, as in **d^{h}g^{wh}ei̯-* (Greek φθίνω 'decay, wane', LIV 150–152), **pteh$_2$k-* (Greek πτήσσω 'frighten; crouch in fear'). These two categories of exception may be seen as a sonority reversal and sonority plateau respectively, or, if all obstruents are counted as equally sonorous in PIE, be part of a general allowance of sonority plateaux. In addition, we find /m/ plus sonorant, and /w/ plus liquid (e.g. **u̯leik^w-*, Tocharian A *lyāktsi* 'to wash', Old Irish *fliuch* 'wet', LIV 696–697; **u̯reg-*, Vedic *vrájant-* 'going, wandering', LIV 697).

The fact that there are other apparent exceptions to the SSP creates problems for the claim that /m/ must be less sonorous than /n/ (and /l/ and /r/), because whatever the explanation is for these exceptions, it can apply equally to /mn/ sequences. Either we simply accept the existence of (certain) reversals/plateaux of the SSP in PIE, in which case such a plateau can apply in /mn/ onsets.[20] Or we take the strong view that the SSP cannot be violated and explain cases like /pt/ onsets with reference to extrasyllabicity (see Section 2). In this case, there is, prima facie, no reason why an onset /mn/ could not be subject

20 The SSP as a violable constraint is found in the OT models of Kobayashi (2004: 23), Keydana (2011), Byrd (2015: 52–53), and Cooper (2015: 6–7).

to the same explanation. Given the partial agreement with the SSP in PIE syllables, this might be a preferable position anyway (but it is contradicted by the evidence of Sanskrit and Greek reduplication in § 4.3, which seems to provide evidence that /m/ in fact does have lower sonority than /n/).

An additional difficulty with explaining /mn/ sequences at the start of the word as being in tune with the SSP if /m/ has lower sonority than /n/ is that /w/ plus liquid sequences are also permitted, as is /wj/.[21] Unless we wish to assert that /w/ also has greater sonority than /l/ and /r/ another explanation for this positional freedom of /w/ must be sought, and that could apply equally well to /m/ (as Cooper 2013: 12 notes).

The question remains why, if at least /m/ and /n/ are of equal sonority, and either the SSP is violable or /m/ (and /w/) can be extrasyllabic, we do not find roots beginning with /nm/, /nl or /nr/. We will have to fall back on some kind of phonotactic rule. Cooper notes that the freedom of /m/ and /w/ to combine may be due to their labial place of articulation; following this line of thought an anonymous reviewer points out that avoidance of of coronal-non-coronal sequences appears to be common cross-linguistically (Blust 1979), which might be relevant for the absence of /nm/. Alternatively, one might suppose that the two sonorants could not have identical place of articulation: in which case roots beginning **nr-*, **rl-* etc. would be ruled out. The absence of **nm-* could then simply be due to chance: after all, the existence of **mn-* is proved only by the single root **mneh$_2$-*.

4.2 *Word-medial /mn/*

In § 4.1 we have considered root- and hence word-initial sequences. Word-internal syllables, which are generally supposed to be more useful for analysing syllable structure, since they avoid the problems of possible extrasyllabicity at word edge,[22] show a similar pattern as regards the position of /m/, although the evidence is a little more complicated. The evidence for /m/ as an onset word-medially comes from two types of evidence.

Firstly, **m* appears to have been lost rather than act as a nucleus in the sequence **-Cmn-*, for which the standard example is Vedic nom. sg. *áśmān* 'stone' < **h$_2$eḱ-mōn*, gen. sg. *áśnaḥ* < **h$_2$eḱ-mn-os*. Other examples consist of apparent *no*-suffixed nouns or adjectives besides *men*-stems, such as Latin *fun-*

21 And these are in fact attested in greater numbers: LIV lists 10 further roots beginning **u̯r-* and two begining **u̯R-*, where R stands for /l/ or /r/.

22 Although some allow extrasyllabicity word-internally as well, it is still probably rarer there than at word edge.

dus, Vedic *budhná-* 'bottom', Middle Irish *bond* 'sole of the foot' < **bʰudʰ-(m)no-* beside Greek πυθμήν 'bottom' < **bʰudʰ-men-* (Mayrhofer 1986: 107, 159; Nussbaum 2010; Steer 2015: 211–214).[23]

Byrd (2015: 20, 74, 136–137) states that this change reflects the permissibility of **mn-* as a syllable onset, showing that **h₂eḱ-mn-os* was syllabified as /h₂eḱ.mnos/ at some point earlier than the last stage of PIE. This claim perhaps seems counter-inituitive at first, since deletion is often attributed in the literature to an inability to satisfactorily syllabify a segment ('stray erasure', conveniently discussed at Byrd 2015: 86–88; see also Harris 2011). However, we know that a sonorant which cannot occupy the onset of a syllable will be made the nucleus of its own syllable (e.g. for **m*, **u̯īkm̥ti* > Doric ϝίκατι, Tocharian B *ikäṃ* 'twenty'). If **h₂eḱ-mn-os* could not be syllabified as /h₂eḱ.mnos/, it would have been syllabified as /h₂eḱ.m̥.nos/ > *ˣáśanaḥ*. It follows that the original syllabification was /h₂eḱ.mnos/, but how to explain the surprising loss of /m/? One possibility is that in syllable- (but not word-) initial position, early **-mn-* underwent assimilation to **-nn-*, which was subsequently reduced to a single **n* by the rule that simplified geminates in PIE (cf. **h₁essi* > **h₁esi* > Greek εἶ, Latin *es* 'you are' etc.).[24]

Secondly, we have the claim that Osthoff's Law in Greek, whereby long vowels are shortened before a sonorant plus consonant sequence, is reputed not to apply before **-mn-*. The evidence for this is assessed by Simkin (2004: 123–134, 147–151), who concludes that there are no good examples of shortening in this context, while the most reliable examples of non-shortening are κρημνός 'cliff, overhang', Λῆμνος (the name of an island), πλήμνη 'the nave of a wheel' < **kʷl̥₁-mneh₂* or **pleh₁-mneh₂*, and the Hesychian gloss πλήμνῳ · παλαιῷ 'old, of old' < **pleh₁-mno-*, and perhaps στρωμνή 'bed' < **str̥h₃-mneh₂*. However, neither κρη-

23 Consequently, I assume that this is a rule that had already taken place in PIE, although there are exceptions. According to Mayrhofer, the rule did not apply after a syllable containing a long vowel: he compares Young Avestan *zaēna* 'in winter' < **ĝʰeu̯-mn-o-* with Vedic *hāyaná-* 'yearly, every winter' < **gʰēu̯-m̥n-o-*. Pronk (2016: 20 fn. 4), who rejects the rule, notes a couple of other Iranian examples in which /m/ syllabifies in the sequence **-CmnV-* (without a long vowel in the preceding syllable), and others are mentioned by Steer (loc. cit.). Apparent exceptions can sometimes be explained analogically (reformation on the basis of other parts of the *men*-stem), but this sound rule seems ripe for further study.

