Indo-European Linguistics in the 21ˢᵗ Century (4)

Completing de Saussure's and Møller's Ablaut *Ae : *A : *eA with PIE *ē

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ABSTRACT: Indo-European (IE) linguistics is in the severest paradigm crisis of its history, as the only two theories of the field have been brought to a reconstructive halt. Szemerényi's monolaryngealist model, denying the correlation between Hitt. ḫ and the IE 'a-colouring', is unable to reconstruct PIE *h, the newest and currently most important postulate of the phoneme inventory, based on Neogr. *ā *a *ə. Eichner's revisionist model assumes the laryngeals *h₁ *h₂ *h₃ and the Neogrammarian vowel system *e *a *o *ē *ā *ō *ə$_{(1-3)}$, which results in ambiguity preventing it from reconstructing PIE *h$_{(2)}$ due to the two contradicting explanations of the IE vocalisms (Pyysalo & Janhunen 2018a, 2019). The necessary condition for ending the paradigm crisis is to complete the defect formulation of de Saussure's and Møller's ablaut pattern *Ae : A : *eA for Neogr. *ā *a *ə with the addition of the missing vowel, PIE *ē (§3.3.1 & 4.4.4). After this correction the path is opened for formulating the sufficient condition for decisively ending the paradigm crisis.

1. Szemerényi's early glottal fricative theory and Eichner's trilaryngealism

1.0 The paradigm crisis of Indo-European linguistics, the severest in its history, emerged from Oswald Szemerényi's (1970) observation of the failure of all laryngeal models of the period, and from Heiner Eichner's (1973, 1978, 1980, 1988) response to this.

1.1 Within the laryngeal theory (LT) the crisis had first surfaced in the late 1950s, when it became understood that the orthodox LT of Hermann Møller (1879, 1880, 1906, 1911), comprising *e + *h₁ *h₂ *h₃ + CC·C and championed by Émile Benveniste (1935), presented only three correspondence sets for LT *HeC (and *CeH), while the comparison of Hittite and IE data in fact indicated more sets.

1.1.1 The incompleteness of the LT had been already intuitively understood by several scholars, who postulated an ever-increasing number of laryngeals ranging from Kuryłowicz's (1935) four (*h₁ *h₂ *h₃ *h₄) to Martinet's (1953) ten items.

1.1.2 The common factor of these early efforts was the lack of a systematic postulation of the laryngeals based on the actual correspondence sets between Hittite and the rest of IE. Jaan Puhvel (1960, 1965) was the first to distinguish six sets for *HeC, each defining a laryngeal of 'a/e/o-colouring' that was either preserved or lost in Hittite (i.e. reflected as Hitt. ḫ or Ø). By the 1970s, however, it became understood that Puhvel's system was typologically unparalleled and unable to solve the problem.[1]

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[1] The orthodox laryngeal theory explains all IE vocalisms with *e, i.e. the system has no *o (or *a). Consequently it either fails to explain even the commonplace *e/o-ablaut of PIE or necessitates the derivation of the ablaut variants from different roots.

1.2 A completely new reconstructive school, monolaryngealism,[2] emerged in Ladislav Zgusta's paper *La théorie laryngale* (1951).[3] The novelty of Zgusta lies in both his approach and the results: unlike everybody before him, Zgusta did not accept Møller's theory (*h₁ *h₂ *h₃ + *e + CC·C) as an axiom. Instead he inductively compared the Old Anatolian and IE data, allowing the material itself lead to the conclusions.

1.2.1 The conjectures of Zgusta (1951) can be summarized as follows:

(a) Hittite – and by extension the Old Anatolian branch as a whole[4] – only has a single (synchronic) laryngeal Hitt. ḫ, reflecting PIE *H.[5]

(b) PIE *H has no colouring effect (see Zgusta 1951: 472),[6] and the Neogrammarian (short) vowels *e *a *o are reconstructed in order to explain the vowel qualities.[7]

(c) The only feature of Zgusta's model (1951: 472) inherited from the LT is the compensatory lengthening rule of de Saussure and Møller for the three vowels:

ZG *eH	→ Hitt. eḫ : Lat. ē, OInd. ā, etc.	(= Neogr. *ē)
ZG *aH	→ Hitt. aḫ : Lat. ā, OInd. ā, etc.	(= Neogr. *ā)
ZG *oH	→ Hitt. aḫ : Lat. ō, OInd. ā, etc.	(= Neogr. *ō)[8]

Consequently, Zgusta's model did not reconstruct long vowels (Neogr. *ē *ā *ō) and only needed a single laryngeal ZG *H and three vowels ZG *e *a *o.

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[2] The term 'monolaryngealism' (der Monolaryngalismus), coined by Heiner EICHNER (1988: 128), does not properly describe SZEMERÉNYI's theory, because he (1967, 1970) reconstructs a glottal spirant (i.e. fricative) PIE *h (IPA [h]) = Hitt. ḫ, not a 'laryngeal'. The term 'monolaryngealism' rather fits ZGUSTA's early theory, reconstructing an undefined 'laryngeal' *H.

[3] The existence of only one laryngeal was first recognized by André VAILLANT (1936: 111f., 1950: 241f.), but he did not present a model like ZGUSTA (1951), whose paper is therefore chosen here as the starting point of monolaryngealism proper.

[4] The term Old Anatolian (OAnat.) is coined to denote Hittite, Palaic, Cuneiform Luwian, and Hieroglyphic Luwian in contrast to the later Anatolian (LAnat.) languages: Carian, Lycian, Lydian, Milyan, Pisidian, and Sidetic.

[5] See ZGUSTA (1951: 472): "Il y avait seulement un H." In (1951: 472) ZGUSTA hesitantly pondered a phonetic value [x] and a vocalic allophone for the postulate: "[...] en indo-européen, il y avait un phonème, que nous pouvons écrire H, qui avait dans le système des phonèmes une place analogue à celui des sonantes, dont la qualité exacte n'est pas sûre, mais qui était similaire au ḫ. Entre les consonnes le H est en état de voyelle (Ḥ = ə) ainsi que les sonantes. En hittite, ce phonème (quand il n'était pas en qualité de voyelle) se changea en ḫ, évidemment sous l'influence des langues avec lesquelles les Hittites vinrent en contact en Asie Mineure."

[6] ZGUSTA (1951: 472): "Il [= H] n'avait rien de commun avec la qualité des voyelles." The lack of colouring effect (or causing allophony) is a common feature of all variants of monolaryngealism, i.e. SZEMERÉNYI (1970), CALIN (2018), and PYYSALO (2013).

[7] See ZGUSTA (1951: 444): "[...] si l'on prouvait qu'il existait au degré plein la voyelle *a* ou, le cas échéant, *o* originaires, ou, si, en d'autres termes, la supposition qu'elles tirent son origine l'influence d'une laryngale n'était pas, au moins, vraisemblable, cela ne pourrait modifier que les considérations du problème, s'il existait plus de laryngales, et lesquelles, mais une telle découverte ne pourrait contester la base de la théorie laryngale [...]."

[8] Generally, the approach to the compensatory lengthening rule divides monolaryngealism in two: While CALIN (2018) follows ZGUSTA (1951) in explaining the long vowels with compensatory lengthening at least in part (he also accepts original long vowels), PYYSALO (2013) follows SZEMERÉNYI (1970) in reconstructing long vowels for PIE without compensatory lengthening.

1.2.2 Zgusta's empirical approach, drawing conclusions based on direct observation of as broad a material as possible, is strikingly modern[9], economic[10], and effective in solving problems.[11] Owing to these qualities, the next generation of leading comparative lexicographers in Anatolian linguistics endorsed Zgusta's ideas.[12] Meanwhile, however, the overall situation had changed due to new actors seizing the initiative, thus leaving Zgusta's opening unnoticed by most.

