

A Minor Sound Law for Celtic: PIE *VNHK → OIr.Vcc: OCymr.Vnc

Jouna Pyysalo

1. The segmental laryngeal in PIE and its treatment in the subgroups

1.0 The Proto-Indo-European laryngeal PIE *H (\approx *h₂), phonetically a voiceless/voiced glottal fricative PIE *h/fi (see Pyysalo 2013), was lost as an independent phoneme in all Indo-European languages except Old Anatolian (Hittite, Palaic, Cuneiform Luwian and Hieroglyphic Luwian).¹

1.1 There are, however, some twenty direct or indirect features indicating an original PIE *h/fi in the subgroups.² Some of these features, like the ‘a-vocalism’ of the cognates reflecting Neogr. *ə a ā, have been known since the discovery of Hittite and others have been more recently suggested, for instance, PIE *h/fi, which is the hitherto unknown criterion for Fortunatov’s law.³

1.2 In this paper I propose a minor sound law for Old Irish stating that PIE *h/fi between a nasal and a voiceless velar yielded a geminated velar before which the nasal was lost in Old Irish, in contrast to the rest of the Celtic group, as indicated in

PIE *VNHK → OIr. Vcc, OCymr. Vnk, etc.

Consequently the reconstruction of Proto-Celtic requires at least one sound law in which PIE *h/fi is needed in order to explain the attested forms in Old Irish regularly.

1.3. In a broader context, the proposed Celtic sound law supplements the revised Indo-European sound law system, a.k.a. the *glottal fricative theory* (GFT), first presented in Pyysalo 2013 and now digitalized in the PIE Lexicon project at the University of Helsinki.⁴ As one of the key objectives of the project is to formulate a

1 In this article, I use the monolaryngealist reconstruction of Pyysalo 2013 with a single laryngeal *H = PIE *h/fi (\approx *h₂). The glottal fricative was always accompanied by PIE *a, the reinterpreted Neogr. *ə (schwa indogermanicum), i.e., they appeared together in the diphonic pairs *ha *ah *fia *afi, where the vowel PIE *a accounts for the colouring and syllabicity commonly associated with *h₂.

2 For the most comprehensive recent presentation of the indirect features pointing to PIE *h/fi, see Pyysalo 2013.

3 For Fortunatov’s law, see Fortunatov 1881, 1900 and Collinge 1985. For the revision of Fortunatov’s law in the glottal fricative theory, see Pyysalo 2013, 224–243.

4 <http://pielexicon.hum.helsinki.fi>

consistent digitized set of sound laws automatically generating the Indo-European data, the rule also modestly contributes to the broader theoretical goals of Indo-European linguistics.

2. The historical treatment of OIr. -cc- (i.e. unlenited -c-)

2.0 The geminate OIr. -cc- between vowels, usually simplified into a single (unlenited) OIr. -c-, is currently traced back to two starting points in Proto-Celtic.

2.1 The majority of the instances of OIr. -c(c)- reflect an original Proto-Celtic geminate *-kk-. This subset was correctly analyzed already during an early phase of Indo-European linguistics and need not be doubted (see GOI §149). An example of an original geminate with an Indo-European parallel is preserved, for instance, in a correspondence with the meaning ‘scarlet’:

| | |
|-----------------------|---|
| OGaul. <i>cocco-</i> | (PN.m) ‘Lerouge’ or ‘Leroux’ (DLG 120) ⁵ |
| Gr. κόκκο- | (m.) ‘Kern von Früchten, der Granate’ (GEW 1:895) |
| OIr. <i>coic-</i> | (a.) ‘rouge’ (DLG 120; DIL 128) |
| Gr. κόκκίνο- | (a.) ‘scharlachrot: scarlet’ (GEW 1:895) |
| Lat. <i>coccineo-</i> | (a.) ‘scarlet’ (WH 1:240–241) |