24 As a confirmation that /mr/ (and presumably /ml/) sequences are also permitted in onsets, I have found only Latin *hībernus* 'wintry', which comes from **ĝʰeu̯-m-r-ino-* > **heu̯m̥rnos* (where syncope produces secondary syllabic **r̥* > *-er-*) and Greek χίμαιρα 'female goat', originally 'one-winter old' (Beekes 2010: 1634) < **ĝʰeu̯-m-r-ih₂*, where the **r* has syllabified secondarily after **-ih₂* > **-i̯a*, but **m* has not been syllabified. These suggest a syllabification **ĝʰeu̯.mri-* rather than *ˣĝʰeu̯.m̥.ri-*.

μνός (Beekes 2010: 777) or Λῆμνος (Beekes 2010: 857) have certain etymologies, while στρωμνή 'bed' could have been influenced by στρῶμα 'anything spread out, bed'. So the evidence is rather limited.

Moreover, the forms πλήμνη and πλήμνῳ are hard to square with the non-syllabification of /m/ in the sequence *-*CmnV*- discussed above; if the reduction to *-*CnV*- is a PIE change, we would expect ˣπλήνη < ˣ*pleh₁-neh₂* or ˣ*kʷl̥h₁-neh₂* instead of πλήμνη, and likewise ˣπλήνῳ rather than πλήμνῳ. Alternatively, if the reduction did not take place, for whatever reason, we'd expect either ˣ*pleh₁-m̥neh₂*- > ˣπλέμνη (or conceivably, ˣπλέανη) or ˣ*kʷl̥h₁-m̥neh₂* > (presumably) ˣ*kʷlm̥neh₂* > ˣπλάνη.[25] One wonders whether πλήμνη and πλήμνῳ are not somehow remodellings on the basis of the otherwise unattested *men*-stem(s) **pleh₁-mn̥* implied by Hesychian πλῆμα · πλήρωμα 'fullness, complement', πλημαινόν · παλαιόν 'old' < **pleh₁-mn̥-i̯o-*. In which case the value of these forms for evidence of Osthoff's Law is dubious. If the failure of Osthoff's Law before *-*mn*- is to be believed, it could be explained by an assumption that the Law only takes place when the long vowel is in an super-heavy syllable (this is the conclusion of Simkin 2004: 153–199): hence it would not occur in a sequence like **plē.mnā*.[26] This implies once again that /mn/ forms a syllable onset.[27]

On the basis of these two arguments, in particular the first, we find that /m/ can precede /n/ in an onset. This might be due to adherence to the SSP, which would suggest that /m/ has lower sonority than /n/ (and, as expected, /l/ and /r/). But it could also be due to phonotactic restrictions of the sort mentioned in § 4.1 (in which case, either /nm/ would be ruled out, or its absence could be coincidental).[28] To decide between these we can once again look to

25 See Zair (2012: 172–176, 179–180) for discussion of the reflexes of *-*VRHC*- sequences in the various Indo-European languages.

26 It is difficult to test this hypothesis with the other possible syllable-initial sequences **mr*- and **ml*-. The only plausible example of such a sequence in the context of Osthoff's Law in Greek appears to be Ionic μεσαμβρίη 'noon', a compound of μέσος and ἦμαρ 'day'. If we reconstruct Proto-Greek **medʰi̯āmri̯i̯ā*, this appears to be a case of Osthoff shortening, interestingly suggesting a syllabification *-*ām.ri̯i̯ā*. But if laryngeals were still in existence at the time of the creation of the second part of the compound, **Heh₂m̥ri̯i̯eh₂* would probably give **ămri̯i̯ā* regularly.

27 There are no good examples of an expected long vowel before *-*nm*-, so we cannot say whether Osthoff's Law would take place in this environment, and therefore cannot be sure that /nm/ is not an acceptable onset.

28 Since there are no PIE suffixes of the shape *-*nVm*- in PIE, the only place I can think of to find *-*CnmV*- sequences, would be in compounds whose second element was a *mo*-suffixed noun to a root in **Cen*- in the zero grade (i.e. of the shape *-*Cn-mo*-).

see whether /wr/ or /wl/ form acceptable onsets word-medially: if they do, this is good evidence that the SSP is not a strong constraint on the shape of onsets.

On the one hand, **sm̥ekuros* > Greek ἑκυρός, Latin *socer* etc. 'father-in-law', which is presumably derived from an *r/n*-stem **sm̥ekr̥* (NIL 672–675), suggests a syllabification **sm̥e.ku.ros* rather than **sm̥ek.r̥o-*.[29] On the other hand, it has been suggested that the voiced /d/ in the Latin combining form *quadr-* 'four-' is the regular result of **kʷatr̥rV-* (Meiser 1998: 121), but the absence of /u/ in *quadr-* can also be explained as due to a metathesis of **-r̥r-* > **-ru-* before consonants in forms like **kʷatr̥-ped-* > *quadrupes* 'quadruped' (Mayrhofer 1986: 161–162): *quadr-* would then have been mis-analysed and generalised into compounds where **kʷatr̥-* was followed by a vowel such as *quadrans* 'a quarter'. An alternative explanation is then required for the strange voicing of **t* to **d*: Schrijver (1991: 491–492) suggests that it is regular in the multi-consonant sequence **kʷtr-*, but does not provide additional evidence in Latin (or explain the reasons for the change).

The—admittedly exiguous—evidence of **sm̥ekuros* seems to me slightly more convincing than **kʷatr̥rV-* > *quadrV-*, so we might cautiously suppose that the pattern seen in word-initial position for /m/ and /w/ is not reproduced in word-medial syllable onset. While /mn/ and /mr/ (and presumably /ml/) are acceptable onsets, /wr/ (and presumably /wl/) are not. This might suggest that there is in fact a difference between /wr/, /wl/ and /mn/, /mr/, /ml/ at word beginning: in /wr/ and /wl/ the /w/ is extrasyllabic because of its sonority reversal (and hence not permitted in word-internal syllable onsets), while /m/ in /mn/, /mr/ and /ml/ is not extrasyllabic (and hence are also permitted in word-internal syllable onsets). This would presumably imply greater sonority of /m/ than /n/, /l/ and /r/, but further good examples, particularly of medial syllable-initial /wr/, would make the case stronger.

4.3 *Reduplication in Sanskrit and Greek*

In Sanskrit, a reduplication syllable built to a root beginning with an onset cluster reduplicates only one member of the cluster. Using reduplicated perfects as our examples, we find in the following forms that an obstruent is preferred to a sonorant, and a plosive to a sibilant—and /m/ to /n/:

29 It is of course easy to find instances of the sequences **-CurV-* and **-CulV-* in *lo-* and *ro-*adjectives derived from old *u*-stems (of the type Greek γλάφυ 'hollow, cavern', γλαφυρός 'hollow', παχύς 'thick', παχυλῶς (adv.) 'coarsely, roughly'), but in these cases, which were generally created late in PIE or in the individual languages (Rau 2009: 74), the morpheme boundary and analogy with the *u*-stem is likely to be responsible for the syllabification of the **u*.