1.3 In 1967 and 1970 Szemerényi made his main contribution to IE linguistics by presenting the first full-scale theory based on a single laryngeal, continuing Zgusta's monolarygealism, but improving and connecting it theoretically to the broader PIE reconstruction of the Neogrammarian tradition:

1.3.1 Szemerényi (1996: 139) endorsed Zgusta's idea that 'only one laryngeal is to be assumed', but questioned the compensatory lengthening (1996: 122)[13] and operated with the long vowels SZ *ē *ā *ō instead.[14]

1.3.3 In contrast to Zgusta's hesitating interpretation of *H (Hitt. ḫ) as [x], Szemerényi (1967: 96-97) presented the first data-based argument for its phonetic interpretation: Hitt. ḫ reflects PIE *h, the glottal spirant (i.e. fricative) IPA [h], its phonetic character revealed by its co-occurrence in the series Neogr. *Th = T+h and Neogr. *Dh = D+h.[15]

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[9] In comparison, all of ZGUSTA's predecessors leaned deductively upon MØLLER's aprioristic concepts, which predated the discovery of the Anatolian data, in the interpretation of Hittite. For a critical evaluation of this, see e.g. TISCHLER (1980: 498): "Im übrigen liegt ja die Annahme nahe, daß Kuryłowicz selbst gar nie auf die Idee gekommen wäre, das hethitische ḫ auf mehr als einen idg. Laut zurückzuführen, well er induktiv vom sprachlichen Material ausgegangen wäre. Kuryłowicz ging dagegen deduktiv von den Theorien de Saussures und Cunys aus und wollte im Hethitischen nur die Bestätigung für diese Theorie finden."

[10] ZGUSTA's system consists only of three vowels *e *o *a, a laryngeal *H, and the compensatory lengthening rule for VH. It is consequently simpler than MØLLER's, because the number of entities assumed (3 + 1) is identical, but ZGUSTA does not need the three colouring rules of MØLLER in addition to the shared (compensatory lengthening) rule.

[11] For illustration's sake, one of the most challenging problems for the LT has always been the absence of 'a-colouring' in Hitt. ḫe eḫ. MØLLER's pupil Holger PEDERSEN, while accepting an a-colouring laryngeal *A (= *h₂ = PEDERSEN *h), was led to disagree with his teacher and postulate also a non-colouring laryngeal *H (1938: 179-181). In terms of economy PEDERSEN's suggestion is weaker than that of ZGUSTA, as it necessitates two laryngeals (*h and *H), *e *o, and a colouring rule for *h, while the latter only needs a single 'laryngeal', *e *o *a, and no colouring rule at all. A generation later also Heiner EICHNER (1973: 53, 71f.) had to postulate a new phoneme, the long vowel *ē (and, as vowel quantity was now reconstructed, *ā and *ō), and a new sound law ('Lex EICHNER') to account for the absence of 'a-colouring' in Hitt. ḫe and Hitt. eḫ, which he derived from *h₂ē and *ēh₂ respectively.

[12] See Johann TISCHLER (1977 = HEG A: ix-x, 1980), Roberto GUSMANI (1979), Annelies KAMMENHUBER (1985), and Emmanuel LAROCHE (1986).

[13] See SZEMERÉNYI (1996: 122): "It is considerably more speculative to assert that the long vowels are really combinations of this same e and modifying elements with which it was contracted."

[14] Note SZEMERÉNYI's comment (1996: 138-139): "There are, however, many instances in which a long vowel has no corresponding h in Hittite, e.g. Hitt. pas- 'swallow': Lat. pō-tāre [Hitt.] hassa- 'hearth': Lat. āra, Osc. aasas (nom.pl.), [Hitt.] ais, Luw. assa 'mouth': Lat. ōs". This can also be interpreted as indirect criticism of ZGUSTA: if no long vowels are reconstructed, and all are derived from *e/a/oH = Hitt. ḫ, this phoneme should appear in all Old Anatolian cognates corresponding to IE long vowels.

[15] SZEMERÉNYI (1970, 1996: 140): "We know, moreover, that, as R. Jakobson formulated it, 'languages which have the pairs voiced–voiceless, aspirated–unaspirated also have the phoneme /h/'. It seems to follow from this that the laryngeal which we have just accepted was none other than h, the normal glottal spirant. With its h the IE system was similar to that of Latin."

In so doing he introduced a welcome step towards realism in the reconstruction[16] that can be confirmed by phonetic and phonological arguments.[17]

1.3.4 Finally, perhaps with the greatest impact on his contemporaries, Szemerényi presented a forceful criticism of the laryngeal theory:

(a) Szemerényi (1996: 138, §6.6.9) noted the insufficiency of Benveniste's (1935) (orthodox) trilaryngealism, because in it "(…) Hittite does not oppose *ha-* to an *a-* or *o-* of the other languages: Hitt. *arkiya-* 'testicle' : Gr. *órkhis* Hitt. *arras* 'arse' : Gr. *orrós*, IE *orsos* (…). With three laryngeals such cases cannot be explained at all." Although a vowel *o was assumed in the revisionist theory of Kuryłowicz (1935), it was not available in the orthodox model of Benveniste, only recognizing PIE *e.

(b) Szemerényi (1996: 139) further noted that the "attempts to reconcile the Hittite h with the laryngeal theory" by means of increasing the number of laryngeals from Kuryłowicz's four up to six laryngeals in Puhvel "obviously (…) lead nowhere", thus simultaneously disabling both the trilaryngeal and multilaryngeal models in existence.

(c) Szemerényi (1996, §6.6.4) pointed out that the lack of the vowel *a, a common feature of all laryngeal theories of the period, leads to several inconsistencies:

> "The elimination of *a* by means of a laryngeal [*H_2] is not a complete solution: internal *a* cannot in this way be removed without trace. The attempt has certainly been made to explain various instances of the type CaT by assuming CH$_2$eT and to derive CaiT from CeH$_2$iT. In a considerable number of cases, however, this way of escape is not only without foundation (i.e. invented for the sake of the theory) but also incredible: there is no advantage in deriving *kas-* 'grey', *nas-* 'nose', *sal-* 'salt' etc. from *kH$_2$es- *nH$_2$es- *sH$_2$el-, if the presupposed forms (Theme I) *keH$_2$s- *neH$_2$s- *seH$_2$l- themselves inspire no confidence. In the case of *bhardhā 'beard', a form bhH$_2$erdh- can hardly be taken seriously."

In general, this lack of a vowel *a had plagued the LT ever since de Saussure (1878), who did not include it in *Mémoire*, leaving his system incomplete and thus invalid despite Møller's partial improvement of reconstructing *Ae for Neogr. *a.

(d) Szemerényi (1996: 138) pointed out the absence of 'a-colouring' in Hitt. eḫ (and ḫe, see e.g. Hitt. ḫegur-), writing: "(…) there are also cases in which *h* appears after *e* and therefore cannot be *H₁*, e.g. *mehur* 'time'; it would thus be necessary to posit a sixth laryngeal."

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[16] CAMPBELL (2004: 132-3): "We attempt to achieve as much phonetic realism as possible by observing what phonetic features are shared among the reflexes seen in each of the daughter languages in the sound correspondence. We determine which phonetic features are common to the reflexes in the daughter languages (and features which can be derived from others by the known direction of sound changes […]) and then we attempt to reconstruct the proto-sound by building into it these shared phonetic features."

[17] The phonetic argument, based on Sanskrit (and other IE languages with secondary [h] such as Latin), refers to the fact that the secondary laryngeals emerging in Sanskrit, RV. ḥ = [h] and RV. h = [ɦ], were glottal fricatives, making it likely that this value filled the gap left in the original PIE system, also containing glottal fricatives. A phonological argument in favour of the value [h] is that if there is a single laryngeal in an inventory of a language, this is most likely the glottal fricative [h].

(e) As regards the method(ology), Szemerényi's theory denied the validity of the root axiom of Møller and the LT in the postulation of laryngeals.[18] Instead of a Semitic typology CVC·(C), used to generate laryngeals $*h_1$, $*h_2$, …, $*h_n$ on the basis of the IE vowel timbre[19], PIE *h has to be reconstructed on the basis of Hitt. ḫ alone.[20]

1.4 Szemerényi's argumentation was followed closely in Heiner Eichner's (1973, 1978, 1988) response, consisting of a remodeling of the LT into a revisionist form, i.e. assuming more vowels than the single *e of the orthodox theories.