2.2 In the second subset, OIr. *cc* (or simply OIr. *c*) reflects an earlier PCelt. **ank*, **enk*, or **ink*, all of which collided in OIr. *ēc* following the loss of the nasal and a compensatory lengthening of the preceding vowel into OIr. *ē*. This subset is reasonably well documented in well-known examples like OIr. *ēc-* ‘death’ (GOI §208) from PIE **haenK-* ‘death’ (≈ **h₂enK-*). The contrast between OIr. *ēc-* and PCelt. **ank-* is obvious in a Celtic correspondence quoted by Pokorny (IEW 762):

| | |
|------------------------|---|
| OIr. <i>ēc-</i> | (m.*-u) ‘Tod: death’ (DIL 258, <i>ēc</i> [sgN], <i>ēca</i> [sgG]) |
| OBret. <i>ancou-</i> | (m.) ‘Tod’ (Grundr ² 1:411; EtDiPC 37) |
| Bret. <i>ankow-</i> | (m.) ‘Tod’ (EtDiPC 37) |
| Corn. <i>ancow-</i> | (sb.) ‘Tod’ (EtDIPC 37) |
| ModCymr. <i>angau-</i> | (m.f.) ‘Tod’ (EtDiPC 37; GPC 1:49) |

This development remains unproblematic due to the numerous regular examples.

5 According to Delamarre (DLG 120), the Celtic formation is a loan from the classical languages, but there are no compelling reasons for this assumption. On the contrary, the rich derivation in Celtic can be understood as an argument in favour of the original PIE character of the Celtic forms.

2.3 The real problem is the third Celtic subset in which an earlier sequence of nasal before velar has resulted in the geminate OIr. -Vcc- without nasal or compensatory lengthening according to §2.2. One particularly commonplace example with an Indo-European etymology is the compound OIr. Π·icc- ‘reach, arrive, come’ also appearing with ‘a-vocalism’ in OIr. Π·acc- ‘reach, arrive, come’. In the examples Old Irish -cc- corresponds to -nk- with an unchanged root vowel in the rest of the Celtic group as indicated in

| | |
|---------------------------|---|
| MidCymr. <i>r·ync-</i> | (vb.) ‘reach’ (LIV ² 282; EtDiPC 36–37) ⁶ |
| OIr. <i>con·ricci-</i> | (pr.) ‘meet, encounter, join’ (DIL 149, <i>conriccim</i> [1sg]) |
| MidCymr. <i>cyfr·anc-</i> | (vb.) ‘encounter, meet’ (IEW 317; GOI §208) |
| OIr. <i>com·r·acc-</i> | (vn.) ‘Zusammentreffen: meeting’ (DIL 149). |

The standard development of §2.2 has not taken place, and, instead of OIr. *ēc*, MidCymr. *inc* corresponds to OIr. *icc* and MidCymr. *anc* to OIr. *acc*.

2.4 At least two attempts to explain the problems of this subclass have been made: (a) Pokorny (IEW 317; Pokorny 1969, 16) proposed that the Goidelic form would derive from a lengthened grade PIE *·ēnk- → PCelt. *·īnk- → *·ink- → OIr. *icc-*, allegedly through a later, ‘Celtic version’ of Osthoff’s law. In addition to Schrijver’s (1993, 39) counter-arguments, I would like to state that Osthoff’s law is older than its alleged Celtic version, and would have led from PIE *·ēnk- to PCelt. †·enk- before the latter, which therefore could not take place.⁷ Yet the core problem remains, because, regardless of its origin, Pokorny’s *·ink- is expected to result in OIr. *ēc*, not the attested OIr. *icc-*, according to §2.2.

(b) Schrijver (1993, 33) assumes that PIE **ṅ* developed into PCelt. **an* instead of the usually assumed rule PIE **ṅ* → PCelt. **in*:

‘I accept that Proto-Indo-European [...] syllabic nasals developed into PC **am*, **an* irrespective of the phonetic environment, which therefore is the starting-point for Irish (thus Cowgill *apud* Hamp 1965, 255, note 2; McCone 1991c, 21ff. 1991d, 51ff.’

Further assuming that the underlying verb was **n*-infix, Schrijver (1993, 41) presents the following chain of derivation for Old Irish:

6 For the root with initial PIE **i-* in modern Welsh, see ModCymr. *rhyngu bodd* ‘to please’ (lit. ‘reach satisfaction’); see Schrijver 1993, 40.

7 The alleged examples of the Celtic version of Osthoff’s law like PIE **u̯ēntus* → ModCymr. *gwynt* ‘wind’ can also be explained with an original PIE **i* (for this extension see Goth. *waiā-* ‘wehen: blow: πνεῖν: flare’ (GoEtD W9), Lith. *vėja-* (m.) ‘wind’ etc.). Due to similar ambiguity in all examples the ‘Celtic Osthoff’s law’ lacks proper motivation and is to be discarded.

