A Storm of Words

vetera verba, priscae linguae

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Carlos Quiles

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A Song of Sheep and Horses

Book 3

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A SONG OF SHEEP AND HORSES:

EURAFRASIA NOSTRATICA, EURASIA INDOURALICA

Book One: A Game of Clans: *collectores venatoresque, agricolae pastoresque.*

Book Two: A Clash of Chiefs: *rex militaris, rex sacrorum.*

Book Three: A Storm of Words: *vetera verba, priscae linguae.*

Book Four: A Feat of Crowds: *hic sunt leones, hic sunt dracones.*

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Guide to the reader

Abbreviations

1.: first person

2.: second person

3.: third person

abl.: ablative

acc.: accusative

act.: active

adj.: adjective

adv.: adverb

Alb.: Albanian

Arm.: Armenian

aor.: aorist

aux.: auxiliary

Av.: Avestan

BSl.: Balto-Slavic

CA: Common Anatolian

Cel.: Celtic

cf.: *confer* 'compare, contrast'

OE: Old English

OInd.: Old Indian

OIr.: Old Irish

OHG: Old High German

OHitt.: Old Hittite

OLat.: Archaic Latin

OLith.: Old Lithuanin

ON: Old Norse

OPers.: Old Persian

OPru.: Old Prussian

ORuss.: Old Russian

opt.: optative

Osc.: Oscan

OSV: object-subject-verb order

OV: object-verb order

p.: person

perf.: perfect

CIE: Common Indo-European

CS: Central Semitic

Cz.: Czech

dat.: dative

DIE: Disintegrating Indo-European

Du.: Dutch

e.g.: *exempli gratia* 'for example'

Eng.: English

EPU: Early Proto-Uralic

esp.: especially

f.: feminine

fem.: feminine

gen.: genitive

Gaul.: Gaulish

Gk.: Greek

Gmc.: Proto-Germanic

Goth.: Gothic

Hitt.: Hittite

Hom.: Homeric

IE: Indo-European

imp.: imperative

imperf.: imperfect

ins.: instrumental

int.: interrogative

Ita.: Italic

Lat.: Latin

Lith.: Lithuanian

Ltv.: Latvian

loc.: locative

LPIE: Late Indo-European

PA: Proto-Anatolian

PAA: Proto-Afrasian

PEB: Proto-East Baltic

PF: Proto-Balto-Finnic

PFP: Proto-Finno-Permic

PFS: Proto-Finno-Samic

PFU: Proto-Finno-Ugric

PIAr.: Proto-Indo-Aryan

PIIr.: Proto-Indo-Iranian

PIr.: Proto-Iranian

PGk.: Proto-Greek

Phryg.: Phrygian

PIE: Proto-Indo-European

PIA: Proto-Indo-Anatolian

PIU: Proto-Indo-Uralic

pl.: plural

Pre-BSl.: Pre-Proto-Balto-Slavic

Pre-Ita.: Pre-Proto-Italic

Pre-Gmc.: Pre-Proto-Germanic

Pre-PIIr.: Pre-Proto-Indo-Iranian

pres.: present

pron.: pronoun

PS: Proto-Samic

PSem.: Proto-Semitic

PSmy.: Proto-Samoyedic

Ptc.: particle

PT: Proto-Tocharian

PU: Proto-Uralic

PUg.: Proto-Ugric

PWB: Proto-West Baltic

LPU: Late Proto-Uralic

Luv.: Luvian

Lyc.: Lycian

Lus.: Lusitanian

m.: masculine

masc.: masculine

MFTD: Multilingual Folk Tale Database (<https://mftd.org/>)

MHG: Middle High German

mid.: middle-passive voice

Mong: Proto-Mongolic

MPIE: Middle Proto-Indo-European

Myc.: Mycenaean

n.: neuter

neu.: neuter

nom.: nominative

NP: noun phrase

NWIE: North-West Indo-European

O: object

Obj.: object

OAv.: Old Avestan

OCS: Old Church Slavic

PYuk.: Proto-Yukaghir

Russ.: Russian

sg.: singular

Skt.: Sanskrit

Sla: Proto-Slavic

SOV: subject-object-verb order

subj.: subjunctive

SVO: subject-verb-object order

Toch.: Tocharian

Tung.: Proto-Tungusic

Turk.: Proto-Turkic

Umb.: Umbrian

Ved.: Vedic

Ven.: Venetic

v.i.: *vide infra* 'see below'

VO: verb-object order

voc.: vocative

VP: verb phrase

v.s.: *vide supra* 'see above'

VSO: verb-subject-object order

WIE: West Indo-European

WS: West Semitic

Symbols

    *   denotes a reconstructed form, not preserved in any written documents

    **   denotes a reconstructed form through internal reconstruction

    <   "comes from" or "is derived from"

    →   "turns into" or "becomes"

    -      indicates morpheme boundary, or separates off that part of a word that the reader should focus on

    ( )   encloses part of a word that is not relevant to the discussion, or that is an optional part

    Ø   "zero desinence" or "zero-grade"

    ×   denotes a wrong formation

Spelling Conventions

All linguistic forms are written in *italics*.

When representing word schemes:

C = consonant

R = resonant (r, l, m, n)

T = dental

K = occlusive

J = glide (i̯, u̯)

H = any laryngeal or merged laryngeal

V = vowel

V̄ = long vowel

I = i, u

° = *epenthetic* or *auxiliary* vowel

(conventionally, the symbol ° under the vocalic resonants is placed before it in these cases)

\# = syllabic limit

Introduction

This monograph began as an evolving collection of papers relevant to the reconstruction of the North-West Indo-European proto-language. This concept has its distant origin in the notion of a *European group*, prevalent in the first half of the 20th century, and finds its dawn in the studies of Old European hydronymy by Hans Krahe from the 1940s to the 1960s. The first real approach to a North-West Indo-European dialectal group, however, were the lexical studies of Norbert Oettinger in the 1990s.

The pioneer work of diverse archaeologists have paved the way to the current picture of Chalcolithic and Bronze Age cultural expansions in Europe: Dergachev (2007) with the expansion of Khvalynsk-Novodanilovka settlers as the Suvorovo group in the Balkans; David W. Anthony (2007) with the identification of late Repin as the source of Early Yamna migration to the east and west of the Pontic-Caspian steppes; Volker Heyd in the 2000s, identifying East Bell Beakers as originally from west Yamna settlers in Hungary expanding to all of Europe, and developing the Early European Bronze Age; James P. Mallory (2013), identifying Bell Beakers as expanding Nort-West Indo-European languages; and Christopher Prescott & Eva Walderhaug (1995), identifying immigrant Bell Beakers as bringing Pre-Germanic to Scandinavia.

Genetic studies are confirming the overall picture developed by certain linguists and archaeologists over the past decades, proving that the concept of Indo-European migrations is real, and that these migrations over huge areas can be traced to societies where ancient Indo-European languages were later attested. This gives strong support to actual ancestral languages spoken and transmitted by communities of peoples—in contrast to the 'constellation analogy' of James Clackson (2007), and to the unending cultural diffusion theories developed over the years—and that these reconstructed branches often evolved within small territories and expanded explosively.

The most recent genetic findings using ancient DNA samples point to a markedly different kinship-related (male-biased) expansion of Yamna settlers first as late Repin / early Yamna to the west and east of the Don-Volga-Ural region ca. 3500/3300 BC; then Yamna settlers westward along the Danube ca. 3000 BC; and then from the Carpathian Basin as Bell Beakers into west, south, north, and central-east Europe ca. 2500 BC. These successive expansions strongly support the feasibility of accurately reconstructing a real language with real dialects, unifying for its latest European stage previous concepts such as the North-West Indo-European lexicon, the West Indo-European or Italo-Celto-Germanic isoglosses, as well as the various fragmentary languages classified as of "Pre-Celtic", "Para-Celtic", "Para-Italic", or "Para-Germanic" nature.

Its proper definition and reconstruction is important not only for the reconstruction and classification of European languages that derive from this parent language, but for a better definition of Graeco-Aryan dialects, and of the parent Late Proto-Indo-European language.

From Mallory and Adams (2007):

"How real are our reconstructions? This question has divided linguists on philosophical grounds. There are those who argue that we are not really engaged in 'reconstructing' a past language but rather creating abstract formulas that describe the systematic relationship between sounds in the daughter languages. Others argue that our reconstructions are vague approximations of the proto-

language; they can never be exact because the proto-language itself should have had different dialects (yet we reconstruct only single proto-forms) and our reconstructions are not set to any specific time. Finally, there are those who have expressed some statistical confidence in the method of reconstruction. Robert Hall, for example, claimed that when examining a test control case, reconstructing proto-Romance from the Romance languages (and obviously knowing beforehand what its ancestor, Latin, looked like), he could reconstruct the phonology at 95 per cent confidence, and the grammar at 80 per cent. Obviously, with the much greater time depth of Proto-Indo-European, we might well wonder how much our confidence is likely to decrease. Most historical linguists today would probably argue that reconstruction results in approximations. A time traveller, armed with this book and seeking to make him- or herself understood would probably engender frequent moments of puzzlement, not a little laughter, but occasional instances of lucidity."

Today, genetic investigation of ancient DNA is helping select the appropriate archaeological models of demic or cultural diffusion of material culture, and consequently the most accurate models of dialectal development. We can now be certain that our reconstructions of Late Proto-Indo-European dialects—at least those with the shallowest time depth—have increased in accuracy and precision, with a time traveller likely to find him- or herself surprisingly close to the language spoken by native North-West Indo-Europeans, Proto-Greeks, and Indo-Iranians.

The reconstruction of North-West Indo-European should therefore not be considered a mere theoretical exercise, but a pragmatic approach to the phonetic reconstruction of a real language, spoken by a close community of people that lived during the mid–3rd millennium in a relatively small region of central Europe by some tens of thousands of settlers. During and after their expansion, close ties were kept between vast regions dominated by Bell Beaker groups—in contrast to the relationship with neighbouring cultures, like the Corded Ware culture—and these contacts were kept for a good part of the Bronze Age during the 2nd millennium, which further supports their close ethnolinguistic identification.

Immobility and conservatism have unexpectedly seized the field Indo-European studies. Schools created around famous linguists or institutions are usually defined by certain theories, and most of them are extremely reticent to abandon them. This is evident with the example of Hittite phonetics, which has been clearly shown to derive from an archaic stage of the proto-language. In the nineties a decline as seen in the theory which proposes at least two strata of Indo-European (with the archaism of Hittite barely mentioned), with the most commonly used manuals barely presenting the effects of gradual dialectalisation. The field keeps moving forward in the study of individual languages, but the general theory is paralysed, so that in fact dialectal studies are actually based on false theoretical assumptions.

Apart from the focus on North-West Indo-European, a holistic approach has been followed in this monograph, which tries to integrate language, culture, archaeology, and genetics of all potential peoples involved in the development of Proto-Indo-European. While reconstructing language stages before Indo-Hittite partly abandons the field of comparative grammar and enters the realm of internal reconstruction and hypothetical typological similarities, regarding the Indo-Uralic hypothesis it seems that progress in Proto-Uralic reconstruction might help develop the theory further. According to Kallio (2015):

"In the case of Indo-Uralic in particular, the Boppian tradition of comparative grammar seems to be the only way forward, because superficial comparisons of few basic words have already been made for centuries. Then again, even the 21th century comparative Uralic grammar is still nowhere near the 19th century comparative Indo-European grammar. Thus, there will be a lot of work to do on the Uralic side alone before seriously moving on to comparative Indo-Uralic grammar, something that already Thomsen (1869: 1–2) pointed out.

As far as the Indo-Uralic hypothesis is concerned, it is easily far more promising than most other hypotheses recently debated in [the Journal of Indo-European Studies], since even its alleged opponents call it "plausible but inconclusive" (Campbell & Poser 2008: 162), telling us that "you can believe in it if you want" (Koivulehto 1993: 189). (...)

While I, too, still keep a wait-and-see attitude to Indo-Uralic, I could not agree more with Kassian & al. that "it is recommendable to search for a more appropriate explanation than chance coincidence"."

Because this book tries convey the idea that reconstructed proto-languages—even if defective to some extent—were real languages spoken and spread by actual prehistoric communities, a short text, the famous Schleicher's Fable titled *The sheep and the horses*, has been translated whenever possible, to reflect some of the most common phonetic and morphosyntactic changes from one stage to the next, and to compare between languages.

The most accurate oldest versions reconstructible today, where phonetics, morphology, syntax, and vocabulary are as certain as they can be, are probably those of North-West Indo-European (NWIE), Proto-Indo-Iranian (PIIr.), and Proto-Greek (PGk). This is due to the difficulties in reconstructing(and agreeing upon the reconstruction of not only phonology—e.g. laryngeals (number and phonetic inventory, as well as potential evolution), velars (number and realisation), and even vowels—but also morphology, syntax, and lexicon (with precise semantic definition) common to all Late PIE dialects, let alone earlier Proto-Indo-European stages.

This fable is poorly adapted to societies that did not know the use of domesticated horses and carts, and especially to societies which had not undergone Neolithisation, so many ancient versions are bound to be limited in the vocabulary used. Commonly substituted words include 'horse' for 'deer', 'donkey', 'bull', or 'big animal'; 'wagon' for 'carrying' or even derivatives of 'load' (hence making the actions of two horses similar in meaning); 'ride' for 'mount' or 'lead', etc.

This is Schleicher's original (1868) version, relying heavily on Sanskrit, and its translation (Beekes 2011):

The Sheep and the Horses. [On a hill,] a sheep that had no wool saw horses; one of them pulling a heavy wagon, one carrying a big load, and one carrying a man quickly. The sheep said to the horses: "My heart pains me, seeing a man driving horses." The horses said: "Listen, sheep, our hearts pain us when we

see this: a man, the master, makes the wool of the sheep into a warm garment for himself. And the sheep has no wool." Having heard this, the sheep fled into the plain.

<div align="center">

avis akvāsas ca

</div>

Avis, jasmin varnā na ā ast,	*dadarka akvams;*
am, vāgham garum vaghantam,	*tam, bhāram magham,*
tam, manum āku bharantam	*avis akvabhjams ā vavakat:*
"kard aghnutai	*mai vidanti manum akvams agantam."*
akvāsas ā vavakant: "krudhi avai!	*kard aghnutai vividvant-svas*
manus patis varnām avisāms	*karnauti svabhjam gharmam vastram,*
avibhjams ka varnā na asti."	*kukruvants avis agram ā bhugat.*

<div align="center">

The Sheep and the Horses

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[On a hill,] a sheep that had no wool	*saw horses;*
one of them pulling a heavy wagon,	*one carrying a big load,*
and one carrying a man quickly.	*The sheep said to the horses:*
"My heart pains me,	*seeing a man driving horses."*
The horses said: "Listen, sheep!	*our hearts pain us when we see this:*
a man, the master, the sheep's wool	*makes into a warm garment for himself.*
And the sheep has no wool."	*Having heard this, the sheep fled into the plain.*

1. First stage

1.1. Indo-Uralic

1.1.1. Indo-Uralic, or Early Indo-European and Early Uralic

One of the most promising macro-language proposals nowadays is Indo-Uralic (IU). This language family was traditionally considered formed as Indo-European (IE) and Uralo-Yukaghir (Kortlandt 2010), but it seems likely that the greatest similarities between Uralic and Yukaghir are due to late areal contacts, while early loanwords point to close contacts between Uralic and Indo-European (Häkkinen 2012).