1.4.1 Eichner (1973, 1988: 125ff.) agreed with Szemerényi in the idea that the multiplication of the laryngeals indeed leads nowhere, and restricted his model to three laryngeals $*h_1$, $*h_2$, $*h_3$ having vocalic allophones $*ə_1$, $*ə_2$, $*ə_3$.

1.4.2 In order to avoid Benveniste's problem, the absence of Hitt. ḫ in the initial position in Hitt. arraš 'arse' : Gr. ὄρρος 'id.', Eichner (1973), like Kuryłowicz (1935) before him, assumed the vowel *o, which allowed him to reconstruct the correspondence set with $*h_1$orso-. For the correspondences having no respective *e-grade, Eichner postulated $*h_3$e- : Hitt. a-, thus assuming that $*h_3$ was lost in Hittite altogether.[21]

1.4.3 The first genuine novelty of Eichner, unprecedented in the LT, responded to Szemerényi's criticism of the absence of *a by reconstructing LT *a, allowing him

(a) To eliminate Kuryłowicz's $*h_4$, the 'a-colouring laryngeal lost in Hittite', and Puhvel's counterpart by reconstructing $*h_1$a for $*h_4$e and $*ah_1$ for $*eh_4$, hence not needing more than three laryngeals.

(b) To reconstruct *kas- 'grey', *nas- 'nose', *sal- 'salt' independently of $*h_2$, exactly as Szemerényi had done before him.

1.4.4 The second novelty in the framework of the LT introduced by Eichner was his response to the absence of the 'a-colouring' in Hitt. ḫe, eḫ. Eichner assumed the existence of the long vowel PIE *ē (and as a side product also the vowels PIE *ā, *ō and phonemic quantity for PIE), which according to 'Lex Eichner' resisted the colouring effect of $*h_2$, allowing him to explain Hitt. ḫe, eḫ with LT $*h_2$ē, $*ēh_2$.

1.4.5 When the phonemes assumed by Eichner, including the core vowel *e, are arrayed together, we obtain *e, *o, *a, *ē, *ō, *ā, $*ə_{(1-3)}$, i.e. Szemerényi's vowel system to which the triple representation of schwa of the lt has been added.

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[18] SZEMERÉNYI (1967: 92-93) "there is no intrinsic reason why we should attempt to reduce all IE 'roots' to a single tri-phonemic pattern of the CVC-type [...]. On the contrary, it is clear that such notions were due to a double influence from Semitic linguistics: (a) in Semitic all words begin with a consonant; (b) in Semitic the general root-shape is tri-radical. But, of course neither feature is binding for IE." For the original formulation of the Proto-Indo-Semitic root hypothesis CC·(C), see MØLLER (1879: 492 and 1906: xiv).

[19] SZEMERÉNYI (1996: 139): We must simply accept that a laryngeal cannot be assumed just to match the vowel timbre, but only when it is present in Hittite."

[20] SZEMERÉNYI (1970: 131): "Ein heth. es- 'sein' (...) beweist also ein idg. *es- (...) ohne Laryngal, ein heth. henkan 'Schicksal, Pest' ein idg. *Henk- mit Laryngal."

[21] EICHNER (1978: 162, fn77): "Von den in der Literatur für anatol. h- < $*h_3$- genannten Beispielen ist keines sicher, alle können auch mit $*h_2$- angesetzt werden (Material bei F. O. Lindeman, Einführung in die Laryngaltheorie, Berlin 1970, § 27)."

1.5 As a result of the actions of Szemerényi and Eichner, the overall situation in IE linguistics had changed decisively: In monolaryngealism Szemerényi's theory superseded that of Zgusta, and in the lt all earlier models fell out of the competition. As a result, as pointed out by Eichner in 1988, only two contenders, (Szemerényi's) monolaryngealism and (Eichner's) trilaryngealism, were left as possible candidates to solve the laryngeal problem.[22]

2. The road to the paradigm crisis in Indo-European linguistics

2.0 As a result of the simplification of the entire field into two models, it would have been reasonable to expect one of them to triumph over the other, settle the laryngeal dispute for good, and subsequently explore the ensuing breakthrough. However, nothing of the sort happened. Instead the lexicographically oriented monolaryngealists from Zgusta and Laroche to Tischler disengaged, dedicating their academic efforts to the description and comparison of the Anatolian languages, while Szemerényi never charged the revisionist LT. Simultaneously, the LT, instead of emerging as a winner and unifying under the new theory, began to splinter into competing submodels,[23] all of which were weaker than that of Eichner, in effect regressing instead of progressing.[24]

2.1 More interesting than the support Szemerényi received[25] is the criticism he did not receive, especially because of multiple issues in his model that indeed do require criticism.[26] As making this criticism explicit is necessary for understanding how Szemerényi's theory became a major factor leading to the paradigm crisis, it is presented below.

2.1.1 Szemerenyi discarded de Saussure's idea (1878: 127) of *A as the common denominator in Neogr. *ə : *ā = DS *A : *eA as well as Møller's *Ae = Neogr. *a.[27] As his rationale Szemerényi referred to the incomplete treatment of *a in the LT (see §1.3.4.c), thus making the case for assuming the existence of *a independently of *A (*h₂). In so doing Szemerényi, however, did not take into account that postulating an independent vowel *a meant that he also carried the burden of proof: after the emergence of the Old Anatolian languages the main bulk of the material has confirmed a correlation between *A (and thus Neogr. *ə : *ā) and Hitt. ḫ.

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[22] EICHNER (1988: 124): "Hinsichtlich der **Anzahl** der postulierten urindogermanisch-grundsprachlichen Laryngale läßt sich beobachten, daß gegenwärtig nur noch zwei Konzeptionen von einer jeweils größeren Zahl gut unterrichteter Forscher vertreten werden, nämlich der Monolaryngalismus (ein Laryngal) und der Trilaryngalismus (drei Laryngale)."

[23] For this development, compare the theory of light before NEWTON, at which time "there were a number of competing schools and sub-schools, most of them espousing one variant or another of Epicurean, Aristotelian or Platonic theory." (KUHN 1970: 12).

[24] Sara KIMBALL (1987) and Craig H. MELCHERT (1987) proposed, independently of each other, a model essentially identical to EICHNER's except for assuming †h₃ to be reflected as Hitt. ḫ- in root-initial position. This constitutes a step backward in returning to BENVENISTE (1935), assuming a fully preserved *h₃, and results a weaker theory than that of EICHNER due to leaning on ambiguous *Oe.

[25] See e.g. Louis HAMMERICH (1967). Neville COLLINGE (1971: 97), Thomas BURROW (1973³), Alfred BAMMESBERGER (1984), and Elmar SEEBOLD (1988).

[26] Instead of being cohesive and detailed, most criticism of SZEMERÉNYI is either anecdotal or formulated on a very general level, as illustrated by EICHNER's (1988: 128) comment: "Er [der Monolaryngalismus] bildet im Grunde die Fortsetzung der Brugmannischen Auffassungen vermehrt um die Ansicht, daß man nach der Entdeckung der anatolischen Evidenz nicht mehr ganz ohne Laryngal auskommt."

[27] In its early form de SAUSSURE's idea that the ablaut pattern Neogr. *ə : *ā contain a common denominator *A (Neogr. *ə) alternating with *A₂ (Neogr. *ā) appears already in his 1877: 386.