Root	Perfect
crav- 'hear'	*ci-crāv-*
dhvans- 'scatter'	*dha-dhvans-*
prath- 'seize'	*pa-prath-*
kṣad- 'divide'	*ca-kṣad-*
mnā- 'note'	*ma-mnā-*
mloc- 'set'	*mu-mloc-*
mlā- 'relax'	*ma-mlā-*

The obvious analysis is that the rule is that the leftmost consonant of the onset is reduplicated. However, instances of reduplication in roots beginning with /s/ plus plosive result in the plosive being copied, not /s/, e.g. the reduplicated present *tí-ṣṭhati* 'stands' or the perfect *ca-skánda* 'have leapt'. Two possible explanations arise from this: the first is that reduplication involves the less sonorous of the onset consonants being copied, and that obstruents are less sonorous than /s/. Since in *ma-mnā-*, *mu-mloc-*, and *ma-mlā-* it is the /m/ that is copied, this rule would imply that /m/ is less sonorous than both /n/ and /l/ (Kennedy 2011, Parker 2011: 1165).

An alternative analysis, which tries to avoid the violation of the SSP implied by /s/ plus obstruent syllable onsets in the *tíṣṭhati* type, would identify /s/ as extrasyllabic (Keydana 2011).[30] In this view, the reduplication rule applies only to the first consonant of a properly constituted syllable, resulting in the replication of the plosive rather than /s/.

Under both analyses, /m/ would seem to be less sonorous than /n/. According to the first, because it is the less sonorous segment which is reduplicated. According to the second, because extrasyllabic /s/ is posited to avoid SSP violations; the extrasyllabic segment is then ignored in the reduplication. Since /m/, rather than /n/ is reduplicated, it cannot be extrasyllabic, and /mn/ and /ml/ onsets cannot count as SSP violations.[31]

30 Or, strictly speaking, semisyllabic. Steriade's (1982: 312–328) argument for the extrasyllabicity of /s/ does not rely directly on the SSP, but does involve relative sonority. On other evidence for extrasyllabicity of /s/ in Vedic see Cooper (2015: 51–55).

31 One could get around this conclusion in two ways: firstly, positing an explanation for the strange behaviour of /s/ that is not predicated on relative sonority. Secondly, by supposing that the reduplication rule was sensitive to reversals of sonority (as in /st/, if fricatives have higher sonority than plosives), but not plateaux (as, perhaps, in /mn/). But the Greek evidence below is not susceptible to either of these.

This conclusion is supported by the Attic data for perfect reduplication, where onsets of the shape voiced plosive plus /r/ or voiceless plosive plus sonorant reduplicate the first (less sonorous) segment, as in the examples below:

Present 1sg.	**Perfect 1sg.**
γράφω 'write'	γέγραφα
θνήσκω 'die'	τέθνηκα
πληρόω 'fill'	πεπλήρωκα
κρίνω 'judge'	κέκριμαι

Where there is a sequence that violates the SSP—including by means of plateaux, not just reversals—neither element is reduplicated.[32]

Present 1sg.	**Perfect 1sg.**
σπείρω 'sow'	ἔσπαρκα
σχίζω 'split'	ἔσχισμαι
κτίζω 'build'	ἔκτικα
βδελύσσομαι 'make loathsome'	ἐβδέλυγμαι (attested late)
πταίω '(cause to) stumble'	ἔπταικα
ξηραίνω 'dry'	ἐξήρασμαι
ψαύω 'touch lightly'	ἔψαυκα

Word-initial /mn/ and /ml/ reduplicate like the first, rather than the second group:[33]

32 Since /ps/ and /ks/ are treated just like /sp/ and /sk^h/, presumably they reflect sonority plateaux rather than increases, so that fricatives and plosives occupy a single rank in the sonority hierarchy.

33 All this data is actually slightly messy, since a number of verbs have variants with and without a reduplicated first consonant. According to Steriade (1982: 351–353), this variation is due to a change from a wider range of acceptable onsets in an earlier period (including /mn/ and /ml/), to a reduced range in Attic. But there is no real evidence of this change having taken place by the time of Classical Attic with regard to /m/ plus sonorant sequences: μεμβλώκα is paradigmatically isolated and the examples in LSJ may be influenced by Homeric language, but μέμνημαι is used by Aristophanes and other Attic authors.

Present 1sg.	Perfect 1sg.
μίμνησκω 'remind'	μέμνημαι
μνηστεύω 'court'	μεμνήστευκα
(βλώσκω) 'go'	μεμβλώκα

Although the evidence is, as usual, scanty, this suggests that in Attic /mn/ and /ml/ were acceptable onsets, which in turn suggests that, since word-onsets that break the SSP do not reduplicate a consonant, /mn/ is not such an onset, and that /m/ therefore has a lower sonority than /n/.[34]

5 Arguments not directly based on sonority

5.1 *Syllabic *r̥ and *l̥ before /m/ in Proto-Celtic*

In Proto-Celtic there is a difference between the development of **r̥* and **l̥* depending on what segment follows them. If they are followed by **n*, **r*, **l*, **u̯*, **i̯*, or **s*, or by a word boundary, they develop to **-ar-* and **-al-*, as shown by examples (a) to (f). If they are followed by a plosive or /m/ they develop to **-ri-* and **-li-*, as shown by examples (g) to (k) (McCone 1996: 49–50, 72; Schumacher 2004: 125–126):[35]

(a) Welsh *sarn-* 'strew' < **sarnat*(*i*) < **str̥nh₃-*
(b) Old Irish *a-t:baill* 'dies' < **-balnit*(*i*) < **gʷl̥n*(*e*)*h₁-*

As a perfect of μνηστεύω, ἐμνήστευκα is attested only as a varia lectio in the Gospel of Luke (although μεμνήστευκα is also only found late). The table given by Vaux & Wolfe (2009: 118–119) quotes only ἐμνήστευκα.

34 Steriade (1982: 186–208) connects the behaviour of word-initial onset sequences with word-medial sequences. In general, the same onsets which show no consonant in the reduplication are also heterosyllabic word-medially, as demonstrated by the fact that their first segment closes the preceding syllable, causing it to scan heavy, in Attic comedy. Conversely, the voiceless plosive plus sonorant sequences do not close a syllable, i.e. they form an onset. The sequences /gl/ and /bl/ are variable in whether they act as hetero- or tauto-syllabic, and Steriade also sees them as variable in forming perfects with or without consonant reduplication. Curiously, /mn/ nearly always acts as heterosyllabic, with four exceptions.