The latest population genetic research has made it still more evident that the relationship of Proto-Yukaghir (PYuk) with Proto-Indo-European (PIE) and Proto-Uralic (PU) must be considered within the framework of an ancient Eurasian Proto-Indo-Uralic (PIU) community, hence the need to establish Yukaghir, if genetically related to Indo-Uralic, as a third independent branch, which is supported by its independent phonetic development (Hyllested 2009). The relationship of Indo-Uralic with other Asian languages, especially with Altaic, into a Eurasian group has also been proposed as quite likely (Kortlandt 2010).
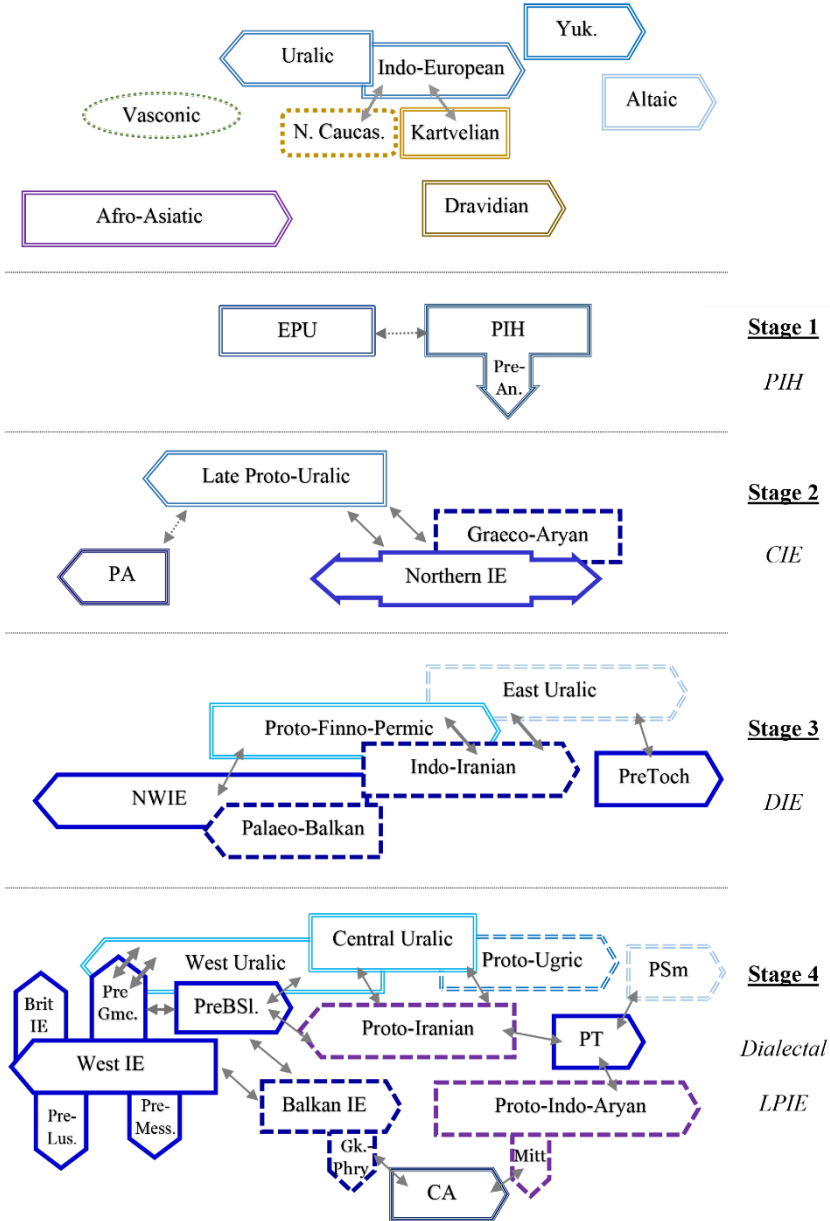
Figure 1. Schematic representation of the reconstructed Indo-Uralic evolution in comparative grammar, divided into four main stages. It also includes an initial hypothetical 'Nostratic' stage above (languages marked by solid double lines), informed by internal reconstruction and typological similarities.

Regular phonetic equivalences in shared ancient vocabulary between Indo-European and Uralic not only speak in favour of a common group, but the specifics of their evolution may be partly explained if we "think of Indo-European as a branch of Indo-Uralic which was transformed under the influence of a Caucasian substratum" (Kortlandt 2002). Population genetics has made it obvious that a Caucasian substratum (probably driven by exogamy and absorption of a previous population of the Caucasus or the nearby steppes) affected both, Uralic- and Indo-European-speaking communities, but probably the influence was earlier and stronger on the latter, which in turn affected the genetic composition of the former—but less so its pronunciation—due to successive migration waves.

There are two ways of seeing the close relationship of Proto-Indo-Anatolian (or Middle Indo-European) and Uralic: either one considers both to derive from a common Proto-Indo-Uralic trunk from which they split, or they began as different languages that converged due to contacts. To complicate things further, the first option does not include the second one, and may in fact explain the similarities of Uralic and Indo-European over Yukaghir (Figure 1). Based on the current archaeological and genetic data, it is likely that the Neolithic Pontic-Caspian steppes represented the Proto-Uralic community to the west (Mariupol) and the Proto-Indo-European community to the east (Samara-Orlovska), already separated during the 6th millennium BC; before, during and after which period they influenced each other with successive population movements.

We will assume in this paper an ancient genetic relationship—that is, that Early Proto-Indo-European is in fact Proto-Indo-Uralic—which is supported by the initial formation and continued similar genetic admixture in the Eneolithic steppe. By the time of the Suvorovo-Novodanilovka expansion at the end of the 5th millennium, though, they were already two different, unintelligible languages.

1.1.2. Indo-Uralic proto-language

These are some common traits of Indo-Uralic:

- Shift from PIU implosives *ɓ, *ɗ, *ɠ → PU *p~m, *t~n, *k~ŋ, nasals PIU *m, *n, *ŋ → PIA *m/u̯~ʔb, *n~ʔd, *ʔg? (Kümmel 2015; Pooth 2017).

- PIA *H- ~ PU *k- (and partly also in Yukaghir) in initial position, distinguished with neighbouring vocalism, although the three appear in with neighbouring PU *u (Hyllested 2009):

  o PIU *χ → PIA *h- before front vowels, with only a few examples available; e.g. PIU *χegu̯e → PU *kii̯i, *küi̯i 'snake' ~ PIA hogʷ-i-s 'snake, worm', heg-i- 'snake, leech'.

  o PIU *χ → PIA *χ- before PIU *a-, or PU *k before PIU *a, *ä; e.g. PIU *χangu̯e (*χengu̯e-) → PU *kunčë 'tapeworm, intestinal worm' ~ PYuk *könč'ə ~ PIA χenʔgʷ- 'snake'.

  o PIU *ɣ → PIA *ʕʷ-, PU *k (appears next to *o or *i ~ ü), PYuk *Ø-; e.g. PIU *ɣmige 'urinate' → PU *kuńćë 'urine' ~ PYuk *ončə 'water' ~ PIA *ʕʷmeig- 'urinate'.

- Laryngeals in non-initial position yield similarly PIA *H ~ PU *k:

  o PIU *deχe 'do, make' → PFU *teki 'do' ~ PIA *deh- 'put'.

  o PIU *kalχe 'straw, talk' → PFU *kalkë '(a) hair; stalk' ~ PIA *kelχ- 'twig, thin handle or shaft', *kolχ-mo- 'straw'.

  o PIU *ɠurɣV 'swallow' > PU *kurkV 'throat, neck' ~ PIA *ʔgʷer(ɣʷ)-(i̯-) 'swallow' > *ʔgʷer-u̯eχ, *ʔgʷriɣʷ-u̯éχ- 'neck'.

- Exceptions in laryngeal outputs (Hyllested 2009):

  o PIU intervocalic *ɣ is kept in PU in the position *V[+back]_V, cf. PIU *luɣV → PU *luɣV 'to wash' PYuk *loɣo- id. PIA *leu̯ɣʷ- id.

  o PIA *-mH- ~ PU *-mp-; e.g. PIU *śemχV → PU *ćumpV 'scoop, ladle' ~ PIA *semH- 'scoop out, ladle out (water, etc.)'. Compare also the comparative/superlative adjectival suffix (see below).

- o Loss of laryngeal preceding PIU *u (theoretically also *i) cf. PIU *$buχue$ 'grow' → PU *$puuë$ 'tree', PIA *$beuχ$-, $buеχ$- 'become, grow; plant etc.'
- Intervocalic PIU *g- → PIA *g- (PIE *g^h-) ~ PU, PYuk *$ɣ$- (Hyllested 2009).
- Proto-Uralic palatalisation trend (Hyllested 2009):
  - o Word-initial PIA *g- ~ PU, PYuk *i-, in positions where it eventually yields palatals in certain Late PIE dialects; e.g. PIU *$χag$-, *$χeg$- → PU *$kiịi$, *$küịi$, 'snake' ~ PIA *heg-i- 'snake, leech', *heg^w-, 'snake, worm';
  - o but, e.g. PIU *g following a nasal shows PU *$ć$, *$č$ (<*$dź$, *$dž$ before the devoicing of voiced stops and affricates in pre-PU); e.g. PIU *$deng$-u- 'tongue' → Pre-PU *$ńaŋkdźë$ 'tongue, gums' (denasalisation) ~ PYuk *$anče$-, $anču$- 'tongue' ~ PIA $deng$-u(-$eχ$) 'tongue'.
- PIU imperfect aspect *-$χ$-, terminative aspect *-me, preserved in PU, but not in PIA, except in root variants. Compare PIU *$gaue$ 'go' (cf. PU *$kaue$ ~ PYuk *$keue$) in PIU *$gaué$-$χe$- → PIA *$^ʔg^we(u)h_2$- vs. PIU *$gaué$-me- → PIA *$^ʔg^wem$-, etc.
- PIU 1st person sg. inactive/intransitive ending *-$χ(V)$ → PU 1st sg. pres. subj. *-k ~ PIA 1st sg. perf. *-$χe$ (Hitt. 1st sg. pres. -$ḫi$).
- PIU comparative/superlative adjectival suffix *-$mχa$ → PU *-mpa comparative suffix PIA *-mH-(o-) superlative suffix, see above for PIU *-mHV → PU *-mpV (typologically similar to Old Irish -mch- giving Modern Irish -mp-).
- PIU 1st person *mi, *m.
- PIU 2nd person pronoun *ti, later assibilated to *si (Kortlandt 2002) → PU nom. *ti, obl. *$tina$ ~ PIA *$ti(H)$, *tu, Late PIE *$tu(H)$, *tu- (Kloekhorst 2008).
- PIU verbal endings 1.sg *-mi, 2.sg. *-ti/-si, 1.pl. *-me, 2.pl. **-te.

- PIU demonstrative **i-*, also **e-* (behind PIU 3rd person singular), **t-*, **s-*.
- PIU dual **-i/*-e*; **-χ* → PU **-k*.
- PIU plural nom. **-t*, obl. **-i*; PIE **-es* < ***-eti*.
- PIU accusative **-m*.
- PIU genitive **-n*.
- PIU dative **χ*, **-χa*, to be compared with the characteristic laryngeal **-χ* of the non-third persons, e.g. PIA perfect endings, with PIE **-gʰi*, and with PU **-k*, **-ka*.
- PIU locative **-i*, **-ru*, **-n*.
- PIU ablative **-t* → PU **-ta* ~ Hitt. *-z* (<**-t-i*); **-os* (maybe originally ergative), also found in **t-os* and abl. pl. **-i̯-os*.
- PIU nominaliser **-i*, **-m*.
- PIU diminutive **-k*.
- PIU reflexive **-u/u̯* → PIA **-o*, originally limited to the third person, also found in the dual.
- PIU interrogative **ku̯-*.
- PIU participle **-n*, **-t*, **-nt*, **-l*, verbal noun **-s*.
- PIU negative **n*.

1.1.3. Schleicher's fable in Proto-Indo-Uralic

The following is potential translation of Schleicher's fable into Proto-Indo-Uralic:

<div align="center">

ɣeu̯e – luɣit

</div>

ɣeu̯e ne χesen χu̯alχni	*luɣii̯ ɣokwe;*
u̯iχe χauɡ̑am u̯egim u̯egent,	*u̯iχe mege luɡ̑im,*
u̯iχe u̯iχrem suχe luɡ̑ent.	*u̯eku̯e ɣeu̯e luɣii̯:*
"kerd cemtemi,	*u̯iχrem u̯ainɡ̑ent luɣii̯ χaɡ̑ant."*
u̯eku̯et luɣit: "χeule, ɣeu̯e!	*cemteme kerd u̯ainɡ̑ent,*
u̯iχre, u̯aiχi, ɣeu̯ei χu̯alχni	*su paχu̯ë u̯esim deχe,*
ɣeu̯ei χu̯alχni ne χese."	*i χeulet ɣeu̯e χanɡ̑am buɡ̑e.*

Tentative reconstructions of the vocabulary used are as follows (those marked ** are tentatively reconstructed based on indirect data[i])

- PIU **ɣeu̯e* 'sheep (?)' → PU **keu̯i*, 'female of wild animal' ~ PIA *ɣʷeu̯is* 'sheep' (Hyllested 2009). PFU **u-či* 'sheep', which has been related to PIE root *ɣʷu-*, would need to be explained as a more recent loanword due to the lack of laryngeal traces, if it is related at all.

- As a common word for 'horse', which in this period of Neolithisation was probably considered as mere cattle, may be found in PUg **luu̯V* 'horse' < PU **luɣë* ~ PIA **leuH* 'cut off, separate', extended as PIA **luHp-* 'hide, skin, flay' found widespread. A more specific 'cattle (sheep, cow, goat…)' in Cel. **lāpego-*, Bal. **luop-*, Alb. *lope*, and also possibly behind Finn. *lupo* 'mare'. Therefore, it seems that verb PIU **luɣe* 'cut off; skin', and verb and noun PIU **luɣi* '(domesticated) animal', could hypothetically be traced back to this stage, although the precise dialectal evolution is obscured.

  - Another, earlier alternative would be to consider horse as large game, included in PIU ***elV-* 'deer' → PF **ältV* (cf. Saami *al'do*,

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[i] Based also on data from Starostin's online dictionaries at <http://starling.rinet.ru>.

altō; Mord. *elde*, *ildä*, *äldä*) ~ PIA **el-n-*, **el-k-*, cf. also Kartvelian *elV (cf. Svan *ilw*, *il*, *hil*), Altaic *ĕlV. The lack of a specific ancestral name for horse, the use of this root for 'horse' in Mordovian, and the appearance of multiple innovative names in PIE with an epithetic origin may suggest an original shared root for big herbivores, such as deer or elks.

- o For a later period, when the horse is ridden and becomes a symbol of power, one could propose a common epithet PIU **duχ-li 'wind' → PU *tuɣli* 'feather, wind, bird', PIA *duH-li-* 'fly, swirl, esp. smoke, steam, vapor, breath", *duH-*, 'smoke, raise dust' (Koivulehto 1991).

- For wool, PIU ***χu̯alχ-ni* → PIA **χu̯(e)lh-n-* should be proposed, which would correspond to PU ***kulk-i?* If it is a loanword from NE Caucasian **λ̣:u̯ähnɨ* (Starostin 2009), such a borrowing should have happened before the separation of Proto-Anatolian from PIA. This should be distinguished from PFU **kulk-i-*/**kulk-ë-* 'move, go, wander' ~ PIA **kʷelH-* 'stir, move around, wander' < PIU **ku̯elχ-e* (Koivulehto 1991).

  - o A native, Pre-Neolithic word would have probably come from 'hair', such as PIU **mangi̯e-* → PIA *moisós 'ram, sheep, fleece' ~ PU *mäńći* 'tail (of a deer, bird)', with a similar phonetic change of PUI *-*gi̯-* seen after nasal in PIA *ɣʷmeig 'urinate' ~ PU *kuńće* 'urinate; urine' ~ PYuk. *ončə* 'water'.

- PIU *χese 'exist, be' → PIA **hes-* 'be', PFP *kesä, 'sommer, harvest season' (Koivulehto 1991). Compare also PIU **buχu̯e* 'grow' → PU **pu̯u̯ë* 'tree' ~ PIA **beuχ-*, *bu̯eχ-* 'become, grow; plant etc.'

- PIU **ɣoku̯e* (**ɣaku̯e*) 'see' → PU *kokë 'see' ~ PYuk **öɣe-* 'look', *oɣo 'guard' ~ PIA *ɣʷekʷ-* 'see; eye'.

- PIU **u̯aindV* 'see, look' → PFU **u̯äntV* 'see' ~ PIA **u̯eiˀd-*, **u̯inˀd-* id. (Hyllested 2009).

- PIU **u̯iχe* (**iɣe) 'one' → PFU *iki, *üki 'one' ~ PIA **oiH-* / **(h)oi-* 'one' (Hyllested 2009).

- PIU *suχe 'move' → PU *suɣë, *sukë 'row, move back and forth, stir', PIA **suH-e/o-* 'set in motion, hurry' (Koivulehto 1991).

- PIU **χau̯ʄa* 'grow; high, long' → PFU **kauk-a-* 'long', PFU **kau̯a-* 'rise, grow', PFV *kauk-sa, **kasu̯a* 'grow' ~ PIA *χeu̯ʔg-* 'increase, grow', possibly from **χ(e)u-* '(move) away', **χu̯ek-s-* 'increase, grow' Hyllested (2009).