PIE $*h_2n \cdot n \cdot k-$ → PC $*annk-$ → $*\bar{a}nnk-$ → $*\bar{a}nnk-$ → $*ennk-$ → $*enk-$ → $*ink-$

In addition to the numerous cumulative (and unproven) hypotheses on sound laws, relative chronology, and unattested intermediary phonemes, Schrijver's approach is fallacious from the beginning, because he equates the two Celtic bases $*ink-$ = $*ank-$.⁸ This results in a violation of the principle of regularity of sound change, since it is no longer possible to derive OIr. $\cdot acc-$ if PIE $*h_2n \cdot n \cdot k-$ → OIr. $\cdot icc-$ is accepted and vice versa. In addition, we would again expect $*ank-$ / $*ink-$ to yield OIr. $\bar{e}c-$ in the final phase of sound changes, according to §2.2, i.e., the discrepancy remains despite Schrijver's artificial relative chronology.

2.5 Although I appreciate Pokorny's and Schrijver's attempts in principle due to their correct aim of eliminating of the twofold development of PCelt. $*VNC$ in Old Irish, both approaches fail for the same reason: ultimately, Indo-European linguistics does not seek (or find) solutions to its problems by assuming aprioristic prototypes like $*\bar{e}nk-$ (Pokorny) or $*h_2n \cdot n \cdot k-$ (Schrijver).⁹ Instead, comparison of the data — in this case, the attested Indo-European bases of the root, and reconstruction of the respective PIE items — is the proper procedure for solving the problems, including the one at hand.¹⁰

3. The solution: PIE $*VNHK$ → OIr. Vcc = OCymr. Vnc

3.0 Due to the principle of regularity of sound changes, there can be only one explanation for the twofold development in Old Irish: the two assumed Proto-Celtic starting points, §2.2 and §2.3, are ultimately not identical, and a distinction between the original Proto-Indo-European environments is reflected in the Old Irish data. A close external comparison and a reconstruction of the relevant Indo-European data indeed reveal a feature that allows us to define two distinctive sets and restore the regularity of sound changes.

3.1 As a background for the comparative reconstruction, it can be preliminarily noted that:

8 Cf. Schrijver 1993, 40: 'it seems easier if the same proto-form can be reconstructed for $\cdot icc$ and $W \cdot anc$ '.

9 The hypotheses of both Pokorny and Schrijver are unacceptable, because no single starting point may lead to two different outcomes such as OIr. $acc/ecc/icc$ versus OIr. $\bar{e}c$ in an identical environment, which their relative chronologies do not alter.

10 Tellingly, both Pokorny and Schrijver compare very little and do not even mention the fact that the assumed proto-forms, $*\bar{e}nk-$ and $*h_2n \cdot n \cdot k-$, are not secured by Indo-European parallels.

(a) The Neogrammarians, followed by Pokorny, reconstructed the root as Neogr. *enk̑- (IEW 316–318), i.e., with a nasal but without an initial laryngeal.

(b) The root has been more recently reconstructed with an initial laryngeal *h₂ followed by a nasal, e.g., by Rix and Kümmel (LIV² 282–284), who postulate *h₂nek̑-/ *h₂enk̑-. This is certainly an improvement that accounts for the initial PCelt. *a- (Cymr. *·anc-* = OIr. *·acc-*) without creating more problems than it solves (as is the case with the rule, PIE *ŋ → PCelt. *an). However, this alone does not suffice, since the expected outcome of *h₂enk̑- → *hank̑- → ank̑- remains OIr. *·ēc-* (§2.2), not the attested form OIr. *·acc-*. Simultaneously the parallel root, confirmed by Celtic, OIr. *·icc-* = Cymr. *·ync-* without ‘a-vocalism’, remains unexplained due to the fallacious reasoning of the ‘Celtic version’ of Osthoff’s law.¹¹

3.2 The full data, not entirely observed in any reconstruction I would be aware of, reveals the source of the problem: the nasal is not present in all forms of the root, i.e., the PIE root itself has been incorrectly reconstructed up to this point. This conclusion can be now reached externally due to several correspondences pointing in this direction:

(a) First of all, there is a new piece of data in Tocharian, currently without etymology but certainly belonging here:

TochA. *akāntsune* (m.) ‘Geld, Besitz: *res, pecunia*’ (Poucha, 1)