2.1.2 Szemerényi's unconditional endorsement of Neogr. *a *e *o and "the long vowels ā ē ō (…) as basic vowels (…)" was not unproblematic either. Despite the absence of correlation between *O *E and Hitt. ḫ, the data confirm one between *A and Hitt. ḫ. Thus Szemerényi did not make a proper distinction between *O *E on the one hand and *A on the other[28] despite doing so in his ablaut schemata SZ *ē : *e : Ø : *o : *ō versus SZ *ə : a : ā.[29] The bottom line is that the core ideas of de Saussure and Møller can be expressed in terms of Szemerényi's phonemes (SZ *əe : *ə : *eə),[30] and as this would be a more economical solution, he should have at least considered it as an alternative to reconstructing an independent *a.[31]

2.1.3 Szemerényi's reference to analogy to account for the triple representation of the schwa is weak at best, thus not sufficing as a response to de Saussure and Møller.[32] Despite the considerable advantages of Szemerényi's theory,[33] the cost of postulation of independent *a was also enormous: the correlation between Hitt. ḫ (SZ *h) and the 'a-vocalism' (Neogr. *ə : a : ā ≈ LT *A : *Ae : *eA) was lost. As a result Szemerényi's theory lacks the fundamental criterion of reconstructing PIE *h based on IE 'a-vocalism' (Neogr. *ə *a *ā), although this reconstruction criterion is much more frequent than that of postulating PIE *h based on Hitt. ḫ. From the view of the comparative method, etymology, and lexicography this was unfortunate, because the real problem of the field is not as much the reconstruction of PIE *h on the basis of Hitt. ḫ, but connecting the Old Anatolian and the traditional IE material in a scientifically justified, systematic procedure. The truth, suggested by the material itself regardless of how one chooses to explain it, is that there is an intimate connection between Hitt. ḫ and 'a-vocalism', which is, however, absent in Szemerényi's theory.

2.1.4 Szemerényi's model, unlike the classical laryngeal theory, offers no criterion for deciding between SZ *hă and *ắ as well as SZ *ắh and *ắ respectively. Szemerényi treats this problem arbitrarily by choosing the alternative without laryngeal by default, thus returning to the Neogrammarian reconstruction having no laryngeal at all in postulating SZ *agō 'I drive', SZ *agros 'pasture, field' (1996: 38, §4.1.1), SZ *aug- 'to increase' (1996: 43, §4.2.4.), etc. instead of *hagō, *hagros, and *haug- etc.

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[28] A similar mistake is made by Jaan PUHVEL in the introduction to his *Hittite Etymological Dictionary* (HED 3:v), where he writes: "'Laryngeals' do not have the same confirmed epistemological standing (...) as do the traditionally posited phonemes." This is only true with regard to the 'laryngeals' not attested in Hittite or lacking other proven criteria for their postulation in the rest of the group.

[29] SZEMERÉNYI (1996: 121-22, §6.4) deals with *A *O *E identically despite their difference in status: *A (Neogr. *ə) was comparatively correctly defined from the beginning and turned out to correlate with Hitt. ḫ. On the other hand, *O *E are erroneously postulated and lack reflexes in Old Anatolian. Hence SZEMERÉNYI's evaluation of de SAUSSURE and MØLLER ("One looks in vain for a real demonstration of the theory") is an oversimplification with regard to *A = Neogr. *ə.

[30] SZEMERÉNYI's recognition of the existence of patterns *ə : ā and *a : ā, implicitly containing *ā : a : *ə, was preceded by WACKERNAGEL, who (1896: 5-6) noted two reduced grades for *ā, *ə and *a.

[31] In terms of economy the laryngealist pattern *Ae : *A : *eA, only requiring two basic items, *e and *A, is more economical than SZEMERÉNYI's *ā : *a : *ə, requiring three distinct proto-phonemes.

[32] SZEMERÉNYI's (1996: 88) explanation repeats the early (Neogrammarian) argument, according to which the triple representation of schwa is analogical, an explanation hardly satisfactory after the emergence of the competing explanation of the LT: "In the zero grade Greek has respectively *e a o*; Old Indic (…) has *i*; Latin and all other languages have *a*. It was precisely this opposition between Aryan *i* and *a* of the other languages which led in the first place to the supposition of schwa (see 4.1.11); in Greek this unstable neutral vowel would have been assimilated to the corresponding long vowel in each case, i.e. θε- on the analogy of θη-, etc."

[33] SZEMERÉNYI's theory is phonetically realistic in the absence of the colouring effect of PIE *h (IPA [h]) and readily explaining the exceptions to the colouring rule revealed by Hitt. ḫe eḫ.

Accordingly, a generation of work in the reconstruction PIE *h$_{(2)}$ was dismissed, constituting a major setback for monolaryngealism and IE linguistics.

2.1.5 Finally, Szemerényi also bypassed the existence of numerous extra-Anatolian criteria for reconstructing PIE *h,[34] on the basis of which it can be concluded that the rest of the IE group often independently confirms PIE *h in the position where *A was postulated in the LT. For illustration's sake, Szemerényi's ablaut pattern SZ *ā : *a : − : *o : *ō contains a gap (marked with '−'), as if the zero grade were absent e.g. in Szemerényi's own example, *aǵ- 'drive'. However, the zero grade is found in RV. jmán- (m.) 'Bahn' (WbRV. 502), and the related RV. pári·jmā [sgN] 'Umwandler, Herumwandler' that requires once a four-syllabic scansion in the Rig-Veda (see Grassmann, WbRV. 785), thus satisfying Kuryłowicz's (1927b) criteria for *h$_2$ based on the hiatus in the ancient Indo-Iranian meter. Owing to this SZ *hagō 'I drive' is to be reconstructed instead of his †agō and Szemerényi's incomplete ablaut pattern is to be supplied with *ə/Ø, thus actually of the form SZ[+] *ā : *a : *ə/Ø : *o : *ō).[35]

2.1.6 Regardless of Szemerényi's overall brilliant progress in almost every other aspect in 1967 and 1970, severing the correlation between 'a-vocalism' and Hitt. ḫ, the most important frontier of the reconstruction of PIE, dealt a heavy blow to monolaryngealism, which was now unable to make progress in the reconstruction of PIE *h, at least as long as it remained committed to his doctrine. In so doing Szemerényi also unintentionally contributed to the emergence of the paradigm crisis through Eichner.[36]

2.2 Eichner's response, aimed at saving Møller's LT, succeeded at least on paper: Adopting the Neogrammarian vowel system guaranteed him immunity against Szemerényi,[37] and the correspondence sets were once again explained in the framework of the Semitic root theory CC·(C), a factor perhaps explaining why Eichner met little real criticism inside the LT itself. As this missing criticism is of equal importance as that faced by Szemerényi, its main content will be outlined below.

2.2.1 In general the problems of Eichner's model derive from its hybrid character: As an amalgamation of Møller's laryngeal theory and the Neogrammarian vowel system it includes two mutually conflicting older paradigms, not only including the problems of both, but a new layer of problems resulting from their incompatibility. As the other problems of the Eichner's model have already been discussed in previous papers,[38] the focus here is placed on its key issues resulting from adopting Szemerényi's vowel system (see §§2.1.1-5) and Neogr. *a (and *ā) in particular.

2.2.2 As a result of the postulation of *a and *ā, de Saussure's *eA (= *eh$_2$) and Møller's *Ae (= *h$_2$e) lost their reconstructive content, because in Eichner's revised model *ah$_1$ and *h$_1$a can be respectively postulated instead (Pyysalo & Janhunen

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[34] For about a dozen criteria available for the postulation of PIE *h today, see PYYSALO (2013: 459f.).

[35] For SZ *ā a o ō (Gr. ἄγω, Lat. amb-āg-ēs, Gr. ὄγμος, and Gr. ἀγ-ωγ-ή), see SZEMERÉNYI (1996: 87).

[36] In this sense EICHNER's (1988: 129) criticism "Der Monolaryngalismus verfügt hinsichtlich der laryngaltangierten Systemzüge des Indogermanischen (der Grundsprache wie der Einzelsprachen) über keine eigene Theorie.", although strongly exaggerated, does convey a point.

[37] After EICHNER's revisions SZEMERÉNYI did not publicly return to his assault against the LT by targeting the new revisionists models. This is understandable, since after EICHNER the revisionist LT contained the Neogrammarian vowel system, which had formed the basis of SZEMERÉNYI's criticism.