- PIU **u̯ege* 'take, carry' → FU **u̯iɣi* (cf. Finn. *vie-*, Mordvin *vije-*, Hung *vi(v)-, visz-, vë(v)-, vësz-*) ~ PIA **u̯eg-* (Kortlandt 2002). A nominalised ***u̯egi* 'something that is taken or carried, something that carries' could not signify 'chariot' in the Indo-Uralic period, but something else, like a recipient to be carried, 'load'. For PIU ***u̯ede* (or ***u̯ede?*) 'carry, lead', cf. PIA **u̯ede-* 'lead' ~ PU **u̯etä* 'lead, guide, pull'.

- PIU *mege 'large, earth' → PU *mëɣë 'land, earth' ~ PIA **meg-* 'large, great; earth, land' (Hyllested 2009).

- PIU **luʄe 'weight; lift' → PU *luŋë 'lift' ~ PIA **leu̯ʔg-* 'bend; break'. For a potential reconstruction of PIA **ber-*, cf. PIU *borχe 'bore' → PU *pura 'bore; perforate' PIA **berH-*, although the loss of laryngeal after PU *r is controversial (Hyllested 2009).

- PIU **duk-* 'draw' → PU **ńüka-* 'draw, tear' (cf. Hung. *nyű*, Man. *ńüw-*, Selk. *nek-*) ~ PIA **ʔduk-* 'draw, lead' (Kümmel 2015).

- PIU **u̯iχre* 'male, man' → PFU *urɛ, *irkä/*ürkä id. ~ PIA **u̯iHro-* id.; cf. also Karvelian *χu̯ir*.

- PIU **u̯aiχe* '(be) strong, forceful' → PU **u̯äki* 'power' ~ PIA **u̯eih-* 'be strong, vivid; be violent, track down, hunt, strive for'.

- PIU ***u̯eku-* 'say' → PU **u̯akV* 'call' (also related to **i̯ukta*? cf. Finn. *juttele-*, Mord. *jofta*, *jovta*, Hung. *játsz*), ~ PIA *u̯ek^w-* 'say, tell'.

- PIU **kerd-* 'heart' → PU *ćiðä-mə id. (cf. Finn. *sydän*, Hung. *szív*) ~ PIA **kerʔd-* id. (Kümmel 2015)

- PIU **camte*/**cemte* 'feel' → PU **tumtë* 'feel, notice' ~ PYuk **cunde* 'think' ~ PIA **sent-* 'feel' (Hyllested 2009).
- PIU **χaǵe* 'drive' → FU **(k)aįa* ~ PIA *χeˀg-* (Kortlandt 2002). Also proposed is its adoption in FU as **aįa* from late Proto-Indo-Iranian (Kortlandt 2002).
- PIU ***χeule* 'hear' → PU **keulë* (cf. PFU **kuuli-*) ~ PIA **kleu-*.
    - cf. PIU **χaųe-za* 'ear' → PU **kaųë*, PFU **kaųe-ra* 'ear' ~ PIA *χou-s-* 'ear', with a root reconstructed with initial laryngeal and *-s-* as hardened variant **(s)keuh-* 'perceive, hear' (Hyllested 2009).
- PIU **sege* 'have, obtain' → PU **sëγë* 'come, arrive; get, obtain' ~ PIA *seg-* 'hold on to, have; prevail' (Hyllested 2009).
- PIU reflexive **u/ų* could probably be appended to pronouns to signal reflexive '-self', hence the proposal for third person reflexives PIU ***eu-* or ***įu-*.
- PIU ***ece-* 'warm' → PU *ëčV* (cf. Saam *atsek*, Mord *ežda*, *ežde*, Man *ištam*) ~ PIA **eus-* 'burn'. Another possibility would be a word derived from PIU **paχųë* 'burn, heat' → *PU *päiųä* 'sun; day; warmth' ~ PYuk **puyö(-nč)* 'summer; sun' ~ PIA *peχų-* 'fire' (Hyllested 2009).
- PIU ***ųes-* 'dress' → PIA **ųes-*, also Altaic **ùso*, a kind of clothing (Tungus-Manchu **usī-*, Korean **ós*, Japanese *əsə -*).
- PIU **deχe* 'do, make' → PFU **teki* 'do' ~ PIA *deh-* 'put' (Hyllested 2009).
- PIU **χanǵa* 'meadow → FU **kaŋka* ~ 'dry area near river' ~ PIA **χenˀg-(Vs-)* 'meadow' (Hyllested 2009).
- PIU ***buǵ-* 'run' → PU **puk-ta* 'jump, run' PIA **beuˀg-* 'run, flee'. Another possibility would be to use PIU **genge* 'walk' → PFU **įakkV-*, **įankV-* 'go, walk, arrive', perhaps **įekkV-* 'dance' ~ PIA **geng-* 'step, walk'(Hyllested 2009).

1.2. Early and Middle Indo-European

1.2.1. Early and Middle Indo-European evolution

Features of the Middle Proto-Indo-European or Proto-Indo-Anatolian (PIA) parent language can be reconstructed based on Proto-Anatolian (PA) differences with the Common Indo-European (CIE) trunk—defined in turn by differences between Tocharian and other Late PIE dialects—complemented with data informed by internal reconstruction (Kloekhorst 2016, 2017, 2018; Pooth 2018).

Phonology:

- Laryngeals probably reconstructible as **h* and uvular fricatives **χ, *ɣ^w* (Weiss 2016), although possibly uvular stops (Kloekhorst 2018).

- Vocalic system:
  - Ablauting **e, *o*, with **ē, *ō* (see below).
  - Dubious existence (or alternatively minimal relevance) of vowel **a*.

- System of stops most likely different from the classically reconstructed **p/*t/*k – *b/*d/*g – *bʰ/*dʰ/*gʰ*:
  - Most likely (typologically) **p/*t/*k – *ˀb/*ˀd/*ˀg – *b/*d/*g* (Kümmel 2015); also supported by Kortlandt's glottalic reformulation of Lachmann's law (Kroonen 2018).
  - Maybe **pː/*tː/*kː – *ˀp/*ˀt/*ˀk – *p/*t/*k*, i.e. like Pre-Proto-Anatolian. This could be supported by the divergent evolution of PIE **TT* → Late PIE **TˀT* in compounds with **tː* in Anatolian.

Nominal system:

- Evolution of the accent-ablaut system (as described by Beekes and Kortlandt):
  - Initially there were apparently only three paradigms: static (inanimate/animate), proterodynamic (inanimate), and hysterodynamic (animate).

o Sound Law 1: massive vowel reduction, with all accented vowels becoming **e*, all unaccented vowels were lost: e.g. nom.-acc. sg. **mén-s*, gen. sg. **mn-és-s*.

o Intermediate period A: sometimes spread of vowel **e* to unaccented morphemes, e.g. nom. acc. **mén-es*. Zero-grade forms may be replaced by its full-grade form in analogy to hysterodynamic paradigms; e.g. gen. **mn-és-es*.

o Sound Law 2: all unaccented **e* are weakened to **o*. Regular outcome of **mén-es*, **mn-és-es* is then **mén-os*, **mn-és-os.*

o Intermediate period B: new regularisations, e.g. the accented e-grade is generalised throughout the paradigm, yielding **mén-os*, **mén-es-os*. Vowels **e* and **o* are now separate phonemes, so **o* can spread to accented morphemes.

o Sound Law 3: In some environments, short **e* and **o* are lengthened; e.g. **pχ-tḗr* 'father' is the outcome of an earlier short **e*, either because it stood before a word-final resonant, or because it is a compensatory lengthening from ***pχ-ters* (Szemerényi's law).

o Finally, the full reconstructible Middle PIE nominal accent-ablaut system includes also a hysterokinetic (e.g. nom. **pχ-tḗr*, acc. **pχ-térm*, gen. **pχ-trés*) and an amphikinetic one (e.g. **su̯ésor-* / **su̯esr-és* 'sister').

	static			proterodynamic			hysterodynamic		
	inanim./anim.			inanim.			anim.		
	R	S	E	R	S	E	R	S	E
nom.	*é*	-	-	*é*	-	-	*é*	-	-
acc.	*é*	-	-	*é*	-	-	-	*é*	-
obl.	*é*	-	-	-	*é*	-	-	-	*é*
loc.	*é*	-	-	-	*é*	-		*é*	-

Examples of these paradigms are e.g. proterodynamic 'fire' nom.-acc. sg. *péχ-ur, gen.sg. *pχ-uén-s; and hysterodynamic 'hand' nom. sg. *gés-r, acc. sg. *gs-ér-m, gen. sg. *gs-r-és, although for nom. *gḗs-r see Pooth (2018).

- The earliest reconstructible PIE gender system showed differences in gender agreement only in the grammatical cases. Different agreement patterns arose primarily in the nominative, with common gender nouns, adjectives, and pronouns showing different case/number endings in contrast to neuter nouns, which did not distinguish the nominative and the accusative (Matasović 2014).

- Endings:
  - Nom. sg. *-s, *-Ø.
  - Gen. sg. *-(e/o)s, originally probably **-és.
  - Dat.-Loc. in **-i, that develops into an accented *-éi, hence:
    - Dat. unaccented in *-i, accented (hysterodynamic) in *-éi: *CC-éC-i, *CC-C-éi.
    - Loc. unaccented in *-i (proterodynamic, hysterodynamic): *CC-éC-i.
  - Allative in **-é, which developes into *-ó (cf. Hitt. *parā* 'forward', Gk. *pró*, Skt. *prá*), possibly with zero-grade *-Ø. Not productive in later stages.
  - Instrumental in *-et, accented *-ét, zero-grade *-t.
  - Development of ablative by adding *-i to the instrumental, cf. PA *-(o)ti. The common ending *-(e)s developed later.
  - Nominal paradigms for Middle PIE:

	static	proterodynamic	hysterodynamic
	inanim./anim.	inanim.	anim.
nom.	*CéC-C(-s)	*CéC-C	*CéC-C(-s)
acc.	*CéC-C(-m)	*CéC-C	*CC-éC-m
abl.	*CéC-C-s	*CC-éC-s	*CC-C-és
ins.	*CéC-C-t	*CC-éC-t	
dat.	*CéC-C-i	-	*CC-C-éi
i-loc.	*CéC-C-i	*CC-éC-i	
all.	*CéC-C	-	*CC-C-é
Ø-loc.	*CéC-C	*CC-éC	

Verbal system:

- Basic forms were probably injunctive (tenseless) *CéC-t and derivative
  *CéC-i, with an affix **-i* which was either an aspectual (progressive,
  ongoing at refrence time) or a temporal (*hinc et nunc*, i.e. 'here and
  now') mark.

- Endings originally only **-m*, **-s*, **-t*, which added information on
  person and number.

- From punctual verbal roots derivatives could be made (by reduplication,
  n-infix, etc.) with repetitive, durative, causative, etc. meaning; with
  suffix **-s-* a punctual derivative could be made from non-punctual roots.

- Original distributive-iterative inflectional tipe (**su̯opé*, opposed to
  **u̯oidé*) becomes proto-middle.

1.2.2. Schleicher's fable in Proto-Indo-Anatolian

<p align="center">ɣ^weu̯is hku̯es-k^we</p>

ɣ^weu̯is k^woi χu̯elhn̥ ne hest	*hkums ɣ^wek^wet;*
to ʔdenso u̯ogom ugentm̥,	*to mgeχ borom,*
to u̯ihrom hohku brentm̥.	*u̯ēuk^wt ɣ^weu̯is hku̯os:*
"χedgor hme kērʔd,	*χnerm̥ u̯iʔdenti hkums χʔgentm̥."*
u̯euk^wn̥t hku̯es: "klu ɣ^wu̯e!	*χedgor n̥sme kērʔd u̯iʔdenti,*
χnēr, ʔesos, ɣ^wu̯i̯om χulhenm̥	*su̯e g^wermom u̯esti k^wr̥néuti,*
ɣ^wu̯i̯om-k^we χu̯elhn̥ ne hesti."	*To keklu̯us ɣ^weu̯is pleχnom bēuʔgt.*

1.3. Early Uralic

1.3.1. Early Uralic evolution

Common traits of Uralic languages, which can be traced back to the parent language[ii], include the following (Janhunen 1982; Comrie 1988; Sammallahti 1988; Raun 1988):

- General SOV order. Noun phrase basic order is attribute (adjctive, genitive, numeral) before the head noun. Postpositions instead of prepositions.
  - Subjects of finite clauses in the nominative, of nonfinite verb forms in the genitive (or appear as possessive suffixes, for pronouns).
  - Noun phrase structure: Attribute precedes the head noun, with no agreement between attributive adjective and head noun.
  - Direct object in the accusative.
  - Possession may be expressed by two bare nouns standing adjacent to one another (attributive use of a noun), but a specialised structure with possessor in the genitive + head noun unmarked is also common to this early stage.
  - No distinction between nominal and verbal stems.
- Number: Singular, plural, and probably dual.
  - Dual suffix *-ka- + -n ~ *-kä- + n/ń.
  - Plural marker originally probably *-t, ancient ones including *-t, *-i, and *-k.
- Three grammatical cases (nominative, accusative, genitive) and three local cases (locative, allative, ablative):

[ii] A division is made here between traits considered old (hence Early Proto-Uralic) and those considered innovations within the parent language (hence Late Proto-Uralic). Given the phonetic conservatism of the reconstructions ranging from Proto-Uralic to Proto-Finno-Samic, it is reasonable to think that there were probably other phonetic – as well as morphological and syntactic – changes that have not been properly investigated. For example, it is likely that the consonant system, including laryngeal evolution, was more complex and stepped from Indo-Uralic than the static Proto-Uralic reconstructible through comparative grammar.

- o Subjects of finite clauses in the nominative, of nonfinite verb forms in the genitive (or appear as possessive suffixes, for pronouns).
- o Direct object in the accusative (if no distinct form, the nominative form is used). General accusative ending sg. *-m*.
- o Oblique plural case suffix *-i*, possibly from a possessive adjective.
- o Subordinative suffix (eventually functioning as genitive / prenominaliser with nouns, or adverb-formant with verbs) in *-n*.
- o Ablative or separative as *-tV* (*-tə*, *-tu*), for example found with the verb 'to fear' in all Uralic languages, and in the adverb 'from under' *al-ta*.
- o Locative in *-na/-nä*, with the original local meaning appearing in adverbs and postpositions.
- o Lative suffix *-k(V)* 'moving toward, moving along; becoming somebody or something'.
- o Dative-lative suffix *-n* or *-ń*.
- Possession:
  - o Possessive suffix 1p *-mV/me*, 2p. *-tV/te*, 3p. *-sV/se*. In plural a *-t* or *-k* is added, in dual cases an *-n*.
  - o Oblique cases *-n* before a possessive suffix in singular or plural, probably from the genitive ending.
- Diminutive *-mpV*.
- Ancient ordinal *-ntV*.
- Pronouns *mi/me-nä* 'I', *me* 'we', *ti/te-nä* 'thou', *ti/te* 'you', *ći/ će* 'this', *e* 'this', *tä* 'this', *to* 'that', *u/o* 'that', *ke/ki* 'who', *ku/ko* 'who', *-me* 'what'. Functions of third person personal pronouns are covered by demonstrative pronouns.
- Originally, neither imperative nor indicative were marked.
- Verb agreement in person and number with the subject, but less usual in the third person.

- Original verb form probably a kind of aorist, neutral as regards time. Present marker *-k* would develop initially as an emphatic.

- One tense distinction: past and non-past tense (subsuming present future).

- Verbal personal suffixes 1p. *-m*, 2p. *-t* (or *-n*?), 3p. *-s*, plus number suffixes.

- Deverbal suffixes in nouns: *-kV*, *-i̯V* (to designate the actor), *-mV* (different meanings), *-nV* (infinitives and participles), *-tV/ttV*, and *-pV* (predominantly participial), which can be traced back to an Indo-Uralic participial suffix, cf. Pre-PIE *-bo* (Hyllested 2009).

- Deverbal suffixes in verbs: *-l-* (frequentative or momentary), *-tV* (frequentative and causative), *-ttV* (momentary, causative), *-ktV* (causative), *-ntV* (frequentative or causative), and reflexive *-u̯-*.

- Denominal verbs: *-j-*, *-lV-*, *-mV-*, *-nV-*, *-tV-*, and reflexive *-u̯-*.

- The verb 'to have' was expressed with the owner in the locative (possibly also genitive), and the thing owned (grammatical subject) in the nominative, with the verb 'to be' acting as the predicate.