35 Hill (2012) argues, unconvincingly, that the change to **-ri-* and **-li-* also takes place before /n/.

(c) Old Irish *marb*, Middle Welsh *marw* 'dead' < **mr̥-u̯o-*
(d) Old Irish *tart* 'thirst' < **tr̥s-tu-*
(e) Old Irish *carr*, Middle Welsh *car*(*r*) 'wagon' < **karso-* <**kr̥so-*
(f) Old Irish *arbor* 'grain' < **aru̯ar* < **h₂erh₃-u̯r̥*
(g) Old Irish *lethan*, Middle Welsh *llydan*, Gaulish *litano-* 'broad' < **pl̥th₂-no-*
(h) Old Irish *cride* 'heart' < **k̂r̥d-i̯o-*
(i) Old Welsh *rith* (later *rhyd*) 'ford' < **pr̥-tu-*
(j) Old Irish *brí* 'hill' < **bʰr̥ĝʰ-*
(k) Old Irish *cruim*, Middle Welsh *pryf* 'worm' < **kʷr̥m-is*

While this development suggests some similarity between /m/ and plosives in Proto-Celtic, it is not clear that it is a matter of sonority: in particular, note that /s/, which ought to have lower sonority than /m/, conditions the **-ar-*, **-al-* reflex.

5.2 *Lenition in Irish and British Celtic*[36]

In both the Brittonic languages and Irish, lenition of voiced stops and of **m*, **n*, **r* and **l* took place when between two vowels or between two vowels and a sonorant.[37] In the case of the stops and **m*, the result was a voiced fricative as demonstrated in the following examples:[38]

(a) **pibeti* > Old Irish *ibid*, Middle Welsh *yf* 'drinks'
(b) **medu* > Old Irish *mid*, Middle Welsh *medd* 'mead'
(c) **ageti* > Old Irish *·aig* 'drives, impels', Old Welsh *hegit*, Middle Welsh *eyt* 'goes'
(d) **omos* > Old Irish *om* [oṽ], Middle Welsh *of* 'raw'[39]

36 I am grateful to Elysia Warner for drawing this example to my attention.
37 This round of lenition may have taken place at an Insular Celtic period; if so, both branches subsequently underwent independent lenitions of **s* > **h*, and of voiceless stops, which became fricatives in Irish and voiced stops in British Celtic. On the whole question of the development and chronology of lenition in Celtic see McCone (1996: 81–98); whether lenition of voiced stops and **m* was a shared or independent change in Irish and British Celtic is not of importance here.
38 Old Irish orthography uses ⟨d⟩, ⟨g⟩, ⟨b⟩, ⟨m⟩ to represent both non-lenited and lenited consonants. Middle Irish spelling, and modern pronuciation, confirm the lenition. In Welsh intervocalic **g* > **γ* was lost by the time of Middle Welsh (Jackson 1953: 440–460, with Zair 2010/2011 [2012]: 203–206 on **-āgu-*).
39 In Welsh, the reflexes of lenited **b* and **m* had fallen together by the time of Middle Welsh, but were previously distinguished, and remain distinct in Breton, where a vowel preceding original **m* is nasalised (Jackson 1953: 480–495).

The result was quite different for **l*, **r*, and **n*. In Old Irish lenited and unlenited forms are distinguished by single writing of the former and double writing of the latter (i.e. as ⟨ll⟩, ⟨rr⟩, ⟨nn⟩). In Modern Irish distinctions between tense (i.e. unlenited) and lax (lenited) /l/, /n/ and /r/ have tended to become lost, but do exist in some dialects, especially word-initially as part of a morphophonemic process of lenition (Ó Siadhail 1989: 92–95, 112–113): among elderly speakers of the Donegal dialect, there at least used to be a distinction of length between unlenited and lenited /l/, /n/ and /r/ (Ó Dochartaigh 1992: 83, 85, 89–90). In Scots Gaelic, insofar as the distinction is maintained, it has become one of place of articulation, as shown by non-lenited palatalised **l* being realised as [ʎ] and lenited palatalised **l* being realised as retracted [l̠] in the 'Standard Scottish Gaelic' described by Gillies (1993: 156), while Borgstrøm (1940: 23–25) describes lenited /l/, /n/, /r/ as involving the loss of the palatalisation or velarisation characteristic of their non-lenited counterparts. In Modern Welsh, lenited **l* is realised as /l/ (spelt ⟨l⟩), while unlenited **l* is a lateral fricative /ɬ/ (spelt ⟨ll⟩), which is also the reflex of **-ll-* < **-ln-*, *-nl-*, *-ld-*, *-sl-*, *-ls-*. Lenited **r* is /r/ (⟨r⟩) and unlenited **r* is /r̥/ (i.e. a voiceless trill, spelt ⟨rh⟩; Thorne 1993: 1, 22–23). There is no lenition of /n/. The other Brittonic languages, Breton and Cornish, do not seem to have maintained a distinction between lenited and unlenited /l/, /n/ and /r/ (Jackson 1953: 471–480).

The results of lenition in British Celtic and in Irish on /l/, /n/ and /r/ seem to be slightly different in practice but may have similar origins: the Old Irish orthography perhaps implies that the unlenited forms were felt to be longer than their lenited counterparts; the same may have been true in Welsh, at least for **l*, with subsequent devoicing of unlenited /l/ and /r/ (and the subsequent development of /l̥/ to /ɬ/). Whatever the details, the key point is that in the first round of lenition in both Irish and British Celtic, which apparently targetted only voiced sounds, it seems clear that /m/ developed along the same lines as the plosives rather than the other sonorants.

5.3 *Vowel epenthesis in Oscan*

One of the characteristic features of Oscan is the two processes of vowel epenthesis which it underwent (known as 'anterior' and 'posterior'). The best description of these is still that of von Planta (1892–1897: 251–271). It is the posterior epenthesis that is of interest here.[40] As shown in the following examples,

40 Anterior epenthesis also involves sonorants but the evidence is not good enough to allow us to tell whether /m/ behaves like the other sonorants or not.

in this process, a vowel develops between a plosive and /l/, /r/, or /n/. The vowel is the same as the vowel following the /l/, /r/, or /n/, as shown by examples (a)–(f):[41]

(a) **pukalatúí** (Abella 1.4/Cm 1) cognomen < **puklātōi̯*
(b) **sakaraklúm** (Teruentum 18/Sa 7) 'sanctuary' < **sakrāklom*
(c) *acunum* (Bantia 1.31/Lu 1) 'year' < **aknom*
(d) σεγονω (Potentia 1/Lu 5) 'statues' < **segnā*
(e) **patereí** (Teruentum 34.A 25/Sa 1) 'father' < **patrei̯*
(f) καποροιννᾳ[ι] (Potentia 16/Lu 32) divine epithet < **kaprōniāi̯*

Epenthesis does not take place when the syllable preceding the plosive is already heavy, as shown by examples (g)–(j):

(g) **húnttram** (Pompeii 13/Po 1) 'lower' /hontram/
(h) **ehtrad** (Abella 1.B 5/Cm 1) 'outside' /ehtrad/
(i) *contrud* (Bantia 1.11/Lu 1) 'against' /kontrud/
(j) **maatreís** (Fagifulae 3/Sa 30) 'mother' /ma:trejs/

This data suggests that posterior epenthesis is sensitive to syllable weight; it does not take place when a syllable is heavy because it contains a long vowel, diphthong, or /l/, /r/, or /n/ after the vowel. Therefore, we should assume that a sequence of a stop followed by /l/, /r/, or /n/ between vowels forms a complex onset rather than being tautosyllabic, with the result that the preceding syllable is light. In other words, I assume the following syllabifications prior to epenthesis:

(k) **pukalatúí** < /pu.kla:.toj/
(l) **sakaraklúm** < /sa.kra:.klom/
(m) *acunum* < /a.knom/
(n) σεγονω < /se.gno/
(o) **patereí** < /pa.trej/
(p) καποροιννᾳ[ι] /ka.pro:n.ja:j/
(q) **húnttram** /hon.tram/
(r) **ehtrad** /eh.trad/

41 All Oscan texts are referred to by the names used in Crawford et al. (2011) and Rix (2002), in that order. The text is that of Crawford et al. Reconstructions are based on those in Untermann (2000) and Zair (2016). I am grateful to Valentina Lunardi for her help in collecting Oscan forms relevant to epenthesis.