[38] See PYYSALO 2016 and PYYSALO & JANHUNEN 2018a and 2018b.

2018a: 4), except for the minority of cases of actually attested Hitt. ḫ,[39] almost in an identical manner as Szemerényi became unable to decide between *a : ah, *a : ha, etc. The identity of these problems becomes obvious when we compare how Szemerényi (1996: 42, §4.2.1.) reconstructs SZ *aidh- 'burn' despite SZ *haidh- being equally possible. LIV^2: 295n1, deploying a weakened version of Eichner's theory, mentions in connection with the classical LT reconstruction *h₂ei̯dh- 'entzünden' that "Ein Ansatz mit h₁a° würde nur durch wurzelanatomische Verbindung mit anatomisch *ai̯- 'warm sein' (s. 2. *h₁ai̯-) gefordert, bleibt aber möglich." Similarly as in Szemerényi's theory the correlation between the 'a-vocalism' and Hitt. ḫ (LT *h₂) has been severed and no consistent method for deciding between *h₁a/h₂e and *ah₁/eh₂ exists.

2.2.3 The problem of Szemerényi's and Eichner's models (and all variants of the latter) is that the assumption of PIE *ə *a *ā independently of PIE *h₍₂₎ (Hitt. ḫ) leads to a system failure: Due to this assumption the most important phoneme of the inventory, PIE *h (LT *h₂), can no longer be reconstructed on the basis of its most important criterion, the 'a-vocalism' (Neogr. *ə a ā), and the reconstruction of PIE itself is stalled.

2.3 The inability to reconstruct PIE *h in a consistent manner and thus solve the current main problem of IE linguistics defines the paradigm crisis that has by now lasted for almost fifty years. As both existing theories, monolaryngealism and the revised LT, have been similarly affected, IE linguistics has ground to a halt except for the standard philological work in individual IE languages. In a broader context, as pointed out by Thomas S. Kuhn, the issue is that a scientific paradigm is taken for granted, because those doing so implicitly assume that it offers solutions[40] – which is precisely what neither monolaryngealism nor the revised LT does. On the contrary, the partial solution to the problems of the IE a-vocalism that was once provided by the classical LT, has become plagued by ambiguity and solving problems has become impossible in IE linguistics.

2.3.1 Szemerenyi's theory ceased to be functional due to the assumption of *a *ā and the denial of their correlation to Hitt. ḫ, making *ha : *a and *ah : a ambiguous. Eichner's model faced the same fate, because as a result of the assumption of *h₁ h₂ h₃, *a *ā, and the axiom CVC·(C), automatically imposing laryngeals, *h₂eC·(C) and *Ceh₂·(C) are ambiguous, as h₁aC·(C) and Cah₁·(C) are equally possible.[41] Kuhn (1970: 84) diagnoses this kind of ambiguity more broadly as 'blurring of a paradigm':

> "All crises begin with the blurring of a paradigm and the consequent loosening of the rules of the normal research. In this respect research during crisis very much resembles research during the pre-paradigm period."

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[39] In this connection it should have noted that EICHNER (and the laryngeal theory in general) has never responded to SZEMERÉNYI's criticism on the transcendent Semitic element, the root axiom CC·C-, facilitating the postulation of the laryngeals. Ultimately, the axiom itself became the problem, since it – rather than the data – implies the laryngeals leading to the ambiguity *h₁aC- vs. *h₂eC- etc.

[40] See KUHN (1970:37): "(…) one of the things a scientific community acquires with a paradigm is a criterion for choosing problems that, while paradigm is taken for granted, can be assumed to have solutions."

[41] The ambiguity problem is far worse than is currently understood, because most LT reconstructions in the textbooks and dictionaries conventionally reflect the earlier orthodox reconstruction of the 20th century, but actually revisionist alternatives are now equally possible, even if this is not mentioned.

2.3.2 As the second key feature of such a period Kuhn mentions that the problems have turned into unsolvable puzzles as the crisis reflects the assumptions of the theories themselves, which have led to the breakdown of the system.[42]

2.3.3 In order to resolve the paradigm crisis, therefore, the most urgent task of IE linguistics at the moment is to identify and remove the lethal error and revise the paradigm in a manner that steers the field out of the crisis by restoring its ability of problem solving à la Kuhn.

3. The necessary condition for ending the paradigm crisis in IE linguistics

3.0 To identify the source of the problem, one should begin with remarking that monolaryngealism and the classical LT remained viable (i.e. capable of postulating *$h_{(2)}$) until the 1970s, when:

(a) The vowel *a was explicitly assumed to exist independently of Hitt. ḫ (and)

(b) The analysis of *A as the common element in the 'a-vocalism' (in *eA *A *Ae) was made ambiguous by Eichner.

Accordingly, these assumptions must be the cause of the death of Szemerényi's and Eichner's models and the cause of the paradigm crisis. The necessary condition for ending the crisis is, therefore, to understand the mechanism leading to these developments, neutralize it, and infer and present the correct, non-collapsing, solution.

3.1. In order to accomplish this task, we may begin with a detailed analysis of the 'a-vocalism' (Neogr. *ə *a *ā) and its LT counterpart, de Saussure's and Møller's *Ae : *A : *eA, and their relation to Hitt. ḫ.

3.1.1 The pivotal feature of de Saussure's analysis of Neogr. *ə : *ā = DS *A: *eA is to be understood against the background that for the Neogrammarians, the vowels *ə, *a, and *ā were primary items which could not be analyzed further. As such they – to quote a parallel from the history of physics – can be compared to 'E' (energy) and 'm' (mass) in Newton's classical mechanics. In contrast, in de Saussure's analysis *ə = *A + *ā = *eA, Neogr. *ā is no longer primary, but defined as *e+A (Neogr. *e+ə), similarly as Newton's E is defined in Einstein's theory of relativity as $E = mc^2$.[43]

3.1.2 De Saussure's analysis found no support from the Neogrammarians, mainly because he did not account for the vowel Neogr. *a at all, an elementary mistake comparable to someone suggesting a new theory of physics without accounting for F ('force') because its existence were incompatible with the new proposal.[44] De Saussure's fate was sealed when Møller, although offering a partial definition for *a = *Ae, accepted his analysis *ō = *eO (1878: 127) despite knowing it mistaken,[45] and

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[42] In KUHN's words (1970: 92): "The existing institutions have ceased adequately to meet the problems posed by an environment they have in part created (...)."

[43] In modern terminology the novelty of de SAUSSURE's proposal consisted of it being the very first segmental analysis in the history of IE linguistics. It is safe to say that its pivotal approach contributed to the skepticism of his contemporaries.

[44] See BRUGMANN (1879: 773-4) concluding that de SAUSSURE's proposal was "a purely aprioristic scheme ("rein aprioristische Construction") that did not hold water."

[45] De SAUSSURE's (1878: 127) analysis of Neogr. *ə : *ō, for which he claimed a second schwa, *Ô, patterning as *Ô : *eÔ > *oÔ > Neogr. *ō, was pointed out to be mistaken in a critical review by MØLLER,

further added a new error by positing Neogr. *ē = *eE.[46] As Møller's effort amounted to algebraically forcing a genetic relationship between the Indo-European and the Semitic languages[47], the Neogrammarians discarded his theory as 'unsound scholarship'. They seemed to be proven right in doing so when Szemerényi and Eichner caused Møller's house of cards to collapse in the early 1970s. Instead of triumphing, however, the houses of cards of Szemerényi and Eichner collapsed themselves, which brings us to the question of the causes of this chain of events.

3.1.3 Returning to the parallel in physics, we can begin by asking why neither Newton's physics – with undivided 'E' – nor Einstein's physics – with analyzable $E = mc^2$ – do not collapse, whether operated separately or together, but both Szemerényi's model (*ə a ā) and the pioneering LT (*A *Ae *eA) as well as their combination, Eichner's model (*ə *a *ā *h₂ *h₂e *eh₂), do.