- Phonetically, Uralic vowels were divided in two exclusive harmonic categories. Front and back vowels could not occur together in a (non-compound) word (Sammallahti 1988; Janhunen 1982):

	back			front	
	u			*ü*	*i*
stressed	*o*	*ë*			*e*
positions	*a*				*ä*
unstressed	*ë*				*i*
positions	*a*				*ä*

  o *a* is typologically more likely than the traditionally reconstructed *a*, hence the more modern notation will be used here.

- o The traditionally reconstructed unrounded *ï* (also *ï*) will also be replaced by the proposed mid vowel *ë* /ɤ/, so the traditional reconstruction of the *Uralisches etymologisches Wörterbuch* (UEW) by Rédei (1988) can be used for consistency purposes. The true original value of certain vowels is disputed (Abondolo 1998), and different probably between EPU and LPU.

- About consonants, the following is the common repertoire:

p			*m*				*u̯*	
t	*s*		*n*	*d*	*r*	*l*		
	ś	*ć*	*ń*	*ð*			*i̯*	
		č						
k			*ŋ*					*γ*

- o The phonetic nature of *γ* is unclear. It could have been two different sounds, a laryngeal (*h* or *ʔ*) and a velar (*g* or *g*); or even a mere syllable boundary between two successive heterosyllabic vowels.

- o Phonemes *d* and *ð* were probably spirants, and *ć* was retroflex (cacuminal).

- o Consonants could be combined to form geminates, at least *pp*, obstruent + obstruent, sonorant + obstruent, and sonorant + sonorant.

1.3.2. Early Uralic–Indo-Anatolian contacts

If one assumes no genetic relationship between Proto-Indo-Anatolian and Early Proto-Uralic, then one should interpret the above Indo-Uralic roots and words as wanderwords, or loanwords from one language into the other, at a very early stage of both, probably during the Neolithic and Early Eneolithic in the Pontic-Caspian steppes. In this case, it is very difficult to say in each case which one was the donor language, if only because of the scarce material available on Uralic comparative grammar.

If one assumes a genetic relationship between PIA and PU, and thus an Indo-Uralic trunk, it would be very difficult to differentiate an early loanword from a common root, since the phonological rules involved in borrowing would have been quite similar to those described here for derivation.

Suggested loans include:

- PIA *$\gamma^w ne\gamma^w mn$- 'name' → PA *$\textipa{P}ló\textipa{P}mn$, cf. Hitt *lā́mn* (Kloekhorst 2008), cannot be the origin of PU *nime* ~ PYuk *nime*, unless a late, non-laryngeal PIE stage is proposed for its adoption. Most likely, Cavoto's interpretation of an original PIA root *(H)nem-* +*-men* accounts for PIU *γnem* yielding PU *nem-* due to the phonotactically illicit sonorant + obstruent + sonorant in PU (Hyllested 2009). It is, therefore, more likely an ancient, shared IU noun.

- Similarly, PIU *medu* → PU *mete* 'honey' ~ PIA *medu* (cf. hitt. *mitgaimi-* 'sweetened (bread)') 'mead, sweet; honey' seems also an ancient root, and it could have originally been a borrowing from Semitic into Indo-Uralic, cf. Semitic *$mVtk̟$ -*, 'sweet', NE Caucasian *miʒʒV* 'sweet' (Bjørn 2017). Since beekeeping may have spread (replacing the previous honey gathering techniques) with the domestication of *Apis mellifera* ca. 9000 BC in the Near East (Bloch et al. 2010), the arrival of a foreign word could have reached Indo-Uralic with Neolithisation via the North Pontic to the west, or via the Caucasus to the south.

- PIU *ṷede* 'water' → PU *ṷete* ~ PIA *ṷed-*, is in e-grade not only in Hitt. obl. *ṷeten-*, but also in other Late PIE languages (Kloekhorst 2008), and could thus suggest a very old loanword, but it is unlikely that this kind of word would be easily borrowed (Kortlandt 2010), and the vocalic alternation suggests a more complex nom. *ṷód-r*, obl. *ud-én-* paradigm (Kloekhorst 2019 fthc.).

1.3.3. Schleicher's fable in Early Proto-Uralic

For a *dynamic* Proto-Uralic phonological evolution, an intermediate stage has been selected before the full development of de-voicing of voiced stops and affricates in PU (Hyllested 2009), the palatalisation before front vowels, and the harmonic categories.

Pre-Proto-Uralic

geu̯e – luɣɨt

geu̯e e aptɨ ne lɨ   luɣɨi̯ gokɨ;

kʲe gauga u̯eɣem u̯eɣetä,   kʲe enä kanem,

kʲe u̯irkäm suɣɨm kanɨta.   keu̯e luɣɨi̯ u̯akɨ:

"kʲedä-mɨ ƭumtɨ   u̯ikräm luɣɨi̯ kajatam u̯äntetä."

luɣɨt u̯akɨt: "keulɨ, geu̯e!   kʲedä-me ƭumtɨ u̯äntetä:

u̯ikrä, u̯äke, geu̯ei̯ aptɨn   su ecɨ u̯esem teke,

geu̯ei̯ aptɨ ne lɨ."   kʲe keulɨtɨ geu̯e kanʲgak bugä.

Early Proto-Uralic

keu̯i – luɣët

keu̯i e aptën e-u̯olë   luɣëi̯ kokë;

će kauka u̯iɣim u̯iɣitä,   će enä kanëm,

će u̯irkäm suɣëm kanëta.   keu̯i luɣëi̯ u̯akë:

"ćɨðä-mä tumtë   u̯irkäm luɣëi̯ kai̯atam u̯äntitä."

luɣët u̯akët: "keulë, keu̯i!   ćɨðä-mät tumtë u̯äntitä:

u̯irkä, u̯äki, keu̯ii̯ aptën   su ečɨ u̯esim teki,

keu̯ii̯ aptën e-u̯olë."   će keulëtë keu̯i kaŋkak pukä.

The following changes are tentatively proposed, where an Early Proto-Uralic community is probably closer chronologically to CIE than to PIA (i.e. after the separation of Anatolian):

- Word-initial PIU *γ → PPU **g → EPU *k.
- Word-initial PIU *χ → PPU **k → EPU *k.

- PIU *$\acute{g}$→ PPU **g → EPU *k (except for *$\chi a\acute{g}a$- →**$kaja$-).

- PIU *d → PPU **d→ EPU *$\delta^{(j)}$.

- PIU *$k(e/i/a)$ → PPU **k^j→ EPU *$\acute{c}$.

- PIU *$g(e/i/a)$ → PPU **g^j→ EPU *$\acute{s}$.

- PIU *b → PPU **b → EPU *p.

- In vocalic evolution, it is posited a system where harmonic categories are already being developed: PIU *e → EPU **e → LPU *i and PIU *i → EPU **i → LPU *$\ddot{e}$.

2. Second stage

2.1. Anatolian

2.1.1. Anatolian as archaic Indo-European

Proto-Anatolian was the earliest language to branch off of the parent Proto-Indo-European trunk. This can be seen, for example, in the following archaic traits, compared to Late Proto-Indo-European (LPIE) innovations (Kloekhorst 2008):

- While thematic o-stems were already productive in PIA, some stems show a previous stage, such as the reinterpretation of athematic PIA **heku-* 'horse', reconstructed from Anatolian, into LPIE **heku̯os*. While thematisation of an athematic stem is a simple step, the opposite is infrequent.

- Retention of original uvular fricatives where LPIE evolves to pharyngeal fricatives. Laryngeal evolution different from LPIE (*§II.2. Laryngeal evolution*) although the colouring of neighbouring vowels is similar.

- Animate (common) vs. neuter gender, in contrast with the opposition of feminine to masculine among animates in LPIE.

- The fourth number, collective plural, is still fully productive for animate nouns in Anatolian, which shows a number of collective *pluralia tantum*.

- Case system with certain potential defective (e.g. ablative and dative plural) or archaic inflections—obscured by later dialectal developments —not undergoing LPIE innovations, especially regarding the thematic and pronominal inflections (e.g. lack of distinction of singular and plural in oblique cases of personal pronouns).

- Full development of neuter heteroclite nouns in *-r̥/-(e)n-*, *-tr̥/-t(e)n-*, *-mr̥/-m(e)n-*, *-sr̥/-s(e)n-*, *-u̯r̥/-u̯(e)n-*, etc. (Rieken 1999)

- Verbal system with certain archaic traits, such as two tenses (past vs. preterite, from a predecessor of the LPIE present/aorist opposition), two aspects (imperfective with *ske*-verbs and perfective), two moods (indicative and imperative), two voices, and two conjugations (with the innovative *hi*-conjugation), as well as the participle. Most of these are derived from an archaic PIE stage ancestral to LPIE, with some traits being innovations only found within Anatolian.

- Hitt. *mer-ᶻⁱ/mar-* 'to disappear', cognate with LPIE *mer-* 'to die', must point to the original meaning, since the semantic development of *disappear* as a euphemism for dying is much more likely than the reverse.

- PA opposition *tiH*, obl. *tu-* seems more likely to reflect the original situation, which would have undergone in LPIE the adoption of the general oblique form for *tuH*.

- Hitt. *šāḫ-ⁱ* 'to fill up, to plug, to stuff', cognate with LPIE *seħ-* 'satiate' is also more likely the original meaning of the verb.

- PA points to PIA nom. *du̯égχtr̥* 'daughter', while LPIE material points to *dʰugħtér*, which is probably a derived form from the declension of the former.

- PIE *$\chi er\gamma^w$- can be reconstructed as meaning 'to plough', but Proto-Anatolian material points to an original 'to crush (the ground)', which suggests that Anatolian split off before the introduction of the plough.
- PIA verbal root *meh- 'to refuse, to reject' is found in LPIE only as the 2sg. imp. act. form *meh 'don't!', grammaticalised as a prohibitive particle.

2.1.2. Anatolian evolution and contacts

In Proto-Anatolian, the following phonetic changes can be seen:
- The old PIE laryngeal system collapses (Kloekhorst 2008):
  - PIA *χ, *γ^w were preserved in some environments.
  - PIA *χ, *γ^w → PA */H/ in positions *#He- and *CRHV. In all other positions merge of *γ^w, *h and loss.
  - Allophonic colouring of pre-PA *e due to adjacent *χ and *γ^w becomes phonemicised, yielding PA *a and *o.
- PIA *eh → PA *$\bar{\alpha}$.
- Monophthongisation of *ei and *eu, and of *oi, *ai, *ou, and *au in some environments.
- Geminate nasals, liquids, and stops arise through assimilation.
- Probable merger of the voiced aspirates with voiced stops.
- Voicing of IE voiceless stops after long accented vowels and in unaccented syllables.
- PIA medial *k^w → PA *g^w except before *s.
- Affricate *t^s- < PIA *$t\underset{\smile}{i}$-.

Suvorovo chiefs are probably to be identified with Proto-Anatolian speakers expanding from Khvalynsk, and were thus in close contact with the (most likely Proto- or Para-Uralic-speaking) Sredni Stog culture, and with cultures from the Caucasus and Old Europe, which makes any innovative trait traced to the Proto-Anatolian stage suspicious of being a potential loan.

Traits associated with early contacts could include the following:

- The satemising trend proposed for Anatolian (Melchert 1987), if accepted, could stem precisely from this close contact (see below *§3.4.1. Indo-Iranian evolution* and *§4.13.1. Balto-Slavic evolution*).

- Similarly, the 'fortis-lenis' system Pre-PA ***tt/t/ˀt* → PA **tt/t* (Kloekhorst 2008) may stem from early contacts with languages of the Caucasus.

- PU common structure noun + ending + poss. enclitic is found exclusively in Anatolian, which suggests a common origin in Indo-Uralic (Kloekhorst 2008), but possibly also its adoption by Pre-Proto-Anatolian migrants:

1sg.	noun + ending + *-mV* + ending	noun + case suffix + *-mV*
2sg.	noun + ending + *-tV* + ending	noun + case suffix + *-tV*
3sg.	noun + ending + *-sV* + ending	noun + case suffix + *-sV*

The earliest attested Anatolian language is possibly to be found in the inscriptions of Armi, dated ca. 2500-2300 BC (Bonechi 1990), whose onomastic tradition is used to locate it in or near Ebla territory, in what is today north-western Syria (Archi 2011):

"Most of these personal names belong to a name-giving tradition different from that of Ebla; *Arra-ti/tulu(m)* is attested also at Dulu, a neighbouring city-state (Bonechi 1990b: 22–25). We must, therefore, deduce that Armi belonged to a marginal, partially Semitised linguistic area different from the ethno-linguistic region dominated by Ebla. Typical are masculine personal names ending in *-a-du*: *A-la/li-wa-du/da*, *A-li/lu-wa-du*, *Ba-mi-a-du*, *La-wadu*, *Mi-mi-a-du*, *Mu-lu-wa-du*. This reminds one of the suffix *-(a)nda*, *-(a)ndu*, very productive in the Anatolian branch of Indo-European (Laroche 1966: 329). Elements such as *ali-*, *alali-*, *lawadu-*, *memi-*, *mula/i-* are attested in Anatolian personal names of the Old Assyrian period (Laroche 1966: 26–27, 106, 118, 120)."

Common Anatolian seems to have expanded thus early during the 3rd millennium BC into the three known main groups, due to their close relatedness: Southern Anatolian (comprising Luwian and Lycian, and probably Lydian), and two conservative branches, Palaic and Hittite. Intensive language contact after the spread of Common Anatolian is apparent from the morphological and phonological convergence of different dialects, which makes their classification more difficult.

The first attested Hittite and Luwian words come from clay tablets unearthed at Kaneš ca. 1920–1720 BC, before the first texts written in Hittite. Written in Old Assyrian dialect of Akkadian, the tablets refer to the local Anatolian population, and record hundreds of personal names that may be related to various languages, including Hittite, Luwian, Hurrian, and Hattian. The merchant records contain a number of Anatolian Indo-European loanwords adopted by the Assyrian community.

Hittite loans include layers of Hattic, Hurrian, Akkadian loanwords. Potential substrates behind some Anatolian languages include (Watkins 2001):

- Phonetic changes, like the appearance of /f/ and /v/.
- Split ergativity: Hurrian is ergative, Hattic probably too.
- Increasing use of enclitic pronoun and particle chains after first stressed word: in Hattic after verb, in Hurrian after nominal forms.
- Almost obligatory use of clause initial and enclitic connectors: e.g. semantic and syntactic identity of Hattic *pala*/*bala* and Hittite *nu*.

Interesting is the Indo-Iranian words found in the hippological texts of Kikkuli, which contains e.g. PIIr. *aikau̯artanna-* 'single turn', maybe through Luwian or Hurrian (see below *§3.4.4. Mitanni Indic*). The two last layers seen on Hittite are Luwian-like (the so-called "Glossenkeilwörter", marked by writers as of foreign origin), and the Luwian loanwords increasing in the Middle Hittite, and especially in the Neo-Hittite periods.

Luwian loans include potential Hittite Luwianism PIIr. *assussanni-*, as well as Lycian *esbe*, assumed to derive from the Mitanni reflex of LPIE **ek̯u̯os* 'horse'.

2.1.3. Schleicher's fable in Proto-Anatolian

<div align="center">

hʷou̯is ʔku̯es-hʷe

</div>

hʷou̯is ku̯oisom hu̯lʔni no ʔest	*ʔkums ʔaus;*
kom densom u̯ogom ugn̥tm̥,	*kom m̥kom borom,*
kom hn̥duhsom ʔāku brn̥tm̥.	*to teʔt hʷou̯is ʔku̯os:*
"ʔāgor-mu kēr,	*pesenom ʔu̯n̥tˢi ʔkums neihnihn̥tm̥."*
to tent hku̯es: "klu(dʰi) hʷu̯e!	*ʔāgor-nos kēr ʔu̯n̥tˢi,*
pesōn, ʔesos, hʷu̯i̯ōm hu̯lʔni	*tu̯ekᵊm ʔāitatᵊm u̯osbom hʷni̯etˢi,*
hʷu̯i̯ōm-hʷe hu̯lʔni no ʔestˢi."	*Tod keklu̯n̥ts hʷou̯is pl̥hnom nuntri̯et.*

For Proto-Anatolian vocabulary, Kloekhorst (2008) has been used.