(s) *contrud* /kon.trud/
(t) **maatreís** /ma:.trejs/

However, in this process, /m/ acts like a plosive rather than like the other sonorants. Thus we find the following forms, which suggest that **mn-* forms a complex onset, causing epenthesis to take place after a light syllable while **-km-* and **-gm-* are heterosyllabic, resulting in a heavy syllable and hence no epenthesis:

(u) *comẹnei* (Bantia 1.5/Lu 1) 'assembly' < /ko.mnej/
(v) δ{ι}ομανα[ς] (Potentia 10/Lu 7) 'mistress' < /do.mnass/
(w) δεκμας (Potentia 28/Lu 22) 'tithe' /dek.mas/
(x) *egmo* (Bantia 1. 4/Lu 1) 'business' /eg.mo/

In this way, /m/ is treated differently from /n/, which forms a complex onset and permits epenthesis, in *acunum* < /a.knom/, σεγονω < /se.gno/. The refusal of Oscan to form syllable onsets consisting of a plosive followed by /m/ therefore suggests that for the purposes of syllable structure, /m/ patterned with the plosives rather than with the other sonorants.

In some ways, this data fits in well with the idea that /m/ is of lower sonority than /n/ (and presumabbly the other sonorants), since it allows /mn/ as an onset, alongside other onsets which follow the SSP like /kl/, /kr/, /kn/, /gn/, /tr/, /pr/. However, /km/ and /gm/, which also follow the SSP, are not permitted. A tempting approach to this data is to use the concept of the Minimal Sonority Distance (MSD; Parker 2011: 1167–1169), which is a language-specific parameter that specifies a minimum change in sonority within the onset and or coda of a syllable. Thus, if we take the standard sonority hierarchy and give each rank a number, we get the following scale:

glides	4
liquids	3
nasals	2
obstruents	1

The MSD demanded by a given language can then be expressed by subtracting the number of the second element of a sequence from the first. An example of a language with an MSD of 2 is Gizzra, spoken in Papua New Guinea, which allows the onsets TL (3 – 1 = 2), T$\underset{\wedge}{\text{I}}$ (4 – 1 = 3) and N$\underset{\wedge}{\text{I}}$ (4 – 2 = 2), as shown in the examples below, but not TT (1 – 1 = 0), TN (2 – 1 = 1), NL (3 – 2 = 1), L$\underset{\wedge}{\text{I}}$ (4 – 3 = 1) etc.[42]

42 Where T = any obstruent, N = any nasal, L = any liquid, $\underset{\wedge}{\text{I}}$ = any glide.

(y) [glɛs] 'dew'
(z) [ta.pɾaz.də] 'on (his) fangs'
(aa) [djao] 'palm (sp.)'
(bb) [uɾ.mjao] 'tree (sp.)'

If we set up a sonority scale for Oscan as below, we can explain the absence of plosive plus /m/ onsets as the result of an MSD of 2.

glides	5
liquids	4
/n/	3
/m/	2
obstruents	1

Under this model, sequences like /kl/, /tr/ (both 4 – 1 = 3) and /tn/ (3 – 1 = 2) are fine as onsets, but /km/ and /gm/ (both 2 – 1 = 1) are not. This fits in well with most of the examples given above, but not for the /mn/ onsets in *comẹnei* and ð{ι}ομανα[ς], which we would expect to be forbidden, since 3 – 2 = 1.[43]

None of the methods based on sonority provide us with an explanation for the Oscan situation. If Oscan syllable onsets are to be explained in terms of the SSP, an informal description would be to say that Oscan has a basic sonority hierarchy sonorants >> obstruents, with /m/ counting, unexpectedly, as an obstruent; or, alternatively, that the hierarchy is liquids >> /n/ >> /m/ >> obstru-

43 A similar result comes about from the 'Dispersion Principle' put forward by Clements (1990: 302–311; see also Parker 2011: 1173–1175), which states that "the simplest syllable is one with the maximal and most evenly-distributed rise in sonority at the beginning and the minimal drop in sonority (in the limit case, none at all) at the end. Syllables are increasingly complex to the extent that they depart from this preferred profile" (Clements 1990: 303). Clements ranks 'demisyllables' (onset plus nucleus or nucleus plus coda) according to their simplicity. Languages can then admit demisyllables only up to a certain complexity. Thus, for example, assuming a sonority hierarchy glides >> liquids >> nasals >> obstruents, in a two-segment initial demisyllable the maximal rise in sonority consists of a sequence TV (which is hence the simplest initial demisyllable) and the minimal rise is ɪV (which is hence the most complex initial demisyllable). Using a formula for determining dispersion, Clements creates a scale from least complex to most complex demisyllable. Neither a hierarchy vowels >> glides >> liquids >> /n/ >> /m/ >> obstruents nor a hierarchy vowels >> glides >> /l/, /r/, /n/ >> /m/ >> obstruents predicts the situation found in Oscan. Both rank TmV as less complex than mnV, so that it is not possible to rule out TmV without also ruling out mnV.

ents, but that these fall into two camps 'more sonorous' (liquids, /n/) and 'less sonorous' (/m/, obstruents) for the purpose of syllabification. I do not know of such an analysis having been previously proposed for any other language, so I am reluctant to claim that the explanation is because of lower sonority of /m/—this may be part of the story, but other factors seem to play a role, at least.[44]

5.4 *Syllabic punctuation in Venetic*[45]

In most Venetic inscriptions, letters which do not form part of an onset plus nucleus sequence are marked out by the placement of (normally) vertical strokes on either side of the letter, as in e.g. *plede.i. ve.i.gno.i. / kara.n.mniio.i. / .e.kupetari.s. e.go* (Lejeune 131)[46] 'I am the *ecupetaris* to Ples son of Veios son of Karanmnos'. Acceptable (i.e. non-punctuated) sequences include *pr*, *pl*, *tr*, *tl*, *kl*, *vhr*,[47] *tn*, *dn*, *kn*, *gn* and *mn*. In addition, there are votive writing tablets from Este which list acceptable syllables, and these consist of all obstruents plus /l/, /n/ and /r/, as well as /m/ followed by /l/, /n/ and /r/ (Lejeune 1974: 37–39). This pattern matches with the acceptability of /m/ plus sonorant sequences as an onset in PIE, which we said did not provide evidence for a lower sonority of /m/, since /w/ has a similar distribution (the absence of unpunctuated *vr* or *vl* in the texts and writing tablets may simply reflect the rarity of the sequence /wr/ rather than its theoretical impermissibility).