In this form, the loss of a nasal is impossible, i.e., the respective PIE starting point never had one. The absence of the nasal is confirmed in Indo-Iranian and Celtic, where the root TochA *√ak-* has direct parallels in

| | |
|-------------------------|--|
| RV. <i>aś-</i> | (aoA.) ‘erreichen, gelangen’ (WbRV 134-135, <i>asiām</i>) |
| RV. <i>aṣṭá-</i> | (pt.) ‘erreicht’ (WbRV 136) |
| OIr. <i>cum·achtae-</i> | n.-*io) ‘power’ (EtDiPC 215; LEIA C-286) |
| OCymr. <i>com·oid-</i> | (m.) ‘power’ (EtDiPC 215; GPC 1:708) |
| AV. <i>aṣṭi-</i> | (f.) ‘Erreichung’ (WbRV 145) |

¹¹ Thus, although it would be theoretically possible to assume Pokorny’s long grade with an initial laryngeal (*h₂enk̑-) and explain the absence of colouring by accepting Eichner’s law, the problem remains that Osthoff’s law would have shortened the root into *h₂enk̑- before its Celtic version could take place, hence resulting in the wrong vowel in PCelt. *enk̑-, which again should have yielded OIr. *·ēc*.

Accordingly, the underlying PIE root of these forms was not $*\text{h}_2\text{k}^- \approx *h_2\text{nk}^-$ but PIE $*\text{haek}^-/*\text{haok}^-$, i.e., without a nasal.¹²

b) The absence of a nasal in the bases PIE $*\text{haek}^-/*\text{haok}^-$ is confirmed, on the one hand, by the respective zero grade PIE $*\text{hak}^- \rightarrow *h\text{k}^- \rightarrow *k^- \rightarrow \text{gAv. } \sqrt{s}$ - attested in:

| | |
|----------------------|---|
| LAv. <i>ava-sya-</i> | (vb.) ‘erreichen, treffen’ (AIWb 360, <i>avasyāt</i> [inf.]) |
| gAv. <i>frō-sya-</i> | (vb.) ‘erreichen, treffen’ (AIWb 360, <i>frōsyāt</i> [3sg]) ¹³ |

Simultaneously, the nasal is absent in the Indo-Iranian \acute{a} paralleled by OIr. \bar{i} of the preterite (perfect) participle in:

| | |
|----------------------------|---|
| RV. $\acute{a}\acute{s}$ - | (pf.) ‘erreichen, gelangen’ (WbRV 135, $\acute{a}\acute{s}a$ [3sg]) |
| OIr. <i>ar-ícht-</i> | (pret.pt.) ‘erreichen: reached, found’ (DIL 50) |

3.3 The data unambiguously defines a root PIE $*\text{haek}^- (\approx *h_2\text{ek}^-)$ ¹⁴ with an initial laryngeal postulated on the basis of the ‘a-vocalism’ (cf. OIr. *·achtae*), but *without the nasal that has been postulated in all historical reconstructions*.

Since there is no doubt that the forms with a nasal also belong here, they can only be reconstructed as prefixes PIE $*\text{haen}^-/*\text{han}^-/*\text{in}^-$ ¹⁵ of the root PIE $*\text{hak}^- \text{haek}^- \text{haok}^-$ in the following manner:

| | |
|--|--|
| (a) PIE $*\text{hak}^- \rightarrow *h\text{k}^- \rightarrow$ | |
| LAv. <i>ava-sya-</i> | (vb.) ‘zu erreichen, zu treffen’ (AIWb 360, <i>avasyāt</i>) |
| gAv. <i>frō-sya-</i> | (vb.) ‘erreichen, treffen’ (AIWb 360, <i>frōsyāt</i> [3sg]) |

12 For a detailed treatment of these forms with a broader argumentation, see Pyysalo 2015, 65–67.

13 For the segmentation of the prefix, see also gAv. *frō.gā-* (a.) ‘voranschreitend’ (AiWB 1024, *frō.gā* [sgN]).

14 In the GFT Neogr. $*k^-$ is further analyzed à la Szemerényi as PIE $*ki/k_i$ (see Pyysalo 2013, 441f.), but I ignore this detail in this paper as it is irrelevant to the topic.