- No common verbs for 'carry', 'bear', or 'listen' are found in Anatolian, especially one that may be etymologically related to common LPIE verbs. Since we have selected LPIE **u̯egʰ*, **bʰer-*, and **kleu-* for PIU and PIA versions, the most likely output of these roots in Proto-Anatolian have been used.

- PIA **pleχnom* has been selected for 'field, land' because LPIE **χegros* seems to be absent from Anatolian languages, and a connection to Sumerian *agar* 'irrigated territory, grainfield' has been proposed, also found in Semitic **hagar*, and maybe NE Caucasian **ʔüććürV* 'meadow, glade, clearing'.

2.2. Late Indo-European

2.2.1. Late Indo-European evolution

Although it is difficult to pinpoint the potential relationship between certain changes, it is clear that there was no immutable Indo-European at any stage, either in phonological or in morphosyntactic development.

Reconstructible changes from PIA to Late PIE include (Lundquist 2018; Pooth 2016, 2017):

- Phonology:
  - Laryngeal uvular-to-pharyngeal evolution is assumed for the PIA - CIE transition, i.e. *$\chi \rightarrow$*ħ, *$\gamma^w \rightarrow \Omega^w$.
  - The process of laryngeal evolution (called 'laryngeal loss') continues from the PIA stage well into the Disintegrating Indo-European (DIE) phase (see below *§II.2. Laryngeal evolution*).
    - Expansion (or appearance?) of *a as an evolution of *χ or through its effect on neighbouring vowels.
  - The shift to the classical velar distribution may be attributed to the Disintegrating Indo-European stage—following to some extent Kortlandt (2013)—roughly at the same time as the merging of laryngeals, due to the findings in Tocharian; i.e. **^2b/**^2d/**$^2g \rightarrow$ *b/*d/*g; **b/**d/**$g \rightarrow$ *b^h/*d^h/*g^h.
  - Simplification of medial *-ss-: compare for PIA *$héssi$, PA *$\Omega es\!\!:\!i$ (Hitt. *e-eš-ši*), Late PIE *$hési$ (Skt. *ási*, Gk. *ei*, etc.).
- Nominal system:
  - Development of the feminine gender from common gender words (e.g. Gk. f. $k^heír$ = Hitt. c. *keššar* 'hand') and from forms that originally belonged to the neuter gender (feminines in *-χ).
  - Accent-ablaut paradigms, fully developed in a previous stage, start a simplification trend (merger) into a single static paradigm.

o   Further evolution of endings, with an unstable plural oblique system is evident at this stage. Areal innovations that did not reach all dialects (and should therefore be attributed to a Disintegrating Indo-European) include:

		Athematic		Thematic	
		Animate	Neuter	Animate	Neuter
Sg.	nom.	*-s	*-Ø	*-os	*-om
	acc.	*-m		*-om	
	ins.	*-h, *-eh		*-oh	
	dat.	*-ei		*-ōi	
	abl.	*-s, *-es, *-os (*-ti)		*-ohod	
	gen.	*-s, *-es, *-os		*-os, *-osio, *-oso	
	loc.	*-i, *-Ø		*-oi	
	voc.	*-Ø		*-e	
Pl.	nom.	*-es	*-χ	*-ōs	*-eχ
	acc.	*-ms		*-oms	
	gen.	*-oh/ʕʷom (*-om)		*-oh/ʕʷom	

- Common Indo-European ins. pl. *-is (thematic -ōis) evolves regionally into DIE *-bʰis from adverb-forming suffix *-bʰi (cf. Hitt. kuwa-pi), as attested in Indo-Iranian and North-West Indo-European (NWIE).
- CIE ins. singular evolves in a western area into *-bʰi, in Gk. (cf. Myc. Gk. -pi) and NWIE.
- Dative-ablative plural *-os is eventually added to the adverb-forming suffix *-bʰi, probably independently in Indo-Iranian (*bʰi̯os) and NWIE (*-bʰos).

• The old nominal derivation system (including adjectives) collapses, evolving radically from a PIA root and pattern morphology to a

concatenative, fusional, and predominantly suffixation-based morphology accompanied by ablaut change.

- Verbal system evolution (many changes since the first shift point to a period of disintegration, but with contact among the main early dialects):
  - o After the separation of Anatolian, the tense–aspect system develops. If a previous tenseless system is assumed for the parent PIA (i.e. progressive vs. non-progressive), then the original PIE aspect system collapses, and tense (and reinterpretation and reanalysis of old forms) develops.
  - o First shift or Great Voice Shift: Voice-marking collapses, with reanalysis of antipassive construction to neotransitive, original proto-middle and active merging into a (neo-)active voice.
  - o Second shift, of progressive aspect to present imperfective tense and aspect: cumulative (present + imperfective) exponence introduced to the word final. Eventual distinction of primary and secondary endings. Present-tensedness develops.
  - o Dual endings specialised from PIA 1p. + 2p. plural/dual inclusive endings.
  - o Emergence of new mediopassive endings in *-r(i)-*, probably originally from 3pl. endings, and developed (later, specialised mainly in Northern Indo-European) as opponent mediopassive (reflexive, benefactive, O-possessive, passive) endings, i.e. in opposition to the old middle endings.
  - o (Late) development of the 'passive input' voice side by side with the mediopassive one, with no dedicated morphology at this stage, and with demoted agents originally in the instrumental case, as well in thegenitive (Schmalstieg 2002), and through derivation in the dative (Luraghi 2016; Danesi, Johnson, and Barddal 2017).
  - o Late appearence of the dialectal (Graeco-Aryan) augment in *é-* as a marker of punctual preterite.

o   Introduction of optative and subjunctive endings.

o   Full reanalysis of the conjugation system:

LIV	STEM CLASS	Examples
1a	Pres. athem. amphidynamic root	*$g^{wh}én$-ti/*$g^{wh}n$-énti* alternance with *-o-* + *-Ø-* = *-o-*
1b	Pres. athem. acrodynamic root	*$stḗu$-ti/*$stéu̯$-n̥ti* alternance with *-o-* + *-o-* = *-ō-*
1g	Pres. athem. with *-e-* reduplication	*$d^hé$-d^hoh-ti/*$d^hé$-d^hh-n̥ti*
1h	Pres. athem. with *-i-* reduplication	*sti-stéχ-ti/*sti-stχ-énti*
1i	Pres. athem. with *-i-* reduplication	*gi-gn̥h-é-ti*
1k	Pres. athem. with nasal Infix	*li-né-k^w-ti/li-n-k^w-énti*
1n	Pres. them. suffix *-e-*, e-grade root	*$b^hér$-e-ti*
1o	Pres. them. suffix *-é-*, Ø-grade root	*$g^hr̥ʕ^w$-é-ti*
1p	Pres. them. suffix *-ské-*, Ø-grade	*$g^wm̥$-ské-ti*
1q	Pres. them. suffix *-i̯é-*, Ø-grade	*gn̥h-i̯é-toi*
2a	Aorist athem. root	*g^wem-t*
2b	Aorist athem. suffix *-s-*	*prek-s-n̥t*
2c	Aorist athem. reduplicated	*u̯e-uk^w-e-t*
3a	Perfect, reduplicated	*g^we-g^wom-/g^we-g^wm-*

*Most important LIV verbal classes (Kümmel et al. 2001), as interpreted in Meier-Brügger (2003). A disputed proposal is e.g. the division into one class $C_1eC_1oC_2$ and another $C_1iC_1eC_2$, instead of considering them a single class; cf. *d^hi-$d^héh$-mi, *$d^hé$-d^hh1-nti.*

2.2.2. Late Indo-European culture

Some interesting aspects of the complex Proto-Indo-European culture and society can be inferred from the language (Benveniste 1969).

2.2.2.1. Economy and technology

The domestic horse *$hek̯u̯os$*, features prominently in the Proto-Indo-European society since before the Anatolian split, and this is reflected in their *Weltanschauung*. with dozens of words reconstructed for horse-related terms,

as well as in common imagery (swift horses, horses accompanying men in battle), rituals (horse sacrifice for the renewal of kingship in the Indian *Asvamedha*, the Roman *Equus October*, the Gaulish name *Epomeduos*, the Irish account by Giraldus Cambrensis' *Topography of Ireland*, and the Nordic examples from *sagas*), myths (the horse-driven chariot of the Sun, the divine twins and their horses, the Gallo-Roman goddess *Epona*, etc.) surviving into the historical period, including divine epithets, and common names (cf. Gaul. *Eposo-gnatus*, OInd. *Asva-gʰosa* 'tamer of horses', etc.). Whereas cattle and cattle-related terms influence all aspects of life, the horse seems to be associated with the ruling classes.

To transport using animals, *$\u̯egʰ$- 'carry, lead', was essential for Late Proto-Indo-Europeans, who knew the technology associated with wagons, *$\u̯ogʰom$, including the wheel, *$kʷekʷlós$, *$róteħ$ (found in Tocharian), the axle, *aks-; and the thill, *$\Omega^wéisā$ (known in Anatolian).

The common abstract collective *$pekū$ 'wealth; moveable goods, property' developed its meaning further into 'livestock, animal'. This transition evidences the relevance of livestock for the overall subsistence economy of Proto-Indo-Europeans. The subsequent specific meanings of the word (and the rituals of animal sacrifice) can be followed through further specialisations into mainly cattle or cattle and goat-sheep herding economies. The animal sacrifice to the goddess *Ardvī Sūrā Anāhitā* in Iran, consisting of ten thousand sheep, a thousand cattle, and a hundred stallions, is possibly the closest to the original trifunctional sacrifice in terms of the domestic animals used and their hierarchical order of relative economic weight (see below *§2.2.3.1. Graeco-Aryan*, *§3.2.2. North-West Indo-European evolution*, and *§4.1. Greek* for more on its evolution).

Cattle were essential for Proto-Indo-Europeans (West 2007):

- Among a man's possessions his cattle stood on a level with his wife (RV 10. 34. 13; Hes. Op. 405).

- Terms like 'cow', 'bull', 'heifer', were often applied metaphorically to human family members.
- A good ruler was a 'cowherd' or a herdsman.
- Cattle raid is a form of aggression celebrated in Indo-European traditions, as a quick way of acquiring wealth.
- The cow served as a unit of value.
- The measure of a small puddle was 'a cow's hoofprint' (*góṣ padam*, MBh. 1. 27. 9; 9. 23. 18; Rm. 6. 77. 11; cf. Hes. Op. 488 f.).
- Times of day were designated as: 'the cow-gathering' (the morning milking: *sáṃgatiṃ góḥ*, RV 4. 44. 1; *saṃ gavé*, 5. 76. 3), 'the yoking of oxen' (Old Irish *im-búarach*), 'the unharnessing of oxen' (*govisarga-*, *Rm.* 7. 1523*.1; *oulutós*, Il. 16. 779, al.).
- Epithets, myths, and references to the sovereign gods often included their bovine nature: the 'bull' Sky God and his partner the 'cow'.

pekū also includes human slaves, as opposed to the common free people, *leudʰ-*. In Skr. *dvipáde cátus padeca paśáve* the man is considered as bipedal *paśu* 'cattle, mobile property'. An interesting formula is reconstructed by Calvert Watkins as 'protect men and livestock', from the correspondence of (etymologically related words underlined) Skt. *trā́i̯antām asmín grā́me / gā́m áśvam púruṣam paśúm* lit. 'protect in-this village cow, horse, man, (and) flock-animal' Av. *ϑrāϑrāi pasuuå vīraiiå* lit. 'for protection of-cattle (and) of-men', Lat. *pāstōrēs pecuaque salua seruāssīs* lit. 'shepherds farm-animals-and may-you-preserve', Umb. *nerf arsmo uiro pequo castruo frif salua seritu* 'magistrates ordinances men cattle fields fruit safe let-him preserve'.

Slaves are usually prisoners, spoils of war or raids, always foreigners. Particular terms existed for *human value*, *algʰʷós* (cf. Gk. *alpʰế*, PIIr. *argʰás*, Lith. *algà*), and *human sale*, *u̯ésnos* (cf. Lat. *vēnus*, Gk. *ṓnos*, Skr. *vasna*, OArm. *gin*).

The economy is based on exchange and reciprocity, with roots reconstructed for transaction, buying and selling, payment, and recompense.

The central terms of exchange involve a a mutual transaction, a gift entails a countergift, with some derived verbs showing both the meaning of 'give' and 'take'. The traditional rules of hospitality, usually attributed to the Late PIE period (because of its presence in Ancient Greek texts), making guests almost part of the extended family and friends, are more clearly developed in reconstructed lexicon during the NWIE period (see below *§3.2.2. North-West Indo-European evolution*).

2.2.2.2. Family

The patriarcal nature of the Proto-Indo-European family is seen in the asymmetry of **pħtḗr* (not necessarily biological, yuxtaposed to physical father **atta*) vs. **méħtēr*; *bʰréħtēr* (not necessarily related by birth) vs. **su̯esōr* (the 'feminine', **-sor*, of the 'own' group, **su̯e-*). Only the father can own, cf. **pħtri̯os* 'paternal, hereditary, ancestral' (cf. Lat. *patrius*, Skr. *pitr(v)ya-*, Gk. *pátrios*), while no equivalent appears for the mother. *Fraternal* groups, **bʰratri̯os*, do not necessarily share the same parents. Inheritance is also dominated by paternity rules (not necessarily by birth), reflected in the use of **su̯e* for terms of family and property.

The patrilineal system is evidenced by the widespread custom of marriage between cross-cousins, revealed e.g. by the term for uncle (Latin, *avunculus* lit. 'little grandfather') and in the correlative term for nephew (Lat. *nepos*, Gk. *a-nepsíos* 'co-nephew', i.e. 'cousin') subject to the strict *patria potestas*, and which takes on the meaning 'grandson' (or *vice versa*). The custom consists in marrying the daughter of the father's sister, hence the close patrilineal relationship established between the son of this pair, his grandfather, and his maternal uncle (Figure 2). The maternal uncle occupies then a particular position of authority and family ties similar to the father in Indo-European traditions.

Marriage is well defined in Lat. *uxorem ducere et nuptum dare*: it consists in *driving home* a woman, **u̯edʰ-* (cf. Cel. **u̯ed-o-* 'lead, bring together, marry', Gmc. **u̯edan* 'conjoin', Lith. *vedù* 'lead, marry', OCS *vedú*, Av. *vāδaiieiti*;

and derivatives OInd. *vadʰū́-* 'bride', Gk. *éedna*[iii] 'brideprice, wedding-gifts')
that another man—usually her father, or on his behalf her brother—solemnly
gives to the groom, **deʕʷ-* (cf. Lat. *dō*, Goth. *fragiban*, Lith. *išduoti*, Sla.
otŭdati, Gk. *doûnai*, Skr. *pradā-*). This implies that the woman enters the
condition of spouse, i.e. she does not do anything (such as a contract) to enter
the union, she merely changes condition; cf. Lat. *īre in mātrimōnium*, Av.
nāiri-ϑwanāi vādaya-; compare also Russ. *vyĭti zamuž*, or OInd. *vivāha-*
'wedding', lit. "deportation".
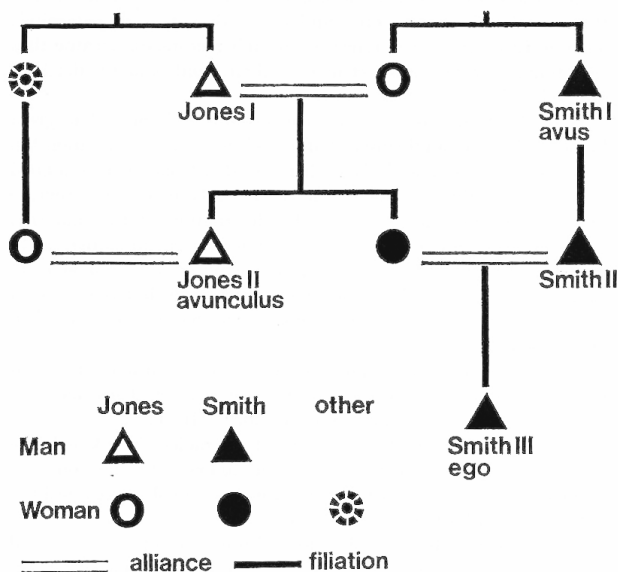
*Figure 2. In this traditional genealogical tree, the individuals are represented by points
(of different shape according to sex, and black or white according to family) and the
relationship by lines (of different design, according to the kind of relationship: filiation
or alliance). Schema from Benveniste (1969).*

The patrilocality of the Indo-European family also appears in vocabulary,
with terms referring originally to the husband's relatives, i.e. terms applied
strictly by the wife to her in-laws after entering the husband's family: father-

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[iii] Kortlandt considers Greek *éednon* 'dowry' more likely to come from **hu̯ed-no-
m*, in common with Sla. **věno*.

in-law (*suékuros*), mother-in-law (*suekrū́s*), brother-in-law (*daiu̯ḗr*), sister-in-law (*glī̄s*, *glōus*), wife of husband's brother (*i̯énatēr*), etc.