More useful, however, is the other observation arising from this data, that sequences of obstruent or sonorant plus /m/ are not acceptable as an onset.[48]

---

44 An anonymous reviewer suggests that the Oscan situation can be solved by the observation that /km/ and /gm/ are absent as medial onsets because they do not exist as word-initial ones, a situation deriving from PIE, where there were also no word-onsets of this shape. Conversely, since /mn/ is a word-onset in PIE, /mn/ is a possible syllable-onset. This, I take it, is a reference to to the 'Decomposition Theorem' (discussed by Byrd 2015: 54–69), whereby word-medial syllable onsets and codas are deducible by reference to onset and coda sequences at word-edge. I do not find this type of explanation very satisfying: firstly because, in a corpus language like Oscan (or a reconstructed language like PIE) we simply cannot rule out the possibility that a putative word-onset /gm/ or /km/ is missing in our evidence, rather than that it did not exist (cf. /kn/, which is attested in Oscan as a syllable onset word-medially, but seems not be be attested word-initially); secondly, because all it does is push the problem to the start of the word, which raises the question of why /km/ and /gm/ are not found there (either in Oscan, or in PIE; I have not identified anything in Byrd's model of the syllable that would make /gm/ and /km/ impossible word-onsets, which takes us back to my first objection).

45 I am grateful to Katherine McDonald for drawing this evidence to my attention.

46 Here full stops are used to mark the punctuation. All texts are quoted from Lejeune (1974).

47 The digraph *vh* represents /f/ in Venetic.

48 It could be argued that the Venetic punctuation in fact reflects the phonology of Etruscan,

This seems to be clear evidence of a similar situation to Oscan, with /m/ patterning with the obstruents rather than the sonorants in the rules of syllable structure. Since Venetic may be an Italic language,[49] it is possible that it and Oscan represent the Proto-Italic situation.[50]

---

from which the Venetic alphabet and punctuation system was originally borrowed (as implied by Prosdocimi 1983: 121–122). The evidence of Etruscan is rather meagre, since the syllabic punctuation system was not uniformly adopted across the Etruscan-speaking area, and it was subsequently abandoned even in areas which used it (Wallace 2008: 26). I have examined all the inscriptions which include examples of the syllabic punctuation included in ET (i.e the Tabula Capuana, TC, and a small number from Campania and Lucania, CM, Veii, VE, and VC 3.4 and 3.5). The inscriptions do not show great consistency: the Tabula Capuana, for example, does not punctuate *cn* in *sa.y.cne.ṣ*. (line 2), but does in *i.c.ni* (lines 22 and 23). I assume that presence of punctuation is more weighty evidence for an illicit syllable onset than lack of punctuation is for a licit syllable onset, since punctuation could presumably be left out due to carelessness or idleness. The inscriptions given above show examples of punctuation of *cl*, *cr*, *cn*, and *pl* sequences, so I assume that these at least were not acceptable syllable onsets (although the word-index of ET 193–317 shows that at the start of the word obstruent plus /l/, /r/ and /n/ was possible, as was /ml-/, /mn-/, /wl-/, /wr-/ and /wn-/). Note also that the syllabary of Caere (Cr 9.1) includes no complex onsets. It seems likely, therefore, that the Venetic evidence reflects Venetic syllabification rather than Etruscan.

49 For an overview of the views surrounding this point see de Melo (2007: 15–16).

50 In principle, we should be able to see whether Latin had a similar system to that of Oscan and Venetic through scansion. Syllables consisting of a short vowel followed by plosive plus liquid sequences scan as light in early Latin poetry, and can still scan light in Classical poetry, suggesting for a word like *patris* 'father (gen. sg.)' an original syllabification /pa.tris/. Before /m/ only velars avoided total assimilation (with **-km-* > **-gm-*, as in *segmentum* 'piece' < **sekmentom*); these /gm/ sequences cause the syllable to scan heavy, suggesting a syllabification /seg.men.tum/, but we cannot compare this to plosive plus /n/ sequences, since these underwent sound changes which changed the make-up of this sequence (Weiss 2009: 137): **-pn-* and **-bʰn-* > *-mn-* (**sụepnos* > *somnus* 'year', **skabʰnom* > *scamnum* 'stool'), **-tn-* > *-nn-* (**atnos* > *annus* 'year'), **-dn-* and **-dʰn-* > *-nd-* (**udnā* > *unda* 'wave', **bʰudʰnos* > *fundus* 'bottom'), while **kn* > **gn*, and **gn* developed into the sequence [ŋn], as demonstrated by the raising before a nasal seen in forms like **seknom* > *signum* 'sign' and **legnum* > *lignum* 'wood' (examples are lacking for **-gʰn-*). The only other obstruent which could appear before /m/ and /n/ in Latin is **s*, which was lost with compensatory lengthening of the preceding vowel some time between the seventh and third enturies BC (*cosmis* > *cōmis* 'kindly', **kasnos* > *cānus* 'white'). No evidence is available for **-ml-* and **-mr-* sequences either, which developed to *-mpl-* and *-br-*, as in **eks-em-lom* > *exemplum* 'example', and **ĝʰeḭ-m-r-ino-* > *hībernus* 'wintry' (Weiss 2009: 164, 166). What is certainly the case is that a vowel followed by /mn/ sequences scans heavy, suggesting that this sequence at least was heterosyllabic, not tautosyllabic, in Latin, unlike in Oscan and Venetic.

6 Conclusions

The evidence put forward by Cooper for a lower sonority for /m/ than the other sonorants in PIE is not conclusive. On the one hand, there does seem to be something special about /m/ at the start of a root, since it can appear before its fellow nasal /n/ in a syllable onset (§ 4.1). However, it is not clear that this is necessarily due to lower sonority, since /w/ can appear before /r/ and /l/ and glides are generally supposed to be of higher sonority than liquids. Word-internally (§ 4.2), we do find a difference, since /w/ does not seem able to form such onsets, while /m/ can, but the potential evidence for /wr/ and /wl/ is pretty slim. Strictly speaking, too, we do not know that an /nm/ onset is forbidden, rather than unattested; if it were allowed, this would be strong evidence against /m/ having a lower sonority than /n/.

Neither the syllabification of *-*im*(*s*), *-*um*(*s*) and *-*rm̥*(*s*) sequences (§ 3.2), nor Stang's Law (§ 3.3) provide strong evidence regarding the sonority of /m/. The unexpected Latin *dormiō* < **dr̥m-i̯e/o-* (§ 3.1) may be due to a lower relative sonority of /m/ than /r/, but as a single form it is not conclusive, and there is counterevidence showing the expected syllabification of /m/ in such a sequence.

The behaviour of Sanskrit and Greek reduplication processes (§ 4.3) does, however, suggest that /m/ was less sonorous than the other sonorants, including /n/, although it would be nice to have more examples of /mn/ onsets, since we have one in Sanskrit and two in Greek, and the Greek evidence is complex.