15 For the prefix PIE $*\text{in}^-$, compare Lith. *in-* also in Cypr. *iv·αλίσμενα* (LSJ, 553), TochB *yn-es-* (a.adv.) ‘manifest(ly), obvious(ly), real(ly)’ (DTochB 517), TochA *yn-es* (adv.) ‘clare, manifeste’ (Poucha, 249), etc., and in Ogam *ini·gena* (f.) ‘Mädchen: fille’ = OIr. *ingen* (f.) ‘Mädchen’.

- (b) PIE **haek-* → **haak-* → **hak-*
 RV. *aś-* (aoA.) ‘erreichen, gelangen’ (WbRV 134-135, *aśiām*)
 OIr. *cum·achtae* (n.**io*) ‘power’ (EtDiPC 215; LEIA C-286)
- (c) PIE **ē·hak-* → **ē·hk-* →
 RV. *āś-* (pf.) ‘erreichen, gelangen’ (WbRV 135, *āśa* [3sg])¹⁶
 OIr. *ar·icht-* (pret.pt.) ‘erreichen: reached, found’ (DIL 50)
 OIr. *rīchtu* (vn.) ‘act of reaching’ (DIL 507, PCelt. **r·īktiō*)
- (d) PIE **haen·hak-* → **han·hk-* → **ank-*
 gAv. *frqs-* (ao.) ‘zu teil werden’ (AiWB 360, *frqštā* [3sg])
 MidCymr. *di·anc-* (vb.) ‘entfliehen: escape’ (IEW 317)¹⁷
 MidCymr. *ranc bod* (phr.) ‘satisfaction’ (Schrijver 1993, 40)
 Bret. *rankout* (vb.) ‘must, be obliged to; need’ (GOI §208)
 RV. *úd (...)* *ān·amś-* (pf.) ‘reichen bis an, gleichkommen’ (WbRV 135)
 OIr. *ro·ānacc-* (pf.) ‘erreichen’ (IEW 317, *roānaic* [3sg])¹⁸
 OIr. *t·ānacc-* (pret.) ‘arrive: kommen’ (GOI §689, *tānaic* [3sg])¹⁹

16 RV. $\sqrt{āś-}$ = OIr. $\sqrt{ich-}$ is thus a perfect in **ē*, PIE **ē·hak-* (to OIr. $\sqrt{ach-}$) formed as Lat. $\tilde{e}g-$ from PIE **ē·fiag-* (to Lat. *agō*).

17 From PIE **haen·haǵ·afi-* → **hanhǵfi-* → PCelt. **ang-* is derived the compound OIr. *cum·ang-* (vn.n.) ‘might’, DIL 169.

18 As far as I know, the morpheme OIr. $\sqrt{ān-}$ = RV. $\sqrt{ān-}$, carrying the morphological meaning of ‘perfect’ (see also, e.g., OInd. *ān·ṛh-*), remains without a clear etymology except for the agreement between Celtic and Indo-Iranian.

19 The plural stem (e.g., in OIr. *tāncatar·forāncatar* [3pl]) reflects a Proto-Irish *II·ān·acc-* with syncope of /a/ and simplification of the final geminate -cc-.

| | | |
|------------------------|-----------|---|
| (e) PIE *in·hak- | → *in·hk- | → *ink- |
| OIr. <i>ro-icc-</i> | | (vb.) ‘reach, come’ (GOI §549, 756, <i>roic</i>) |
| OIr. <i>do-icc-</i> | | (vb.) ‘kommen’ (DIL 237; IWB 317) |
| OIr. <i>con-icc-</i> | | (vb.) ‘can’ (DIL 147; EtDiPC 36–37, <i>conic</i>) |
| OIr. <i>air-icc-</i> | | (vb.) ‘find, discover’ (DIL 50; IEW 317) |
| OIr. <i>arr-ānicc-</i> | | (pf.) ‘find, discover’ (DIL 50, <i>arrānic</i> [3sg]) |
| OIr. <i>air-icc-</i> | | (vn.) ‘(the act of) finding’ (DIL 24, <i>airec</i> [N], <i>airic</i> [G]) |
| OIr. <i>con-ricci-</i> | | (pr.) ‘meet’ (OIr. <i>conriccim</i> [1sg]) |
| OIr. <i>t-icc-</i> | | (pr.) ‘arrive’ (GOI §756, <i>tic</i> [3sg], <i>tecait</i> [3pl]) |
| OIr. <i>for-icc-</i> | | (pr.) ‘find, discover’ (OIr. <i>foric</i> [3sg]) |
| MidCymr. <i>r·ync-</i> | | (vb.) ‘reach’ (LIV ² 282) |

3.5 On the basis of the reconstructions, we arrive at the following conclusion:

PIE *H stands between the nasal and the voiceless velar in the third Celtic subclass OIr. Vcc; OCymr. Vnk. The presence of PIE *H is therefore the hitherto unknown condition for the rule PIE *VNHK → OIr. Vcc; OCymr. Vnc., distinct from the standard development PIE *Vnk → OIr. *ēc*; OCymr. Vnc.