Fosterage, with terms derived from *atta-* '(physical) father', could have been an institution common for noble families, given the Greek, Celtic, and Germanic traditions.

2.2.2.3. Society and laws

The general social division is based on kinship, with basic organisational units (led by a master or lord, *-pótis*, and his wife *-pótni̯a*) as follows:

- The family or household, *dem-*; cf. PIIr. *dam*, NWIE *domos*, Gk. *dómos*, ruled by the *dems pótis*, cf. Gk. *despótēs*, PIIr. *dámspatiš*.
- The clan, *u̯eik-*, including different families in one settlement; cf. PIIr. *u̯aiĉas*, Gk. *u̯oîkos*, NWIE *u̯eikos* (Lat. *u̯īcus*, Goth. *weihs*, BSl. *u̯iś-*), PT *u̯i̯äike*. This organisational level was possibly succeeded in historic times by Gk. *pʰratría*, Lat. *co-uiria*. Ruled by the *u̯ikpótis*, cf. PIIr. *u̯iĉpátiš*, TochA *wikpots*, BSl. *u̯iśpatis*, Alb. *dzwāpt*.
- The tribe, *gen-*, based on kinship: cf. PIIr. *i̯antuṣ*, NWIE *genti*s, Gk. *genos*. The equivalent organisation in historic times is Gk. *pʰulé*, Lat. *tribus* (i.e. aggrupation of three territorial groups, based on root *bʰu-*). For a ruler of the tribe one coud reconstruct **gn̥h-pótis* based on Skr. Prajāpati < *pro-gn̥h-potis*.
- The 'country' or 'people', aggrupating different tribes; cf. PIIr. *dasi̯u*, roughly equivalent to European *teutā* 'people, tribe', Gk. *lā(u̯)ós* 'people'. This global unit was probably ruled by the *king*.

A tripartite internal division of society can be reconstructed for the Late PIE community, in functions and colours associated with them:

- Priests in white: **bʰleħg-men-*, cf. Skr. *brahman*, Lat. *flāmen* 'priest; sacrifice', Gmc. *blōtan-* 'sacrifice'.
- Nobles/warriors in red: no common reconstructible name, cf. Skr. *kṣattri̯a*, Av. *raϑaēštā*; possibly from *ner-* 'man' in NWIE, based on Umb. *ner* in the Iguvine tablets and the specialised meanings in Italic,

Celtic ('hero', 'strength', 'manliness, courage', etc.), or in Balto-Slavic ('anger', 'custom', etc.).

- Farmers (commoners) in blue: PIIr. from **u̯eik-* (cf. Skr. *vaiśi̯a*, Av. *vāstri̯ō fšui̯ant*); Gk. *geōmoroi, agroikoi, geōrgoi*; 'those who care for the livestock'; possibly **u̯īros* in NWIE, based on Umb. *ueiro* in the Iguvine tablets.

- Artisans are a fourth class, appearing at least in Indo-Iranian and Greek: Skr. *śūdrá,* Av. *hūiti*, Gk. *dēmiourgoí*.

The sceptre-wielder ruler, the *king*, 'leader of leaders', is a religious and political leader who sets rules and governs over a group of kinship-related peoples. The term was reinterpreted in each dialectal group, probably to adapt to different political and territorial organisations, although the root **reg-* can be traced back to the common stage (cf. Skr. *raj-*, later remade as an **-n-* stem): WIE **rēgs* 'ruler', who wields the **gʰazdʰ-o-* ('spear', a WIE substrate word, see below *§4.5.1.1. Substrate words*); Gk. **u̯anaks* (the *basileùs basiléōn*), who wields the *skḗptron*; PIIr. **kšatra*, cf. Skr. *ksatra*, Av. *xšaϑra* (*xšāi̯aϑii̯a xšāi̯aϑii̯ānām*).

The king sanctions (with a sign of the head) and executes under divine authority; he is imbued with privilege, **gerħ-* (cf. Gk. *géras*, Gmc. **kar-ilaz*, Toch. B. *śrāi̯*, etc. originally 'old, adult'), and honoured with respect, **kʷei-* (cf. Gk. *timḗ*, Skr. *cai̯a-*); he has the power **kretus* (cf. Gk. *kratús*, PIIr. **krátuš*, Gmc. **harduz*).

The established legal system, **i̯eu̯ōs* 'justice, law' (cf. Lat. *iūs*, Cel. **i̯ou-dos*, Skr. *yós*, Av. *yaoš*) is 'formulated', **deik-*, and is distinct from the natural order, **r̥tús* (cf. PIIr. **r̥túš*, Gk. *artúō, artḗ*, Lat. *artis, artus*). It is composed of intra-family law, **dʰehmn̥-* (cf. PIIr. *dʰā́mā*, Gk. *tʰḗma, tʰḗmōn*, Ita. **fāmen*), and inter-family law, **diks* (cf. Gk. *díkē*, Skr. *diś*, Lat. **dix*). The magistrate is the one who 'formulates', **-dik-*, or 'moderates', **-med-*. Damages may be compensated, **sark-* (cf. Lat. *sarcīre*, Hitt. *sar-ni-k-*). The divine law is *the word*, **bʰeħ-* (cf. Lat. *fās*, Skr. *bʰā́ṣā*; also Gk. *pʰḗmē*, Lat. *fāma*).

2.2.2.4. Ritual and religion

Religion is concerned with the sacred, in turn defined by a pair of positive, *that which is imbued by divine presence*, *kᵤentos* 'holy, sacred' (cf. PIr. *ĉᵤanta*, Gmc. *hunslą*, PBSl. *śᵤentas*); and negative, *that which is forbidden to contact humans*, 'worship, sacrifice', *ịag-* (cf. PIIr. *ịaĵnás*, Gk. *hágios*, *hagnós*, Lat. *iēiūnus < *ịag-ịūnos*). The act of pouring (libate), *gʰeu-*, a libation, *gʰutós* (cf. Skr. *hutá*, Gk. *kʰutós*, Gmc. *gudą*, Lat. i-stem *fūtis*; originally possibly in -*m-*, *gʰu-m-*). The oath consists in pronunciating solemnly, *hᵤogʰ-* (cf. Skr. *óhate*, Gk. *eukʰomai*, Lat. *voveō*, Arm. *gog*). The prayer consists in asking, *gʷʰédʰ-ịe-* (cf. PIIr. *jʰádʰịati*, Cel. *gʷedịeti*, Gmc. *bidịaną*, among other derivatives), especially bent on the knees (cf. Lat. *supplicō*, Skr. *jñu-bādʰ-*, OE *knio-beda*). The ritual or sacred place, *dʰehs* (cf. Gk. *tʰeós*, Phryg. *deōs*, Arm. *dʰēses* Lat. *fēriae, fānum*), is related to the verb 'do', *dʰeh-*.

The creation myth involves a primaeval twin, *ịemos*, being sacrificed by a primaeval man, and carved up into parts that make the physical or social world, from a world that had no 'earth below' or 'heaven above', no 'day (light)' or 'night (moon)'. A 'world pillar' holds the 'stone sky', and at its base the cosmic serpent guards the elixir.

The main immortal gods, *deiᵤós* (from the same root for 'shine' as the word for the sovereign god), their accoutrements and aspects of their person are described as being of gold, they meet and debate in assembly on high ground, ride horses, can transform into animals (like birds), and they eat nectar, *ņmŕtom*. The main gods—opposed to the antagonist *former gods*—include Father Sky, *dịḗus pḫtḗr*, the head of the pantheon; the Sun, *sóḫuḷ*, envisioned as a horse-drawn chariot ride, 'the wheel of the sun' (cf. Skr. *sū́rịasịa cakrás*, Av. *zaranii.caxra-*, Gk. *hēlíou kúklos*, OIce. *sunnu hvél*, OE. *sunnan hweogul*); the Dawn, *ḫeusōs*; the divine twins (Graeco-Roman *Castor and Pollux*, the *Dioskouroi*, or Skr. *Aśvins*, Ltv. *Dieva deli*, Lith. *Dievo sūneliai*), and also known in Late PIE were the Mother Earth, *pḷtḫéᵤiḫ méḫtēr* (originally from

'flat, broad; hence country'). Related to the divine nature are also the good companion, **ar̥i̯omen* (cf. Skr. *ar̥i̯aman*, Av. *airiiaman*, Gaul. *Ariomanus*), associated with the IE cosmogony, and the divine smith, **l̥bhús* (cf. Skr. *r̥bhu*, possibly related to Gmc. **albiz* 'elf').

Interesting is the reconstruction of 'fire' and 'water' each with a pair of terms, one of animate gender, *hn̥gʷnís – ħeps*, and one of inanimate gender, **péħu̯r̥ – *u̯ódr̥*, which suggests the worship of both as animate beings, apart from their use as *substances*. These opposing elements are further associated with a divine figure 'grandson (or nephew) of the waters' (cf. OInd. *Apā́m Napāt*, Av. *Apą̄m Napāt*, also Lat. **Neptonos*; dubious is OIr. *Nechtan*). The myth of the theft of fire from the gods to give them to the humans also appears to be a common IE myth (Gk. *Promḗtʰeús* 'the one who steals', cf. OInd. *pra matʰ-* 'destroy').

The most thoroughly reconstructed Indo-European legend, thanks to the research of Calvert Watkins, is the dragon-slaying myth. It tells the story of a monstruous serpent that hoards the water (the *treasure* whereby wealth and nourishment are allowed to circulate), so the god must battle to restore the natural order. This myth is usually associated with the Stormgod, the god of thunder and lightning, in Anatolian **tr̥ħu-ent-*, (from **terħ*, 'cross over, pass through, overcome'), who uses his magical weapon to try and slay the dragon. Although he is defeated first, he succeeds the second time, after drinking an intoxicant which gives him strength—a drink derived from root **seu-* 'press out, extract' (cf. PIIr. *sáumas*, Gk. *húō*, Lat. *sucus*). This myth is encapsulated in the alliterative formulaic phrase **gʷʰen-t ogʷʰim* '(he) killed the serpent'.

The trifunctional ideology of Georges Dumézil, evident in the social division, may be represented also among the gods, as a division into the sovereign god (of religion), the god of war, and the god of the common people, possibly identified with Father Sky, the Stormgod, and the Sun, respectively. Regional variations would develop continuously, depending on the environment, specific substistence economy, sociopolitical upheavals, etc.

Each of the three main gods would have received a different kind of offering in the rituals of triple animal sacrifice.

Death is a sleep, but mainly a journey of the soul across land which culminates on a body of water across which the soul has to be ferried. At the end of it there is a gate to the underworld guarded by a dog; beyond it there are cattle pastures with herds, where the soul joins the fathers. The journey could be arduous, and requires prayers and oferings of food on the part of the soul's living kin for a period of time, including the deposit of various goods that could be needed on the jorney.

Spells and incantations represent the *best* of the three categories of medical treatment (which is witnesses to the power of the word for Indo-Europeans), the others being the use of a knife or surgical instrument, and the use of herbs or drugs.

Beyond myths, an important part of the oral culture were folk tales, some of which have survived to this day. The most common one reconstructible for Late PIE is "The Smith and the Devil" (MFTD 330), the tale of the blacksmith who strikes a deal with a malevolent supernatural being (da Silva and Tehrani 2016). The smith exchanges his soul for the power to weld any materials together, which he then uses to stick the villain to an immovable object (e.g. a tree) to renege on his side of the bargain.

2.2.2.5. Poets and fame

The poet is specially trained in the art of the word, and has therefore a prevalent role in IE society. There are many terms associated with his mystified work with the *word*, such as 'tell', 'remember', 'weave', 'construct', etc. He sings the praises of heroes, kings, and gods, composing hymns to ensure fame, especially dear to warriors.

Fame was valued above life, because it guaranteed immortality in the memory of later generations, and it could be obtained in combat and in poetry. Hence the reconstructible terms *kléu̯os n̥dʰgʷʰitom* 'immortal fame' (cf. Skt. *śrávas ákṣitam*, Gk. *kléos ápʰtʰiton*), **mégʰ kléu̯os* 'big fame', **kléu̯esʰ ħnrṍm*

'famous deeds of men, heroes' (cf. Gk. *kléa andrōn*, Ved. *śrávas nr̥ṇā́m*); *u̯ésu kléu̯os*, good fame (cf. Av. *vohu sravah,* OIr. *fo chlú*).

Bestowing a name was the subject of a ritual, *néʕʷmn̥ dʰeh-*, literally 'make a name', which happened around nine days after birth, when the mother had recovered, was bathed, and the child was named. Important was the fame attributed to the name (cf. Gk. *onomáklutos* 'famous in name', Toch. A *ñom-kli̯u* 'name-fame', OInd. *śruti̯am nā́ma* 'famous in name', or the OIr. correspondence between *everlasting name – everlasting fame*).

A very common type of name for Indo-Europeans was a bipartite compound X-Y where one or both compound members are concepts, virtues, or animals important in Indo-European society, such as 'fame', 'guest', 'god', 'strength', 'protection', 'battle', 'people', 'man', 'hero', 'wolf', 'dog'. Names of sons were usually picked to ressemble the names of their fathers, by recycling one of the compound members. Nicknames were also common and were typically formed by truncation and other modifications.

Oral-formulaic poetry uses formulaic language, fixed words or groups of words that have the function of filling out a verse-line (cf. Homeric epithets '*swift footed' Achilles*, *'rosy-fingered' Dawn*). Poets manipulated these formulae, mixing old and new ones, and using an obscure and difficult language, linking words with relevant concepts.

A comparison of the metrics has given two distinct poetic forms (Fortson 2010):

- The more archaic one, the strophic style, consists of strophes of short lines whose structure is determined by grammatical and phonetic parallelism, without a fixed line length or syllable count (it is neither rhythmic nor prose), and is characteristic of archaic liturgical and legal texts and certain mythological narratives. Grammatical parallelism and repetition are very frequent. A good example of this form is the following stanza from a hymn of Zarathustra in Gatha-Avestan (Yasna

44.4); a line consists of four plus seven syllables (with a caesura after the fourth syllable):

Tat ϑvā pr̥sā	*r̥š mai vauca, Ahura:*
Kas-nā dr̥ta	*zam ca adah nabās ca*
avapastaiš,	*kah apah urvarās ca?*
Kah va^ʾatāi	*vanmabi̯as ca i̯augi āsuu?*
Kas-nā vahauš,	*Mazdā, dāmiš manahah?*

This I ask Thee,	tell me truthfully, O Lord:
Who has upheld	the earth below and heavens [above]
from falling down	who the waters and the plants?
Who to the wind	and the clouds has yoked the swift [horses]?
Who, Wise One, is	the founder of Good Thinking?

- A more complex form consists of verse-lines of affixed number of syllables and a rhythm that was quantitative, i.e. based on a regular alternation of heavy and light (i.e. ending in short vowel) syllables. Lines were a long version of ten to twelve syllables, and a short of seven or eight syllables, grouped into strophes (stanzas) of three or four lines each. The longer lines had an obligatory caesura (break) neighbouring the fifth syllables. The last syllable could be either long or short. Meillet was the first to see an exact similarity between the eleven syllable line used by the Greek poetess Sappho and the *triṣṭubh* of the Rigveda (¯ long, ˘ short, *x* long or short, | caesura; *a* begins the cadence);
  - *triṣṭubh* x x x x | x ˘ ˘, ¯ ˘ ¯ x
  - Sappho ¯ ˘ ¯ x | ¯ ˘ ˘ ¯ ˘ ¯ x

2.2.3. Late Indo-European dialects

Late Proto-Indo-European must have split quite early into two main dialectal regions (a *Northern* and a *Southern* or Graeco-Aryan one) during the common Indo-European stage, before the separation of Tocharian, which is determined based on phonetic, lexical, morphological, and syntactical features[iv].

2.2.3.1. Graeco-Aryan

A Graeco-Aryan or Southern Indo-European group, ancestor of Palaeo-Balkan and Indo-Iranian dialects, are supposed to have separated later than the Northern group, evidenced by their shard innovations. They show the following traits (Adrados 1998):

- Conservatism in the vocalic alternation system.