In Proto-Celtic, /m/ has the same effect on preceding syllabic liquids as a plosive (§ 5.1). Likwise, plosives and /m/ seem to have undergone the same process of lenition in British Celtic and Irish (§ 5.2). In neither case is it clear that this is due to a difference in sonority between /m/ and the other sonorants. The evidence from Oscan and Venetic in § 5.3 and § 5.4 is tantalising, in that /m/ certainly acts differently from the other sonorants (and like the plosives) with regard to position in the syllable onset, a context in which explanations based on relative sonority are particularly applicable. But as far as I am aware none of the theories about sonority which are commonly accepted will explain the behaviour of /m/.

The strongest evidence for a lower sonority of /m/, therefore, comes from Sanskrit and Greek. Whether this can be projected backwards to PIE is uncertain: one might argue that a lower sonority of /m/ is so unusual among the world's languages that it is highly unlikely to have been independently created more than once, and therefore should be reconstructed for PIE. However, since Greek and Sanskrit are often traced back to a single sub-group (Fortson 2010: 203), lower sonority of /m/ is as likely to have developed in Graeco-Indo-Iranian

as in PIE. Perhaps the peculiar tendency of /m/ to pattern with plosives rather than other sonorants in Oscan and Venetic (and perhaps Proto-Italic?) and in (Proto-)Celtic could also be said to provide indirect evidence from other families to support the evidence of Greek and Sanskrit.

What does all this mean for the PIE syllable, which has been the focus of so much interest in recent years? Despite much of the evidence he cites being unreliable or uncertain, Cooper's claim that /m/ was of lower sonority than the other sonorants (and in particular /n/), more or less stands up. Insofar that this claim is a small part of his theory of syllabification, this theory is strengthened, since his separation of the sonority-hierarchy-based constraint *PK/Nasal into *PK/m and *PK/n (the former ranked higher than the latter), can be justified for reasons outside the needs of his theory, insofar as this ranking reflects the relative sonority of the two nasals. Alternative theories such as those of Kobayashi (2004), Keydana (2011), and Byrd (2015) explain the behaviour of the syllabification of /m/ relative to the other sonorants in different ways, which are not much affected by the relative sonority of /m/ (although they do make use of the SSP). To the extent that OT constraints ought to be based on observed facts about the phonology of languages they aim to represent, future work on the syllable may wish to take the apparently unusual sonority hierarchy of PIE (or at least Graeco-Indo-Iranian) into account.

Acknowledgments

I am grateful to the anonymous reviewers, whose detailed and thoughtful comments made this article far better than it originally was. I owe many thanks to Bert Vaux for advice and reading on relative sonority. All errors are my own.

Bibliography

Beekes, Robert (2010). *Etymological Dictionary of Greek*. Leiden & Boston: Brill.

Blust, Robert (1979). Coronal non-coronal consonant clusters: new evidence for markedness. *Lingua* 47, 101–117.

Borgstrøm, Carl H. (1940). *A Linguistic Survey of the Gaelic Dialects of Scotland. Vol 1. The Dialects of the Outer Hebrides*. Oslo: H. Aschehoug & Co.

Byrd, Andrew Miles (2015). *The Indo-European Syllable*. Leiden & Boston: Brill.

Cho, Young-mee Yu & Tracy Holloway King (2003). Semisyllables and universal syllabification. In Caroline Féry & Ruben van der Vijver (eds.), *The Syllable in Optimality Theory*, 183–212. Cambridge: Cambridge University Press.

Clements, G.N. (1990). The role of the sonority cycle in core syllabification. In John Kingston & Mary E. Beckman (eds.), *Papers in Laboratory Phonology 1. Between the Grammar and Physics of Speech*, 283–333. Cambridge: Cambridge University Press.

Cooper, Adam I. (2013). The typology of PIE syllabic sonorants. *Indo-European Linguistics* 1, 3–67.

Cooper, Adam I. (2015). *Reconciling Indo-European Syllabification*. Leiden & Boston: Brill.

Crawford, Michael, W.M. Broadhead, J.P.T. Clackson, F. Santangelo, S. Thompson & M. Watmough (2011). *Imagines Italicae. A Corpus of Italic Inscriptions*. London: Institute of Classical Studies.

De Decker, Filip (2011). Stang's Law and the Indo-European word for "cow". *Indogermanische Forschungen* 116, 42–59.

de Melo, Wolfgang D.C. (2007). The sigmatic future and the genetic affiliation of Venetic: Latin *faxō* 'I shall make' and Venetic *vha.g.s.to* 'he made'. *Transactions of the Philological Society* 105, 1–21.

Dineen, Nikoleta & Daiva Miller (1995). The derivation of a sonority hierarchy from the Syllable Contact Law (SCL) and the productivity of the SCL in American English. *George Mason University Working Papers in Linguistics* 5, 19–47.

ET = Gerhard Meiser & Helmut Rix (2014). *Etruskische Texte*. Second Edition. Hamburg: Baar Verlag.

Fortson, Benjamin W. (2010). *Indo-European Language and Culture. An Introduction*. Second Edition. Malden (MA), Oxford & Chichester: Wiley Blackwell.

Gillies, William (1993). *Scottish Gaelic*. In Martin J. Ball & James Fife (eds.), *The Celtic Languages*, 145–227. London & New York: Routledge.

Goad, Heather (2011). The representation of sC clusters. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology*, 898–923. Malden (MA), Oxford & Chichester: Wiley Blackwell.

Hankamer, Jorge & Judith Aissen (1974). The sonority hierarchy. In Anthony Bruck, Robert A. Fox & Michael W. La Galy (eds.), *Papers from the Parasession on Natural Phonology. April 18, 1974*, 131–145. Chicago: Chicago Linguistic Society.

Harđarson, Jón Axel (1993). *Studien zum urindogermanischen Wurzelaorist und dessen Vertretung im Indoiranischen und Griechischen*. Innsbruck: Innsbrucker Beiträge zur Sprachwissenschaft.

Harris, John (2011). Deletion. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology*, 1597–1621. Malden (MA), Oxford & Chichester: Wiley Blackwell.

Henke, Eric, Ellen M. Kaisse & Richard Wright (2012). Is the Sonority Sequencing Principle an epiphenomenon? In Steve Parker (ed.), *The Sonority Controversy*, 65–100. Berlin & Boston: De Gruyter Mouton.

Hill, Eugen (2012). Silbische Liquiden vor Nasalen im Inselkeltischen und das Prob-

lem der Nasalpräsentien vom Typ air. *sernaid*, kymr. *-sarnu*. *Keltische Forschungen* 5, 227–254.

Jackson, Kenneth (1953). *Language and History in Early Britain. A Chronological Survey of the Brittonic Languages 1st to 12th c. A.D.* Reprinted 1994. Dublin: Four Courts Press.

Kennedy, Robert (2011). Reduplication in Sanskrit. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology*, 2855–2878. Malden (MA), Oxford & Chichester: Wiley Blackwell.