The cost of the rule is minimal because of the actual presence of PIE *H in the data (cf. OIr. *√acht-*), automatically implying the environment PIE *VNHK. As the condition simultaneously restores regularity, it is highly recommendable.

4. An excursion to some ablaut rules of the laryngeal theory

4.0 Before concluding, I offer a brief excursion to certain rules of the laryngeal theory that are incompatible with the development PIE *VNHK → OIr. Vcc; OCymr. Vnc.

4.1 According to Ferdinand de Saussure (1878), the coefficient *A, identified with *h₂ since Kuryłowicz 1927 in the laryngeal theory, participated in a two-term ablaut *e: Ø, where *eA → *ā (Lat. *ā*, OInd. *ā*) and *A → *ə (Lat. *a*, OInd. *i*). In the modern interpretation, the laryngeal is vocalized between consonants (or, in some models, has a vocalic allophone *ə₂). In the data discussed, this would mean that the Celtic rule proposed in this paper should yield *VnHK → OIr. *√vnach-*, not the attested OIr. Vcc-; OCymr. Vnc.

4.2 The incompatibility is caused by the lack of sufficient distinctions in de Saussure’s early ablaut analysis in two main directions (see Pyysalo 2013): (a) Instead of de Saussure’s two ablaut quantities *e : Ø, the Indo-European languages confirm three quantities as in the example PIE *likʷ- ‘lassen’ (IEW, 669–70):

| | |
|---------|--|
| *likʷ- | Gr. λίπο- (ao.) ‘(ver)lassen’ (GEW 2:99–100, ἔλιπον [1sg]) |
| *leikʷ- | Gr. λείπο- (pr.) ‘laisser’ (DELG, 628–629, λείπω [1sg]) |
| *lēikʷ- | RV. <i>raikṣ-</i> (s.ao.) ‘überlassen’ (WbRV 1165, <i>āraik</i> [3sg]) |

Accordingly, also Proto-Indo-European had three oppositions of quantity, the long grade, the normal grade, and the zero grade.

(b) In connection with *A, with only two distinctions at his disposal, de Saussure associated the long grade Neogr. *ā with the normal grade *eA and the zero grade Neogr. *ə with *A, which led him to neglect the remaining two ablaut alternatives, namely, the vowel Neogr. *a and the loss of *A/ə (i.e. zero in all languages). When these two missing options are added, the PIE pattern requires four distinctions, as illustrated in the following table (see Pyysalo 2013, 140):

| | | | | |
|--------|----|----|--------|--------|
| | I | II | III | IV |
| Neogr. | Ø | *ə | *a | *ā |
| LT | Ø | *A | *Ae/– | *eA |
| PIE | *a | *a | *ae/ea | *aē/ēa |

4.3 The full examination of these defects of the laryngeal theory would take us beyond the scope of this article, and I restrict myself to referring to Pyysalo 2013 for explicit treatment, except for the following two indispensable comments:

(a) The laryngeal theory only partially covers the four existing ablaut alternatives for *A and therefore requires revision in order to properly reconstruct the existing data.

(b) The vowel *a in column I, yielding zero in all languages, is the subset referred to in this paper: PIE *haen·haki- yielded *hanhák and finally OIr. *acc-*. With regard to the rules of the laryngeal theory, this means that *A was not only lost in *Ae and *eA after the colouring effect, but in general, which should also be noted in the revision of the theory.

5. Concluding remarks

5.0 The new Celtic rule, implying a trace of PIE *h/fi in the correspondence type Old Irish -Vcc- = OCymr. -Vnc-, supplements a missing part in the revised Indo-European sound law system first presented in *System PIE: The primary phoneme inventory and sound law system for Proto-Indo-European* (Pyysalo 2013). In this monograph, the successful major sound laws of two centuries of Indo-European linguistics were synthesized and completed into a *glottal fricative theory* (GFT).