- Maintenance of a rich athematic verbal system.

- Better preservation of the nominal declension in consonant.

- Similar pronominal system.

- Mediopassive endings standardised in *-i*.

- Thematic and athematic verbal inflection.

- Innovative augment in *é-* (not obligatory in the common stage).

- Full-fledged perfect mediopassive forms.

- Continuity of the aspectual opposition of *bʰére* vs. *tudé*.

- Strong coincidence between the oldest attested branches (Greek and Indo-Iranian) in the verbal system, including tenses and moods.

- Further (dialectal) development of the inherited passive 'function'.

- Extensive use of middle formation *-mhno-*.

[iv] The traditional division into a 'Centum' and a 'Satem' dialects should be rejected, because satemization trends are late and affected each individual dialect differently, apart from the methodological pitfalls involved in the reconstruction of three series of velars for the parent language (see below for information on the three-dorsal theory).

- Mythological and poetic similarities (West 2007), although the earlier attestation of Greek and Indo-Iranian compositions may influence this assessment.

Palaeo-Balkan peculiar laryngeal evolution (see *§II.2. Laryngeal evolution*), points to an early Indo-Iranian–Palaeo-Balkan separation within an LPIE community in contact.

Lexical isoglosses, especially informed by Greek–Aryan parallels, include (Martirosyan 2013):

- Gk. *álpʰiton, álpʰi* <*ħelbʰit* 'barley-groats', with cognates in Alb. *elb* ~ Pashto *ōrbaše*, Wakhi *arbəsi*.
- Gk. *daitrón* 'portion' ~ Skr. *dā́tra-* 'portion'.
- *dē -* 'bind', cf. Arm. *ti-*, Gk. *déō*, PIIr. *dā-*, Alb. *dúaj*; possibly also in Hitt. *tiie/a-*ᶻⁱ 'bind?'.
- *dʰm̥bʰ-* 'tomb', cf. Arm. *damban*, Gk. *tapʰḗ*, Av. *daxma-*.
- Gk. *dokʰmós* 'oblique, slant' ~ Skr. *jihmá-*.
- Gk. *elelíkʰtʰōn* 'earthquake' ~ Skr. *rejata kṣā́ḥ* 'the earth shaked'.
- Gk. *epitíthēmi* ~ Skr. *api-dʰā* 'to cover, shut'.
- Gk. *eumenḗs* 'well-disposed', Skr. *sumánas*.
- Gk. *bēma* ~ Av. *gāman-* 'step'.
- *gerħ-onts* 'old', cf. Skt. *źárat-* 'old; old man', Av. *zarəta-* 'old, infirm'm Gk. *gérōn*, gen. *gérontos* 'old man', Arm. *cer-un(-i)*; also here *gerħ-s* 'old age', cf. Arm. *cer* 'old man, old', Gk. *géras*, Skt. *źarás-*, Av. *zar-*. Compare also Toch. B *śrāñ* <*gerants*, hence likely an *eastern* isogloss rather than Graeco-Aryan.
- *gʷʰer-os-* 'warmth', cf. Skt. *háras-* 'heat', *gʰr̥ṇá-* '(intense) heat', Gk. *tʰéros* 'summer', Arm. *ǰer* 'warm'.
- Gk. *heîma* 'garment, clothes' ~ Skr. *vásman-*.
- Gk. *katʰarós* 'limpio' ~ Skr. *śitʰirá-* 'loose, lax, slack' (dubious etymology).

- Gk. *kekadménos* 'surpassed, excelled', Skr. *śaśad-*. Maybe here also Arm. *antsav* 'passed'.

- **k(e)r-i̯ā-* 'to tie, attach, bind', cf. Skt. *ā́-śīrta-*, PIr. **sar-*, Arm. *sarem*, Gk. *keránnumi*.

- Gk. *kērúks* ~ Skr. *kārú-* 'singer'.

- **mŕ̥to-* 'mortal' hence 'man', cf. Skt. *márta-* 'mortal; person' Av. *marəta-* 'person', Gk. *mortós* 'person; mortal', Arm. *mard* 'person'. In CIE, **mŕ̥-to-* was probably related simply to 'death' (for the origin of LPIE **mer-*, see above *§2.1.2. Anatolian evolution and contacts*).

- **ħaig-* 'goat', cf. Av. *izaēna-* 'made of leather', Gk. *aíg-* 'goat', Arm. *ayc* 'goat'.

- **ħelh-na-* 'to grind', cf. PArm. **al-n*, Gk. *aléō*, PIr. **arna-*; and derivative **ale-tri-* 'mill', cf. Arm. *aławri*, Gk. *aletrís*, PIr. *arϑra-*.

- Gk. *plḗthō* 'to fill up' ~ PIr. **fraHd* 'increase'.

- **pl̥hu̯-* 'Pleiades', cf. Arm. *alaw(s)unk*, Av. *paoiriiaeiniias*, Gk. *Pleiádes*.

- **polhi-o-* 'wave; grey hair, old' cf. PArm. **(p)olíi̯a-*, Gk. *poliós*, PIr. **pari̯a-*, maybe also here Skt. *palitá* 'grey, grey of old age, aged'.

- **(p)ste/ēn(-o)-* 'breast of a woman', cf. Skt. *stána-* 'breast', Av. *fštāna-*, Gk. *stēníon / stētʰos* 'breast', Arm. *stin* 'breast of a woman'; probably also Toch. A *päśśäṃ*, B *päścane* dual 'woman breasts', hence an *eastern* isogloss. Cognates in other dialects with initial **sp*.

- **r̥s-en- <*u̯(e)rsēn*, 'male, male animal', cf. (for zero-grade form and loss of initial **u̯-*) Arm. *aṙn* 'wild ram', Gk. *arsēn* 'male', Av. *aršan* 'male', Skt. *r̥sabʰá-* 'bull'.

- Gk. *hamártē* 'together, at once' ~ Skr. *R̥ta*.

- Gk. *itʰús* 'straight, direct' ~ Skr. *sādhú-* 'straight, right'.

- Gk. *oîmos <*sħoimó-* 'chant' ~ Skr. *sāman-* 'chant', Av. *hāiti-*.

- **sokʷā* 'company', cf. *Gk. opáōn*, Myc. *oqawoni* 'comrade', Med. *Achemenidae*.

- **(s)peud-* 'zeal, haste', cf. Arm *p'oyt'*, Gk. *spoud-ḗ*, MPers. *pōy-* 'to run'.

The term **pekū* shows further specialisation proper of a sheep–goat herding economy, probably attributable to this stage; cf. for Indo-Iranian OInd. *páśu*, Iranian **páĉu* (although the reference to cattle is not lost in the ancient meaning, and is inherited in Uralic borrowings, see *§3.5.3. Contacts with Indo-Iranian*), as well as Arm. *asr* 'wool, fleece', and possibly Alb. *pile* (Benveniste 1969). Gk. *próbaton* < **pro-gʷm̥-t-* lit. 'forward-going', hence 'moveable property, livestock, sheep' must also be included here. The trifunctional sacrifices of animals include goat, sheep, and cattle, pointing to their hierarchy in economic weight; so e.g. in the Old Indic *Sautrāmaṇī*, or in the sacrifices of ram to Poseidon found in the Odyssey.

2.2.3.2. Northern Indo-European

A Northern Indo-European group, ancestor of Pre-North-West Indo-European and Pre-Tocharian, includes the following common isoglosses, distinct from the Graeco-Aryan group (Adrados 1998):

- Similar evolution of laryngeals in certain environments (see *§II.2. Laryngeal evolution*).
- Maintenance of the archaic semithematic inflection.
- Verbal ending *-r* as impersonal and middle-passive endings.
- Specific genitive singular isoglosses in **-ō*, maybe **-ī* (although more likely from different, late developments).
- Innovative fusion of ancient preterites in a perfect system.

Tocharian is connected more strongly with North-West Indo-European than with any other group through a set of lexical isoglosses, that also often connects it to European dialects. Examples include:

- PT **arë* 'plough', cf. Lat. *arāre*, OIr. *airim*, Goth. *arjan*, Lith. *ariù*, OCS *orjǫ*, Gk. *aróō*, Arm. *arawr*.
- Toch. A *āk*, Toch. B *āke*, 'end, tip' < LPIE **hakos* < **χekos-* 'sharpness' > 'shaff'. Compare with Lat. *acus, -eris* 'husks of grain or

beans; chaff', Goth. *ahs*, OHG *ehir* 'ear of corn', Gk. *akostḗ* 'barley', *tanuḗkēs* 'with thin edge'. Interesting is that Tocharian shows the ancient abstract meaning of 'sharpness', in contrast to the meaning evolution as 'barley' found in younger western languages.

- PT *entu < LPIE **honV-tō(d)* 'then' as Gk. Att. *enteûtʰen*, Ion. *entʰeûten* (from *entʰe + *u* + -*tʰen*), cf. Gmc. *anda/*unda 'and' (Eng. *and*, German *und*) from *hondha/*hṇdʰa*. Maybe here also Lusitanian *indi* 'and' (Blažek 2006), although probably from *indi (cf. Lat. *inde*) and Messapic *anda* 'and', with a locative particle similar to Gk. *éntʰa* (Adams 2013) pointing to a similar meaning evolution in Northern IE, although possibly parallel developments Tocharian–NWIE.

- Toch. B *kālśke*, *kāl̦iśke* 'youth, young brahmin', cf. Gmc. *xaleϑ* – *xaluϑ* 'man, hero', OIr. *caur*, gen. *curad* 'warrior, hero'. Probably from a non-IE source, pointing to an original *kalut/*karut* (Kroonen 2013).

- Toch. AB *kroṅśe* 'bee', cf. Lat. *crābrō* 'hornet' together with OHG *hurnǖz*, *hornaz* 'hornet', Lith *šìrše*, Russ. *šeršen'* 'hornet'.

- Toch. B *laks* 'fish', cf. Gmc. *laxsa* 'salmon', Lith. *lašišà* 'salmon', Ltv. *lasis*, OPru. *lasasso, Russ. *losós'*, *lósos'*.

- Toch. A *mañ* B *meñe* 'moon, month' cf. Lat. *mēnsis*, Umbr. *menzne*, OIr. *mí*, gen. *mís*, Goth. *mēna*, Lith. *mḗnuo*, Gk. *meís*, Arm. *amis*, Alb. *múaj*.

- Toch. AB *oko* n. 'fruit, effect', cf. Lith. *úoga*, OCS. *agoda*, Russ. *jágoda* 'berry', and derived NWIE **ag-r-o-* 'tree fruit' (see *§3.2.4.5. Root variant or parallel root*).

- Toch. A. *śuk*, *tskāt*, a root verb **deuk-e-* 'pull', with a clear NWIE distribution (see *§3.2.4.1. Remade Late PIE stems*), although potential cognates are found in Albanian and Greek, too.

- Toch. AB *tek-* 'touch', cf. OLat. *tagō* 'I touch', OIr. *tais*, OE *ðaccian* 'touch lightly', and also Gk. *tetagṓn* 'having caught, grasped'.

- Toch. A *tuṅkᵤ*, Toch. B *taṅkᵤ* 'love' < PT **tənkᵤ* < **tn̥g⁽ʰ⁾-u-* (Kümmel 2016). For West Indo-European **tong⁽ʰ⁾-éie-*, cf. Gmc. **ϑankᵢan-*, Lat. *tongēre*.

- Toch. B *ᵤalo*, Toch. A *ᵤäl*, obl. *lānt-* 'king' < **ᵤal-*, cf. OIr. *fal-n-* 'rule, reign', *flaith* 'prince', W *gwlad*, Bret. *gloat* 'country', Lat. *ualeō* 'I am strong', Osc. *ualaemom* 'best'. Also belonging to this isogloss **ᵤal-dʰ-* 'rule', cf. Goth. *waldan* 'govern', Lith. *véldu* 'I rule, own' OCS *vladǫ* 'I rule, own'.

- Toch. A *ᵤäs*, B *ᵢasa* 'gold', cf. Lat. *aurum*, Lith. *áusas*, OPru. *ausis*.

2.2.4. Contacts of Late Indo-European with Uralic

Candidates for borrowings of this period include:

- PU **kala* 'fish', maybe 'catfish' ~ LPIE **(s)kʷal-o-* 'large fish' (cf. Av. *kara-*, Lat. *squalus*, Gmc. **xʷal-a-*, Bal. **kal-a-*). The rejection of Gk. *áspalos* as part of this group (Beekes 2010) and the vocalism questions the 'originality' of the version in **s-* and its internal derivation by Kroonen (2013) from **kʷelh-* 'turn' < PIU **kulχ-* 'turn, move around' (Hyllested 2009), cf. PU **kulke-* 'walk around', PYuk. **kile* 'wade'), narrowing this word to a *northern* influence. If accepted, it would be interesting because of the adopted **kʷ*, from a consonantal (i.e. Samoyedic *q*/*k*) perspective (Bjørn 2017).

- PFU *śala* (cf. Finn. *salava*, *salaja* 'salix fragilis l. caprea', Mordv. *śelej*, *śeleŋ*, Moksha *śäli*, Mari *sol*, *solo*, Hung. *szil*) ~ NWIE / Balkan **sal-ik-* 'willow' (see *§3.2.5.1. Substratum common to NWIE and Palaeo-Balkan*). Yukaghir Kolyma *šāl*, Tundra *sāl* 'tree' (Blažek 2018), may point to a shared Indo-Uralic root rather than a loanword, although original vocalism is unclear.

- PF **ᵤerča* 'body covering, clothing' (cf. Finn *verha*, *verho*, Est. *võru*, *varu*, *vahru*, Mord. *oršta-*, *orča-* (E), *šča-*, *uršta-*) ~ LPIE **ᵤers-* 'top, upper', which can more likely be related to an Indo-Uralic stage, would imply—if a loanword—a borrowing from LPU.

- Dubious is the origin of West IE **akʷā* 'water' found in Gmc. **aχʷō-* and Ita. *akwā-*, which may be a loan from a non-IE language (de Vaan 2008). It may be tempting to try to find it in PFU **śä-cä* 'flood water' (~ pre-NWIE ***ha-kʷa-*), or in PFU **ša-ra* 'flood, lake' (~ pre-NWIE ***ha-kʷro-*, cf. Gmc. **agra-* 'flood'). However, another, later, non-Uralic substrate language near the lower Danube seems more likely as a direct and late origin of the word. **akʷā* is traditionally claimed to be a variant from PIE **ap-* 'water' (Kroonen 2013) or **hegʷʰ-* 'drink', but they have survived in different regular cognates, cf. Ita. **āpā-* 'water', **ēbrius* 'drunk'.