Keydana, Götz (2008 [2010]). Hohe Sonorität in der Koda: Indogermanische Lösungen für ein phonetisches Problem. *Historische Sprachforschung* 121, 54–64.

Keydana, Götz (2011). Evidence for non-linear phonological structure in Indo-European: The case of fricative clusters. In Benedicte Nielsen Whitehead, Thomas Olander, Birgit Anette Olsen & Jens Elmegård Rasmussen (eds.), *The Sound of Indo-European. Phonetics, Phonemics and Morphophonemics*, 223–241. Copenhagen: Museum Tusculanum Press.

Kobayashi, Masato (2004). *Historical Phonology of Old Indo-Aryan Consonants*. Tokyo: Research Institute for Languages and Cultures of Asia and Africa, Tokyo University of Foreign Studies.

Lejeune, Michel (1974). *Manuel de la langue vénète*. Heidelberg: Carl Winter.

LIV = Helmut Rix & Martin Kümmel (2001). *Lexikon der indogermanischen Verben*. Second edition. Wiesbaden: Dr. Ludwig Reichert Verlag.

LSJ = Henry G. Liddell, Robert Scott & Sir Henry Stuart Jones (1996). *Greek-English Lexicon*. *With a Revised Supplement*. Ninth Edition. Oxford: Clarendon Press.

Mayrhofer, Manfred (1986). *Indogermanische Grammatik 1/2: Lautlehre*. Heidelberg: Carl Winter. Universitätsverlag.

McCone, Kim (1996). *Towards a Relative Chronology of Ancient and Medieval Celtic Sound Change*. Maynooth: Department of Old Irish, St. Patrick's College.

Meillet, Antoine (1934). *Introduction à l'étude comparative des langues indo-européennes*. Reprinted 1964. Alabama: University of Alabama Press.

Meiser, Gerhard (1998). *Historische Laut- und Formenlehre der lateinischen Sprache*. Darmstadt: Wissenschaftliche Buchgesellschaft.

NIL = Dagmar S. Wodtko, Britta Irslinger & Carolin Schneider (2008). *Nomina im Indogermanischen Lexikon*. Heidelberg: Universitätsverlag Winter.

Nussbaum, Alan J. (2010). PIE *-Cmn-* and Greek τρᾰνής 'clear'. In Ronald Kim, Norbert Oettinger, Elisabeth Rieken & Michael Weiss (eds.), *Ex Anatolia Lux. Anatolian and Indo-European studies in honor of H. Craig Melchert on the occasion of his sixty-fifth birthday*, 269–277. Ann Arbor & New York: Beech Stave Press.

Ó Dochartaigh, Cathair (1992). The Irish language. In Donald MacAulay (ed.), *The Celtic Languages*, 11–99. Cambridge: Cambridge University Press.

Ó Siadhail, Mícheál (1989). *Modern Irish. Grammatical Structure and Dialectal Variation*. Cambridge: Cambridge University Press.

Parker, Stephen G. (2002). *Quantifying the Sonority Hierarchy*. PhD thesis, University of Massachusetts, Amherst.

Parker, Stephen G. (2011). Sonority. In Marc van Oostendorp, Colin J. Ewen, Elizabeth Hume & Keren Rice (eds.), *The Blackwell Companion to Phonology*, 1160–1184. Malden (MA), Oxford & Chichester: Wiley Blackwell.

Pronk, Tijmen (2016). Stang's Law in Baltic, Greek and Indo-Iranian. *Baltistica* 51, 19–35.

Prosdocimi, Aldo Luigi (1983). Puntuazione sillabica e insegnamento della scrittura nel venetico e nelle fonti etrusche. *AIΩN. Annali del Seminario di Studi del Mondo Classico. Sezione linguistica* 5, 75–126.

Rau, Jeremy (2009). *Indo-European Nominal Morphology: The Decads and the Caland System*. Innsbruck: Innsbrucker Beiträge Zur Sprachwissenschaft.

Rix, Helmut (2002). *Sabellische Texte. Die Texte des Oskischen, Umbrischen und Südpikenischen*. Heidelberg: Universitätsverlag C. Winter.

Schindler, Jochem (1977). Notizen zum Sieverschen Gesetz. *Die Sprache* 23, 56–65.

Schrijver, Peter (1991). *The Reflexes of the Proto-Indo-European Laryngeals in Latin*. Amsterdam & Atlanta: Rodopi.

Schrijver, Peter (2003). Athematic *i*-presents: the Italic and Celtic evidence. *Incontri Linguistici* 26, 59–86.

Schumacher, Stefan (2004). *Die keltischen Primärverben: ein vergleichendes, etymologisches und morphologisches Lexikon*. Innsbruck: Innsbrucker Beiträge zur Sprachwissenschaft.

Simkin, Oliver (2004). *Osthoff's Law: a Study in Greek Historical Phonology*. PhD thesis, Cambridge University.

Steer, Thomas (2015). On the origin of the Proto-Indo-European local adjectives in **-mnó-*. *Historische Sprachforschung* 128, 205–235.

Steriade, Donca (1982). *Greek Prosodies and the Nature of Syllabification*. PHD thesis, MIT.

Steriade, Donca (1988). Reduplication and syllable transfer in Sanskrit and elsewhere. *Phonology* 5, 73–155.

Thorne, David A. (1993). *A Comprehensive Welsh Grammar*. Oxford & Cambridge (MA): Blackwell.

Tsunoda, Tasaku (2008). Sonority Hierarchy in Warrongo (Australia). *Gengo Kenkyu* 133, 147–161.

Untermann, Jürgen (2000). *Wörterbuch des Oskisch-Umbrischen*. Heidelberg: Universitätsverlag C. Winter.

Vaux, Bert & Andrew Wolfe (2009). The appendix. In Eric Raimy & Charles E. Cairns (eds.), *Contemporary Views on Architecture and Representations in Phonology*, 100–143. Cambridge (MA) & London: MIT Press.

von Planta, Robert (1892–1897). *Grammatik der oskisch-umbrischen Dialekte*. Strassburg: Verlag von Karl J. Trübner.

Wallace, Rex (2008). *Zikh Rasna. A Manual of the Etruscan Language and Inscriptions*. Ann Arbor & New York: Beech Stave Press.

Weiss, Michael (2009). *Outline of the Historical and Comparative Grammar of Latin*. Ann Arbor & New York: Beech Stave Press.

Willi, Andreas (2018). *Origins of the Greek Verb*. Cambridge: Cambridge University Press.

Zair, Nicholas (2010/2011 [2012]). British *-*āw*- and *-*āg*-, and the Celtic words for 'sun'. *Die Sprache* 49, 194–208.

Zair, Nicholas (2012). *The Reflexes of the Proto-Indo-European Laryngeals in Celtic*. Leiden & Boston: Brill.

Zair, Nicholas (2016). *Oscan in the Greek Alphabet*. Cambridge: Cambridge University Press.

Zwicky, Arnold (1972). Note on a phonological hierarchy in English. In Robert P. Stockwell & Ronald K.S. Macaulay (eds.), *Linguistic change and generative theory*, 275–301. Bloomington: Indiana University Press.