5.1 The content of Pyysalo 2013 has now been coded and digitally tested by means of *foma*, a digitized predicate calculus by Mans Hulden (2009), in the Proto-Indo-European Lexicon (PIE Lexicon).²⁰ In the digitalization, each sound law was given a formalized counterpart, and the sound laws of each language were arranged in chronological order into a *foma script* capable of automatically generating the forms of the respective language.²¹

5.2 The rule proposed in this paper, PIE *VNHK → OIr. Vcc, will also be coded in *foma*, set in its chronological place in the Old Irish sound law system, and subsequently proven in the PIE Lexicon by means of demonstrating its consistency with the other sound laws and its capability to generate the Old Irish data regularly. This will allow the reader to personally confirm the correctness of the solution proposed in this paper.

Abbreviations

| | |
|--------|--------------------------------------|
| a. | – adjective |
| A | – active |
| adv. | – adverb |
| AIWb | – Bartholomae 1904 |
| ao | – aorist |
| AV. | – Atharva-Veda |
| Bret. | – Breton |
| Corn. | – Cornish |
| Cypr. | – Cypriot (dialect of) Greek |
| DELG | – Chantraine 1968-1980 |
| DIL | – Marstrander <i>et alii</i> 1913ff. |
| DLG | – Delamarre 2003 |
| DTochB | – Adams 1999 |

²⁰ <http://pielexicon.hum.helsinki.fi>

²¹ For example, the Old Irish *foma script*, as far as it has been coded by early 2017, is found at this address: <http://pielexicon.hum.helsinki.fi/?showrule=78>.

| | |
|------------------|---|
| EtDiPC | – Matasović 2009 |
| f. | – feminine |
| G | – genitive |
| gAv. | – Gathic (Old) Avestan |
| GEW | – Frisk 1960-1972 |
| GFT | – glottal fricative theory |
| GoEtD | – Lehmann 1986 |
| GOI | – Thurneysen 1935 |
| Goth. | – Gothic |
| GPC | – Bevan & Donovan 2003 |
| Gr. | – Greek |
| Grundr2 | – Brugmann 1895-1916 |
| IEW | – Pokorny 1959-1969 |
| inf. | – infinitive |
| Lat. | – Latin |
| LAv. | – Late(r) Avestan |
| LEIA | – Vendryes, Bachellety & Lambert. 1959ff. |
| Lith. | – Lithuanian |
| LIV ² | – Rix & Kümmel 2001 |
| LSJ | – Liddell & Scott 1940 |
| LT | – laryngeal theory |
| m. | – masculine |
| MidCymr. | – Middle Welsh |
| ModCymr. | – Modern Welsh |
| n. | – neuter |
| N | – nominative |
| Neogr. | – neogrammarian |
| Bret. | – Old Breton |
| OCymr. | – Old Welsh |
| Ogam | – Ogam (Irish) |
| OGaul. | – (Old) Gaulish |
| OIr. | – Old Irish |
| PCelt. | – Proto-Celtic |
| pf. | – perfect |
| phr | – phrase |
| PIE | – Proto-Indo-European |
| PN | – personal name |
| Poucha | – Poucha 1955 |
| pr. | – present |
| pret. | – preterite |

| | |
|-------|-------------------------|
| pt. | – participle |
| RV. | – Rig-Veda |
| s. | – sigmatic |
| sg | – singular |
| TochA | – Tocharian (dialect) A |
| TochB | – Tocharian (dialect) B |
| V | – vowel |
| vb. | – verb |
| vn. | – verbal noun |
| WbRV | – Grassmann 1996 |
| WH | – Walde & Hofmann 1938 |