3.1.4 As the correlation between *A and Hitt. ḫ (SZ *h) is confirmed by the IE material and is therefore beyond doubt, the only possibility is that while de Saussure's and Møller's early ideas are correct to a degree, their – to use Kuhn's (1970) term – articulation (i.e. formulation) of the ablaut is not. The necessary condition to steer IE linguistics out of its crisis therefore initially equals reformulating the ideas of the pioneers of the LT in a manner that does not lead to a collapse, that is, correcting the mistake in their equation.

3.2 The primary problem of de Saussure's and Møller's ablaut *Ae : A : *eA was from the beginning its inability to account for Neogr. *a (Lat. a = RV. a = Gr. α). This led Szemerényi and Eichner to assume an independent *a, which in turn led to the breakdown of their models. Accordingly, we need to understand why the combination of the assumption of *A *Ae *eA and *a (Eichner) independently of PIE *h is fatal for IE reconstruction theories.

3.2.1 In order to answer this question, let us closely examine de Saussure's famous derivation of the common denominator *A in the pattern *A : eA = Neogr. *ə : ā (1878: 127). In order to justify *eA, de Saussure referred to the parallel patterning of (re)sonants DS *i : *ei, *m : *em, etc. (1878: 127). According to him, *A : *eA is similarly formed structurally, which led him to his functional (or structural) definition of *A as a 'coefficient sonantique' in the pattern *A : *eA e.g. in Lat. status : OCS. stati 'sich stellen' etc.

3.2.2 The formulation of de Sausssure's analysis is extremely revealing, because it was only some years later that Hermann Osthoff (1881a, 1881b) demonstrated through his sound law both the shortening of the long diphthongs in the European languages *and* that PIE originally had three, not two, quantity oppositions, as erroneously believed by

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noting that all occurrences of Ô can be explained by means of Neogr. *o in *oA = Neogr. *ō, see 1880:494n2: "Ich sehe indessen kein wort, für welches die annahme dieses dritten elementes [= Ô] notwendig und die erklärung des o durch geänderten ablaut unmöglich wäre."

[46] MØLLER (1879: 151n1): "Saussure stellt ausser dem A noch ein zweites wurzelhaftes element derselben art auf für wurzeln wie stufe 1 und 2 δω-, stufe δο-, und er hätte für wurzeln wie stufe 1 θη- germ. dē-, 2 germ. dō-, θε- skr. hi- lat. a in ratus, satus (s. 140ff.) nach meiner ansicht noch ein drittes aufstellen sollen. Diese wurzelhaften elementen werden als consonantische (A die tönende, E die tonlose kehlkopfspirans?, O das kehlkopf-r?) aufzufassen sein."

[47] MØLLER (1906: xiv): "Es gibt im Indogermanischen nur a-Wurzeln (oder, wenn man fürs Indogermanische lieber will, e-Wurzeln, was für die Sache dasselbe), den semitischen a-Wurzeln entsprechend."

de Saussure in 1878, recognizing only an incomplete two-term pattern DS Ø : *e. Instead of the two oppositions DS *i : *ei etc., the correct proto-pattern has three oppositions of quantity, PIE *i : *ei : *ēi[48], just as the ablaut pattern for *A does, i.e. the vowel PIE *ē is to be added to the patterns of the LT:

$$*A : eA : *\bar{e}A \qquad\qquad *A : Ae : A\bar{e}$$

When we now apply the 'colouring rule' for both *e and *ē and the loss of *A, we can see that there is only one possibility to formulate the equations in order to make this the equivalent of the IE 'a-vocalism' (Neogr. *ə *a *ā), namely

	zero:	*e-grade:	*ē-grade:
DS[+]	*A = *ə	*eA → *aA → *a	*ēA → āA → *ā
MØL[+]	*A = *ə	*Ae → *Aa → *a	*Aē → Aā → *ā

3.2.2 This improved system DSM[+], consisting of the revised ablaut patterns of de Saussure (DS[+]) and Møller (MØL[+]), has the following properties:

(a) There are three quantitative ablaut grades, exactly as in Neogr. *ə a ā and – even more importantly – as in PIE itself.

(b) All terms of 'a-vocalism', Neogr. *ə a ā, are present in the output of the implications, i.e. the system DSM[+] is – unlike de Saussure's and Møller's proposal – complete, and in particular includes Neogr. *a.

(c) The only terms used in the input of implications are *A, *e and, *ē, i.e. the cover symbols Neogr. *a and Neogr. *ā have been eliminated (Occam's razor) from DSM[+].

(d) The inability of de Saussure's and Møller's proposals to completely account for the cover symbol Neogr. *a has been corrected by the addition of the pattern DSM[+] *eA → *aA → *a, replacing the incorrect original assumption of the long outcome of DS *eA → Neogr. *ā.[49]

(e) In order account for Neogr. *ā ≠ DS *eA, the long vowels can be explained with the corresponding equations with long PIE *ē, respectively

$$\text{DS}^+ *\bar{e}A → āA → *ā \qquad \text{(and)} \qquad \text{MØL}^+ *A\bar{e} → Aā → *ā^{[50]}$$

3.3 After these adjustments there is no longer need for assuming the independent vowels *a and *ā that caused the system failure of Szemerényi's and Eichner's models to PIE at all. Since de Saussure's and Møller's defect formulation of the ablaut patterns *Ae : *A : *eA, reflecting only two quantities PIE Ø : *e instead of PIE *Ø : *e : *ē, led

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[48] For an example of the three quantity oppositions (PIE Ø : e : ē), see e.g. PIE *likᵘ- 'lassen' (IEW 669-70) having the alternatives *likᵘ- (Gr. λίπο- (ao.) '(ver)lassen', GEW 2: 99-100, ἔλιπον [1sg]), *leikᵘ- (Gr. λείπο- (pr.) 'laisser', DELG 628-9, λείπω [1sg]) and *lēikᵘ- (RV. raikṣ- (s.ao.) 'überlassen', WbRV. 1165, āraik [3sg]).
[49] The correctness of the short outcome of DS *eA is proven, for instance, by the correspondence OPers. paya- (pr.M.) 'to protect' (OldP. 194, apayaiy [1sg]) : LAv. ni·paya- (pr.) 'beschützen' (AIWb. 886, nipayeimi [1sg]), both reflecting DS *peAi̯e/o- → *paAi̯e/o- → *pai̯e/o- → OPers. paya-.
[50] For the outcome of DS[+] *ēA, see Hitt. paḫš- (vb.M.) 'schützen, verwahren' (CHD P: 2f.), RV. pári pās- (s.ao.) 'rings schützen, behüten' (WbRV. 800), and Lat. pāstor (WH 2: 260).

Szemerényi and Eichner to assume *a, the error of the pioneers is the fundamental cause of the paradigm crisis.

3.3.1 Respectively, *the necessary condition for ending the crisis is to replace the defect pattern* *Ae : *A : *eA *with one having all three* PIE *quantity oppositions*:

$$\text{DSM}^{+} \qquad = *A\bar{e} : *Ae : *A : *eA : *\bar{e}A$$

3.3.2 As a summary we finally offer a brief *post mortem* outlining the developments leading to the crisis:

(a) The premature publication of the *Mémoire sur le système primitif des voyelles dans les langues indo-européennes* in 1878, a few years before the clarification of the existence of the PIE long quantity and three quantity oppositions by Osthoff in the early 1880s, led de Saussure to present an incomplete theory lacking an equivalent of Neogr. *a.

(b) Unaware of the existence of three original quantities in PIE, de Saussure and Møller operated on the basis of two oppositions of quantity and accordingly attempted to generate the missing long quantity through compensatory lengthening rules. While this allowed Møller to abstract the 'laryngeal' *A O E from *eA *eO eE,[51] the actual long vowels *ā *ō *ē (≠ *eA *eO *eE) were forgotten and lost in the LT.