Bibliography

- Adams, D. Q. 1999. *A Dictionary of Tocharian B. Leiden Studies in Indo-European*, 10. Amsterdam: Rodopi.
- Bartholomae, C. 1904. *Altiranisches Wörterbuch*. Strassburg: Trübner.
- Bevan, G. A. & P. J. Donovan 2003. *Geiriadur Prifysgol Cymru. A Dictionary of the Welsh Language*. Caerdydd: Gwasg Prifysgol Cymru, 2nd edition.
- Brugmann, K. 1895–1916². *Grundriss der vergleichenden Grammatik der indogermanischen Sprachen I-II*. Strassburg: Trübner.
- Chantraine, P. 1968–80. *Dictionnaire étymologique de la langue grecque. Histoire des Mots*. Paris: Klincksieck.
- Collinge, N. E. 1985. *The Laws of Indo-European*. Amsterdam: Benjamins.
- Delamarre, X. 2003². *Dictionnaire de la langue gauloise. Une approche linguistique du vieux-celtique continental*. Paris: Éditions Errance, 2nd edition.
- Fortunatov, F. F. 1881. ‘L + dental im Altindischen’. *Beiträge zur Kunde der indogermanischen Sprachen* 6, 215–220.
- Fortunatov, F. F. 1900. ‘Die indogermanischen Liquiden im Altindischen’. *Zeitschrift für vergleichende Sprachforschung* 36, 38–54.
- Frisk, H. 1960-72². *Griechisches etymologisches Wörterbuch I-III*. Heidelberg: Winter, 2nd edition.
- Grassmann, H. 1996⁶. *Wörterbuch zum Rig-Veda, 6. Überarbeitete und ergänzte Auflage von Maria Kozianka*. Wiesbaden: Harrassowitz.
- Hulden, M. 2009. *Finite-State Machine Construction Methods and Algorithms for Phonology and Morphology*. PhD Thesis, University of Arizona.
http://arizona.openrepository.com/arizona/bitstream/10150/196112/1/azu_etd_10793_sip1_m.pdf.
- Kuryłowicz, J. 1927. ‘ə indo-europeen et h hittite’. In *Symbolae Grammaticae in Honorem Ioannis Rozwadowski* 1, 95–104. Kraków: Drukarnia Uniwersytetu Jagiellońskiego.
- Lehmann, W. 1986. *A Gothic Etymological Dictionary Based on the Third Edition of Vergleichendes Wörterbuch der gotischen Sprache by Sigmund Feist*. Leiden: Brill.
- Liddell, H. G. & R. Scott 1940⁹. *A Greek-English Lexicon, revised by Henry Stuart Jones with the assistance of Roderick McKenzie*. Oxford: Clarendon Press, 9th edition.

- Marstrand, C. J. S. *et alii* 1913ff. *Dictionary of the Irish Language*. Dublin: Royal Irish Academy.
- Matasović, R. 2009. *Etymological Dictionary of Proto-Celtic*. Leiden Indo-European Etymological Dictionary Series 9. Leiden & Boston: Brill.
- Pokorny, J. 1959-69. *Indogermanisches etymologisches Wörterbuch I*. Tübingen: Francke.
- Pokorny, J. 1969. *Altirische Grammatik*. Berlin: de Gruyter.
- Poucha, P. 1955. *Institutiones Linguae Tocharicae I: Thesaurus Linguae Tocharicae Dialecti A*. Monografie Archivu orientálníhoho 15. Prague: Státní pedagogické nakladatelství.
- Pyysalo, J. 2013. *System PIE: The Primary Phoneme Inventory and Sound Law System for Proto-Indo-European*. Helsinki: Unigrafia Oy. <https://helda.helsinki.fi/handle/10138/41760>.
- Pyysalo, J. 2015. 'Ten New Indo-European Etymologies for the Celtic Languages'. *Studia Celtica Fennica* 12, 62–79.
- Rix, H. & M. Kümmel 2001. *Lexikon der indogermanischen Verben. Die Wurzeln und ihre Primärstambildungen*. Wiesbaden: Reichert.
- Saussure, F. de 1878. 'Mémoire sur le système primitif des voyelles dans les langues indo-européennes'. In *Recueil des publications scientifiques de Ferdinand de Saussure*, repr. Heidelberg 1922: Winter, 1–268.
- Schrijver, P. 1993. 'On the Development of Vowels Before Tautosyllabic Nasals in Primitive Irish'. *Ériu* 44, 3–52.
- Thurneysen, R. 1935. *A Grammar of Old Irish*. Rev. and enl. ed., transl. D. A. Binchy & O. Bergin. Dublin: DIAS.
- Vendryes, J. & E. Bachellery & P. Y. Lambert 1959ff. *Lexique étymologique de l'irlandais ancien*. Dublin: DIAS.
- Walde, A. & J. B. Hofmann 1938. *Lateinisches etymologisches Wörterbuch. 3., neuarbeitete Auflage von J. B. Hofmann I-II*. Heidelberg: Winter.