4. On the phonetic interpretation of Neogr. *ə = DS *A = LT *h₂

4.0 Finally, a correction to the historical phonetic and phonological interpretation of the 'coefficient sonantique' DS *A = Neogr. *ə = LT *h₂ and its relation to the other reconstructed PIE phonemes, one of the most problematic questions in the entire reconstruction of the PIE phoneme inventory, should be made.

4.1 The research history of the cover symbol begins with August Fick, who during the compilation of his etymological dictionary (1870-71) had recognized the necessity of postulating a new phoneme, defined by him in an article appearing in 1879 as the featureless middle vowel Neogr. *ə, '*schwa indogermanicum*' (cf. Hebr. šwa 'empty').

4.1.1 Some examples of *schwa indogermanicum* are:

(a) Neogr. *kəl·C 'Schwiele, harte Haut' (IEW 523-4)

Lat. callo-	(n.) 'Schwiele, dicke Haut' (WH 1: 139, callum)
Lat. calleo-	(vb.) 'eine dicke Haut haben' (WH 1: 139, calleō [1sg])
OInd. kiṇa-	(m.) 'Schwiele' (KEWA 1: 208, EWA 3: 90, kiṇaḥ)

(b) Neogr. *gəl·V 'Maus, Wiesel' (IEW 367)

Lat. galeā-	(f.) 'Helm aus Leder' (WH 1: 579, galea [sgN])
Gr. γαλέη-	(f.) 'Wiesel, Marder' (GEW 1: 284-5, γαλέη [sgN])

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[51] Accordingly, MØLLER (1906: xiv-xv) generalized *E, *A, *Ô: "Die langen indogermanischen Wurzelvokale ē, ā, ō sind aus dem kurzen Wurzelvokal und einem ursprünglich folgenden Kehllaut, semitischem Kehllaut entsprechende, entstanden."

OInd. giri-   (f.) 'Maus' (KEWA 1: 336, EWA 1: 488, giriḥ [sgN])

4.1.2 The main features of the correspondence set for *schwa* are:

(a) The vocalic nature of the reflexes of the cognates implies that also the respective proto-phoneme was vocalic, and it was interpreted as a vowel (V), not a sonorant (R), by the Neogrammarians.

(b) The treatment Lat. a = OInd. i implies that the vowel underlying the cover symbol Neogr. *ə is not identical with Neogr. *a = Lat. a, OInd. a. Owing to this distinction the correspondence set is correctly defined in terms of the comparative method.[52]

(c) The absence of the second palatalization in Sanskrit before Neogr. *ə implies that the underlying PIE item was not a front vowel. This is confirmed by the opposition between the non-palatalizing OInd. i_2 = Lat. a etc. (Neogr. *ə) and the palatalizing OInd. $i_1 \equiv$ Lat. i etc. (Neogr. *i).[53]

(d) While prototypes in the range *e … ɛ are excluded as a candidate for schwa, since they would have triggered the second palatalization, the phonetic value Neogr. *ə is possible, but not necessarily correct. In the 19th century the first reference to typology tended to be Hebrew owing to its biblical prestige and availability of teaching (and thus knowledge of the language among scholars), but in fact several other 'non-palatalizing' places of articulation remained possible.

4.2 A new phonetic (or phonological) interpretation of Neogr. *ə was proposed by de Saussure (1878), according to whom *A was a 'coefficient sonantique', a sonorant (or resonant), having a vocalic and a consonantal allophone. Against this idea observe the following:

4.2.1 Owing to the algebraic nature of de Saussure's analysis it was no surprise that the reality of phonetics did not offer any candidate for a phoneme that could be interpreted as a sonorant *A with the features ascribed to it by de Saussure.

4.2.2 Nothing confirms de Saussure's claim that the phoneme underlying *A is a sonorant. On the contrary, the substitution of a vowel Neogr. *ə into the ablaut schema yields *əē : *əe : *ə : *eə : *ēə, and the substitution of an obstruent Neogr. *p yields *pē : *pe : *p : *ep : *ēp. In other words any class of phonemes fits the pattern *xē : *xe : x : *ex : *ēx, which simply expresses the possible positions of a phoneme in quantitative ablaut in connection with schwebeablaut, not especially restricted to sonorants, as asserted by de Saussure.

4.3 Finally the consonantal interpretation of *A emerged in the LT in several successive phases:

4.3.1 Møller immediately interpreted de Saussure's *A as 'guttural of Semitic type' (1880:492n2), for which he later coined the term 'laryngeal', thus phonetically neither

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[52] Thus, despite the attempts of some authors to deny the existence of 'schwa', the correspondence set forth by the Neogrammarians is correct (see PYYSALO 2013: 99-100).

[53] For the second palatalization in Sanskrit before *i, see e.g., RV. ci- (rel.pron.) 'wer?' (WbRV. 444, cid) : Hitt. kui- (rel.pron.) 'wer, was, welche(r/s)' (HHand. 82, ku-iš) : Lat. qui- (rel.pron.) 'wer, was, …' (WH 2: 410, quis, quid).

a vowel (V) nor a sonorant (R), but an obstruent (C) having a colouring effect or – to use modern terminology – causing allophony $*eh_2 \rightarrow *ah_2$ and $*h_2e \rightarrow *h_2a$.

4.3.2. In his main contribution to the LT, Albert Cuny (1912: 102f.) claimed that the laryngeal *A ($*h_2$) became sonorous (syllabic) in a non-sonorous environment, or – to use modern terminology – had an allophone $*\underset{\circ}{h}_2$ in a consonantal environment.

4.3.3 In 1927a: 95-104 Jerzy Kuryłowicz identified of DS *A (Neogr. *ə) with Hitt. ḫ, based on examples such as:

*Aent- → Hitt. ḫantei 'frons' (HEG 1: 149) : Lat. ante (WH 1: 53)

*peA·s- → Hitt. paḫš- 'schützen' (CHD P: 2f.) : RV. pās- (WbRV. 800)[54]

4.3.4 However, Kuryłowicz's identification of *A = Hitt. ḫ caused him a problem: Vocalic obstruents $\underset{\circ}{C}$, including $^\dagger\underset{\circ}{h}_2$, whether phonetically interpreted as [x̥] or [ḫ̥], do not exist.[55] For this reason Kuryłowicz proposed that a *schwa secundum* was attached to the laryngeal ($*_e h_2$), but this is not acceptable due to the lack of comparative evidence for the existence of $^\dagger{}_e$.[56]

4.4 As de Saussure's sonorant R and the obstruent C of the LT fail to convey the phonological content of the correspondence set, the only possibility is that the Neogrammarian interpretation of *ə as a vowel V, confirmed by the correspondence set itself, must be the correct one. However, despite its phonological accuracy, the Neogrammarian treatment is not phonetically satisfying.

4.4.1 In his article on *schwa* Thomas Burrow (1949: 28-29) denied the capability of a featureless middle vowel /ə/ to consistently develop in two separate directions, /i/ in Indo-Iranian versus /a/ in all other IE languages, as illustrated in the crude picture of the oral cavity below.

IIr. i (= OInd. i, Av. i)

        ↖

   Neogr. *ə

     ↙

IE a (= Gr. α, Lat. a, OIr. a, etc.)

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[54] For the items belonging to the root $*peh_2$- 'protect' (IEW 787 & 839, LIV² 460), see Hitt. paḫš- (vb.M.) 'schützen, verwahren' (CHD P: 2f.), RV. pári pās- (s.ao.) 'rings schützen, behüten' (WbRV. 800), and Lat. pāscō (WH 2: 260).
[55] See TISCHLER (1980: 514): "Zu diesem weit verbreiteten Irrtum kam noch ein zweiter, als Kuryłowicz im hethitischen ḫ den Vertreter der idg. Laryngale erkannte bzw. erkennen wollte, und dieses ḫ genau an den Stellen auftrat, an denen sonst ein ə angesetzt wurde. Kuryłowicz selbst sah zwar sogleich, daß der Laryngal H bzw. ə, der ja ein Konsonant ist, nicht mit dem vokalischen Schwa identisch sein kann [...]."
[56] For the non-existence of schwa secundum, see the broad discussion in PYYSALO (2013: 194ff.).

4.4.2 As can readily be seen, this development would be highly problematic indeed, because

(a) A featureless (mid center) proto-vowel Neogr. *ə would have to gain properties from nowhere in a violation of *ex nihilo nihil*.

(b) There is no single force traceable back to PIE explaining why and how a featureless *ə could consistently develop in two different directions IIr. /i/ vs. IE /a/ in turn in a violation of scientific realism.

(c) From the beginning the Neogrammarian choice of the cover symbol ə was not motivated by weighted phonetic and phonological facts, but rather by the phoneme inventory of Hebrew, and accordingly alternative, less problematic phonetic interpretations exist.
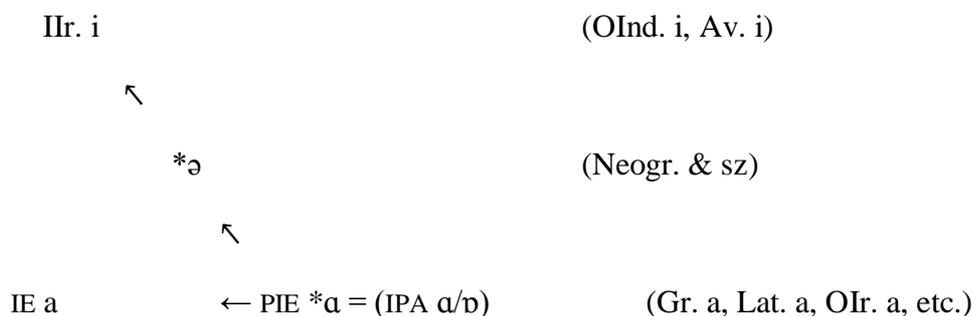
4.4.3 Below it is illustrated how the satisfactory phonetic interpretation of the cover symbol responding to Burrow's criticism can be obtained:

(a) In order to explain the neutrality of IIr. /i/ in the second palatalization in Sanskrit, the proto-phoneme must have gone through schwa after leaving its original place of articulation, by necessity located behind the middle axis.
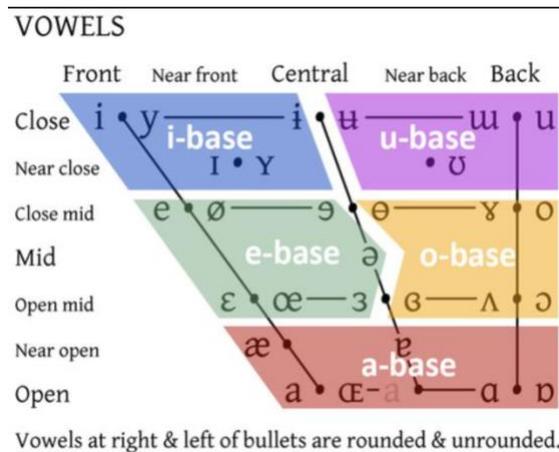
(b) The direct, i.e. simplest (Occam's razor), vector drawn from [i] through [ə] towards the PIE proto-phoneme in mouth cavity, using IPA terms, proceeds first through IPA ə … ə … ɜ, and ends approximately between the places of articulation of the vowels expressed by IPA ʌ … ɔ (open mid) and ɑ … ɒ (open back). Accordingly, one of these vowels must represent the PIE phoneme designated by the cover symbol schwa.

(c) Of these alternatives the open (or 'low') vowel IPA ɑ…ɒ can be chosen as the outcome is an 'a-vowel' in most languages and, because its leads more directly (simplicity) to its second outcome, IE /a/, also an open vowel. Since IPA [ɑ] is unrounded like IE /a/ and IIr. /i/, it is preferable to IPA [ɒ], and PIE *ɑ is postulated as the phonetic PIE value of schwa in the manner shown by a crude figure of the oral cavity illustrating the developments from PIE to Indo-Iranian and the rest of IE:

IIr. i   (OInd. i, Av. i)

        ↖

        *ə   (Neogr. & sz)

            ↖

IE a   ← PIE *ɑ = (IPA ɑ/ɒ)   (Gr. a, Lat. a, OIr. a, etc.)

In other words, the cover symbol for schwa actually denotes to PIE *ɑ, phonetically the open (or 'low') back unrounded vowel IPA /ɑ/.

4.4.4 When PIE *ɑ is substituted for DS *A = Neogr. *ə in DSM⁺ *Aē : *Ae : *A : *eA : *ēA, we obtain the values

PIE *ɑē : *ɑe: *ɑ : *eɑ : *ēɑ   (4.4.4)

From this we first obtain through assimilations ('colouring rules') of *ɑ, *e, and *ē

*ɑā : *ɑa : *ɑ : *aɑ : *āɑ

and through *ɑ-loss (*A-loss)

*ā : *a : *ə : *a : *ā

By simplification this results in the ablaut Neogr. *ə : *a : *ā, i.e. the system is equivalent to the Neogrammarian set of a-quality vowels, but does not require the assumption of *a and *ā.

4.3 After the elimination of KORTLANDT's model from the discussion we are left with only two other models of revisionist trilaryngealism to compete with SZEMERÉNYI's (1967, 1970, 1996) monolaryngealism (and its recent revisions) for the ultimate solution of the Proto-Indo-European laryngeal/vowel problem. The two remaining models are those proposed by EICHNER and MELCHERT/RIX, which will be discussed in a separate paper. In this connection, the generally abandoned orthodox model of PUHVEL (1965), with six laryngeals, will also have to be taken up once again.

5. On the sufficient condition for ending the paradigm crisis in IE linguistics

5.1 As the assumption of Neogr. *a *ā, leading to the ambiguity in monolaryngealism and the LT, is no longer needed, the necessary condition for ending the paradigm crisis is expressed in the formula

PIE *ɑē : *ɑe: *ɑ : *eɑ : *ēɑ   (4.4.4)

5.2 However, this alone does not amount to a sufficient condition for ending the crisis, i.e. restoring the capability of the field to reconstruct PIE *h, because the relation of the formula 4.4.4 to PIE *h (Hitt. ḫ) remains to be explicated.

5.3. In the sequel to this paper, the sufficient condition to end the crisis is formulated using the formula 4.4.4 as a philosopher's stone that leads to the simultaneous solution of all remaining (segmental) problems related to the PIE vowel and laryngeal system, in effect ending the crisis.

Abbreviations

AIWb.	Bartholomae 1904
ao.	aorist
Av.	Avestan
C	consonant
CHD	Hoffner & Gutebock 1997
DELG	Chantraine 1968-80
DS	de Saussure('s reconstruction)
DSM	de Saussure('s and) Møller('s reconstruction)
EWA	Mayrhofer 1956-1980
f.	feminine
GEW	Frisk 1960-72[2]
Gr.	Greek
Hebr.	Hebrew
HED	Puhvel 1984ff.
HEG	Tischler 1977-2016
Hitt.	Hittite
IE	Indo-European
IEW	Pokorny 1959
IIr.	Indo-Iranian
IPA	International phonetic alphabet
KEWA	Mayhofer 1986-2000
LAnat.	Later Anatolian
Lat.	Latin
LAv.	Later Avestan
LIV[2]	Rix et alii 2001
LT	laryngeal theory
M	middle
m.	masculine
Møl	Møller('s reconstruction)
N	nominative
n.	neuter
Neogr.	Neogrammarian (reconstruction)
OAnat.	Old Anatolian
OInd.	Sanskrit
OIr.	Old Irish
OldP.	Kent 1953
OPers.	Old Persian
PIE	Proto-Indo-European
pr.	present
R	sonorant (resonant)
RV.	Rig-Veda
s.ao.	s-aorist
sg	singular
sz	Szemerényi('s reconstruction)
V	vowel
vb.	verb
WbRV.	Grassmann 1996
WH	Walde & Hoffman 1938

zg   Zgusta('s reconstruction)

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