2.2.5. Schleicher's fable in Late Proto-Indo-European

Common Indo-European

ʕʷeu̯is heku̯ōs-kʷe

ʕʷeu̯is kʷoi ħu̯l̥hneħ ne hest	*heku̯oms he ʕʷeʕʷokʷe;*
tom ʔgʷr̥ħeum u̯ogom u̯egontm̥,	*tom mgeħm̥ borom,*
tom u̯ihrom hōku berontm̥.	*u̯ēukʷt ʕʷeu̯is heku̯obos:*
"ħedgo hme kērʔd,	*ħnerm̥ u̯iʔdenti heku̯oms ħeʔgontm̥."*
u̯eukʷn̥t heku̯ōs: "klu(dʰi) ʕʷei!	*ħedgo n̥sme kērʔd u̯iʔdenti,*
ħnēr, potis, ʕʷu̯i̯om ħu̯l̥hneχm̥	*su̯e gʷermom u̯esti kʷr̥néuti,*
ʕʷu̯i̯om-kʷe ħu̯l̥hneħ ne hesti."	*Tod keklu̯us ʕʷeu̯is ħʔgrom bēu̯ʔgt.*

Early Disintegrating Indo-European

hou̯is heku̯ōs-kʷe

hou̯is i̯oi u̯l̥hnah ne hest	*heku̯ons dedorke;*
tom gʷr̥hum u̯ogʰom u̯egʰontm̥,	*tom mgahm̥ bʰorom,*
tom u̯ihrom hōku bʰerontm̥.	*hou̯is heku̯obʰos u̯ēukʷet:*
"hagʰnutoi (e)moi kērd,	*(a)nerm̥ u̯identei heku̯ons hagontm̥."*
heku̯ōs u̯eukʷn̥t: "kludʰi hou̯i!	*hagʰnutoi nos kērd u̯identei,*
(a)nēr, potis, hou̯i̯om u̯l̥hnahm̥	*subʰi gʷʰermom u̯estrom kʷr̥neuti,*
hou̯i̯om-kʷe u̯l̥hnah ne hesti."	*Tod keklu̯u̯ós hou̯is hagrom bʰēugt.*

Notes:

- It is unclear how the proposed velar evolution may have impacted the described laryngeal evolution, and *vice versa*. In this text, a laryngeal uvular-to-pharyngeal evolution is assumed for CIE, while the shift to the classical velar distribution is attributed to Disintegrating Indo-European—following to some extent Kortlandt (2013)—at the same time as the merging of laryngeals. For *u̯l̥hnah* < **ħu̯l̥h-neħ*, two alternative outputs found in late DIE dialects were *u̯l̥nā* / *ulā́nā* (see *§II.2. Laryngeal evolution*)

- The verb *hes-* with a possessive meaning is found in different ancient IE languages accompanied by genitive or dative, with subtle differences; cf. OInd. *ásmi* + gen., dat., Lat. *sum* + dat. (but cf. *cuius esse*, comparable to Gk. *einai tínos*), Gk. *eimí* + gen. (general possession or connection), dat. (less close or necessary relationship); compare also Russ. *u menya* (gen.), Ltv. *man* (dat.) *ir*. Originally, the genitive seems to be a marker of a more *stative* possessive, and it can also lend an additional partitive meaning when it substitutes another case. The dative seems to give a more *transitive* possessive meaning, denoting something at the disposal of the possessor, or temporarily fallen to his share, maybe nearer to 'belong, acquire, be given'. The dative could thus give more emphasis to the thing owned, unlike the genitive, which lays stress on the possessor. Furthermore, there are different nuances that can be expressed by translating singular or plural. In the horses' speech, the plural has been selected for both final sentences, to insist on the fact that *all sheep* are left without wool, but the use of the singular (like the use of dative with *es-*) would have similar—albeit not interchangeable—meanings.

- CIE *héku̯ons* comes probably from an older **héku̯o-m-s* formed by the accusative singular ending *-m* and plural ending *-s*; compare, for

an older form in *-ms*, PA ****héku-m-s*, in Hitt. *ekku* (Kloekhorst 2008; Kortlandt 2013).

- **dedórke* probably carried the accent on the root, as usually reconstructed following Indo-Iranian examples (Kümmel et al. 2001). The alternative **dédorke* is also possible, and possibly the original form, based on the controversial *kʷetu̯óres* rule. The more commonly reconstructed term for the fable, **u̯óide*, originally a perfect of **u̯eid-* 'see', had already by Late PIE adopted a slightly different meaning, 'know', potentially from a previous 'state derived of having seen'.

- The accusative **tom* has been used, instead of the nominative **so*, because they are the objects seen (i.e. it is referring to acc. **héku̯on*). However, the use of nominative **so* (referring to nom. **héku̯os*) could also be right, especially from a historical point of view, when it was not yet inflected; like uninflected **i* instead of **i̯ós-* (Kortlandt 2010).

- **mégah* has been declined following Late PIE dialectal examples, although it was likely indeclinable in earlier times (Pooth 2017).

- Obliques in *-bʰ-* have been used (**subhi*, **heku̯obʰos*), following the Italo-Celtic and Graeco-Aryan examples—and thus the most likely NWIE reconstruction—against dialectal *-m-* found in Germanic and Balto-Slavic, which are probably influenced by a common substrate to both languages (see *§4.5.3. Northern European*).

- Aorists are reconstructed without augment in *é-*, proper of some late Graeco-Aryan dialects (Meier-Brügger 2003).

- Nominative **kērd* is reconstructed with a **-d* at the end, although it was possibly mute (Ringe 2006).

- For present stem **kl̥néu-/kl̥nu-*, 'hear', cf. OIr. *ro-cluinethar*, Toch. B *kalnem̥*, A *kälniñc*, and also Skt. *śr̥ṇóti*, Av. *surunaoiti*. For verbal stem **klu-*, frequently used when reconstructing the fable, the original meaning appears to be 'be named, be renown', cf. Av. *sruiiē*, 'be famous', Lat. *clueō* 'be named, be famous', South Picene *kduíú* 'be

named' (Kümmel et al. 2001). The use of optional imperative suffix *-dhí* seems thus appropriate when stem **kl̥néu-* is used for the present—as it is done here—but the root **klu-* is used for the imperative.

- It is likely that the appropriate reconstruction for later stages is **hágros* (Ringe 2006; Nikolaev 2009) over the more 'traditional' **hagrós*.

2.3. Late Uralic

2.3.1. Late Uralic evolution

Features of Late Proto-Uralic (LPU) may include (Janhunen 1982; Comrie 1988; Sammallahti 1988; Raun 1988):

- General OV order. Preposing of major constituent before the finite verb for purposes of topicalisation.
  - o Development of agreement between attributive adjective and head noun in noun phrases probably begins at this stage, and affects demonstratives and a few other morphological forms.
- Plural markers develop, with up to ten different class markers *-a* (*-i̯a*), *-ć*, *-i* (*-i̯*), *-k* (*-kk*), *-l*, *-m*, *-n*, *-r*, *-s*, *-t*, to express *Kollektivpluralität*.
- Cases:
  - o Accusative plural in **-m* probably begins to expand during the disintegration stage, not reaching all dialects.
  - o Genitive in **-n* begins to lose its distinct form, due to the weakening of final consonants.
  - o Development of essive starts probably at this stage, with nouns marked before adjectives. The marker probably goes back to locative **-na*, alternating with a translative **-ks* (de Groot 2017).
- Possessor is still marked with the genitive, but a new trend begins whereby the head noun has a possessive suffix.
- Possessives:

- o General weak initial tendency for possessive suffixes to be replaced by possessive pronouns, maybe under the influence of neighbouring Indo-European languages.
  - o Case suffix precedes the possessive suffix.
- Element *-nä* from 'I' and 'thou' becomes a pronominal suffix.
- Verbs:
  - o Development of mood markers, such as imperative and negation in *-k*, probably from an original emphatic function, and identical with the suffix of deverbal nouns.
  - o Subjunctive in *-ne-*.
  - o Past tense developed late, a common ending is to be found in *-ś*, and likely *-sa/-sä*.
  - o Late Uralic past perfect tense (with endings followed by a vowel, as in the case of possessive suffixes) disintegrates to form the objective conjugation in certain branches.
  - o Negative verbal stem *e-* as documented in PFP and Samoyed, with inconsistent attachment of verb categories to the negative auxiliary at this stage; probably at this stage also the *-lV* added to the negative verbal stem in prohibitive expressions.
- Diminutives *-kV*, *-ćV*; also *-ntV*, *- ŋkV*.
- Suffix couple *-ćV-* ~ *-śV-* with many different meanings (duration, repetition, conative, momentary, reflexive, reciprocal, passive, onomatopoetic) point to its late development.

2.3.2. Late Uralic culture

Linguistic palaeontology is much less helpful to locate the homeland in the case of Uralians, because of the limited ancient data, and the many loanwords (and borrowing stages) from neighbouring Indo-European languages. Nevertheless, there are some important clues.

2.3.2.1. Metallurgy

The Common Uralic terms **pata* 'clay pot', and **u̯äśkä* 'copper, metal', combined with the different layers of Late PIE borrowings, point to a *terminus ante quem* ca. 3500 BC for intense Proto-Uralic–Proto-Indo-European contacts (Kallio 2017), even without taking into account a potential Proto-Indo-Uralic community.

Especially relevant is the survival of the term for 'copper', the most important material for metallurgy during the Eneolithic, Chalcolithic, and Bronze Age. To this word we may add two terms for 'tin' or 'lead, PFU **äsa* and **u̯olnë*, and the compound **äsa-u̯äśkä* which clearly denotes an alloy of copper such as tin–bronze (Parpola 2013). Quite old are also PFP **irχeni/ürχeni* 'copper', **sula* 'melt', and various terms for 'axe', 'hammer', and other tools.

The loan of PU **u̯äśkä* into Tocharian—probably by expanding Pre-Samoyedic peoples (see *§4.19.2. Samoyedic evolution*).

its survival into all Uralic branches (which have adopted many words from neighbouring languages for basic economic terms) points to the long-lasting relevance of copper and metallurgy in all expanding Uralic groups, as well as to their mastery in it compared to neighbouring peoples. Another early IE loan witnessing the important role of Uralic metallurgy is found in PU **u̯eŋći* 'knife', borrowed in Proto-Indo-Iranian (probably during the vocalization of sonorants, see *§3.4.1. Indo-Iranian evolution*), appearing later as PIAr. **u̯āćī* 'knife, awl, axe'.

Since the Don–Volga–Ural area of the North Pontic–Caspian steppes can be said today with a great degree of certainty to be the homeland of the Middle and Late Proto-Indo-European communities, the North Pontic Middle and Late Eneolithic forest-steppe cultures can be confidently argued to correspond to the Proto-Uralic community. Rich copper assemblages with an origin in south-east European centres are known from the Dnieper and Donets basin—in contrast with the Khvalynsk area, which shows poorer copper furnishings—

and technological innovations follow the same routes (Figure 3), pointing to continued trade contacts (Rassamakin 1999). The estimated split of Proto-Uralic into Finno-Permic and Ugro-Samoyedic ca. 3000–2500 BC (Janhunen 2009; Kortlandt 2019) fit archaeological estimates of Corded Ware culture group expansions, as well as known bottlenecks under certain paternal lineages.
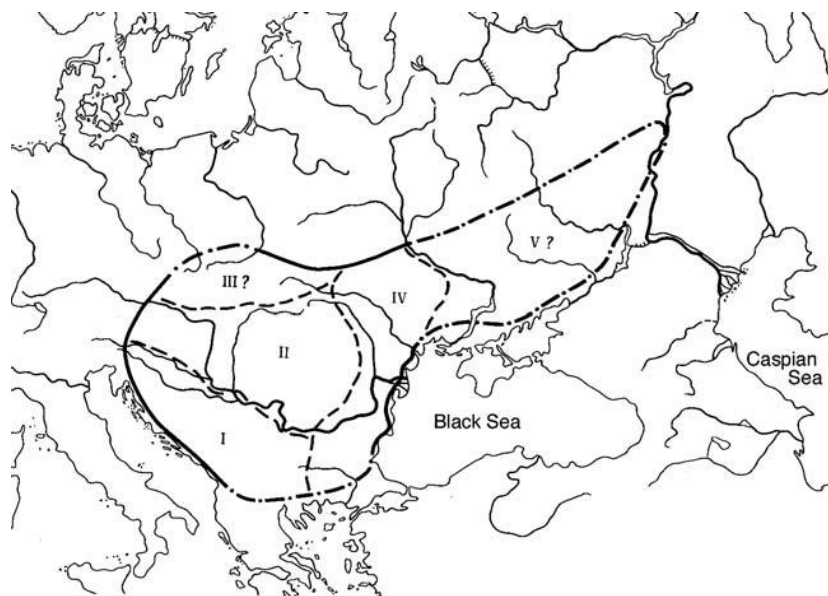
Figure 3. The Carpatho-Balkan Metallurgical Province (CBMP) (from Chernykh 1992: 49, fig. 15); main foci of the CBMP: I – northern Balkans; II – Transylvanian/ Middle Danubian; III – northern Carpathian (postulated); IV – western Black Sea region; V – steppe (postulated).

Later, Corded Ware blacksmiths emerging from North Pontic forest-steppe communities continued the Trypillian skills of processing 'pure' copper and arsenic bronzes, developing a copper–tin bronze industry in the Middle Dnieper and Abashevo cultures, which were near to important metallurgical centres (Klochko 2013). Especially Abashevo would become a leading metallurgical centre for eastern Europe and central Asia, controlling important metal ores in the southern Urals and up to the Zeravshan river. Abashevo showed close contacts with other Corded Ware-related cultures from the north-east European forest zone, associated with Finno-Permic peoples, and with

cultures from the Trans-Ural region emerged with the expansion of the Seima–Turbino phenomenon (Figure 4), linked to the expansion of Ugric and Samoyedic peoples (Parpola 2013).
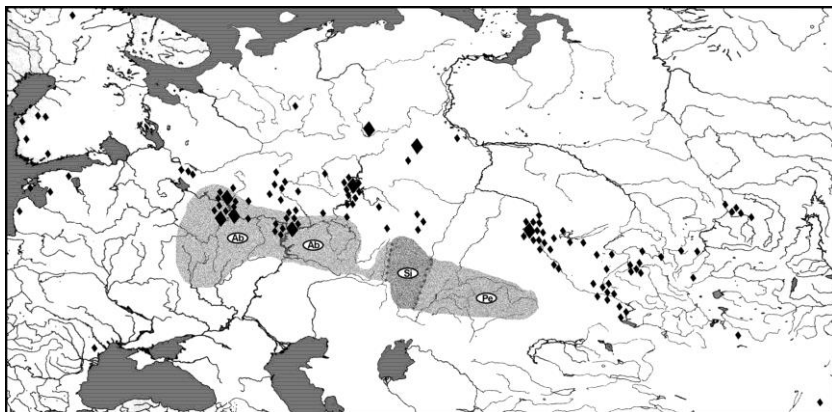
Figure 4. Schematic map of the areas of the Seima–Turbino sites and metal (rhombic signs) and Abashevo-Sintashta archaeological community (the early or formation phase of the Eurasian metallurgical province). Ab – Abashevo culture; Si – Sintashta culture; Pe – Petrovka culture. Image from Chernykh (2008).

3.3.2.2. Hunters and fishers

Uralic is usually described as a culture of mainly hunter and fishers, based on the reconstructed vocabulary that survives to this day. This is compatible with a homeland not only in the north-eastern European forested areas, but also in most of the Pontic–Caspian region before the expansion of cattle herding around the mid–4th millennium BC, linked to expanding late Trypillian cultures in the west and to Repin settlers in the east. North Pontic groups in particular relied mainly on hunting and fishing for their dietary needs, even after the arrival of the Neolithic: sites like Deriïvka or Molyukhov Bugor in the forest-steppe region, and even Mikhailovka I in the North Pontic steppe were sedentary populations who had mainly hunting and fishing as their main subsistence economy (Rassamakin 1999; Mileto et al. 2017; Mileto 2018). If associated with the Corded Ware culture, Uralians would have had only one short period when cattle-breeding was the main subsistence economy: from the Proto-Corded-Ware community (ca. 3000 BC) to late Corded Ware groups (ca.

2200 BC). Cattle herding was soon substituted in north-eastern European communities derived from Battle Axe, Abashevo, or Balanovo groups for economic practices adapted to their new ecological niches and to the changing environment.

It is evident that, for subsistence economies that relied heavily on hunting and fishing (depending on the location and periods of climatic changes), certain old words may have shifted meaning from one domestic animal to another, and from domestic animals to game. A clear example of this evolution is PIE *peku- 'cattle', adopted as PFP *počau / Ob-Ugric *peečəɣ, today meaning 'reindeer (domesticated, calf, …)' or even 'goat'. Another example is found in PU *teu̯ä 'elk, reindeer', probably adopted from the IE root *dʰei- 'suckle, nurse', hence 'milking', 'dairy cow', cf. Skr. *dhenú-*, Av. *daēnu-* (Rédei 1988).

Therefore, many Proto-Uralic words related to different large animals may have been also used for domestic animals before (including their body parts, herding, actions, etc.), proper of a herding society. Similarly, many general words reconstructed with a simple global meaning may have actually served at some ancestral point for a specific farming purpose. For example, PFU *kurë 'dig', borrowed from PIIr. *kar- 'plough' (originally 'pull'), is used in certain Uralic dialects for digging and in others for ploughing, so the usual reconstruction of a meaning for the earliest stage is 'to dig', which seems to cover both terms; however, in this case the reconstructed original meaning the more complex one, as happens probably with other reconstructed ancestral meanings.

There are various reconstructible Uralic and early dialectal words proper of a herding economy, even excluding the borrowings from Indo-European languages: PFV *älti 'female animal (reindeer, mare)', PFP *ašë/ošë 'male (stallion, bull, ram)', PFV *ćońë 'male (ox, bull, stallion)', PFV *ćačë 'herd', PUg. *iśi / *eśi 'mother, female animal (reindeer, cow)'; PU *keu̯i 'female animal', PFP *kentä 'field, meadow; stockyard', PFV *lešmä 'big domestic

animal (cow, horse), PUg. **luwé/luχë* 'horse', PUg. **mäni* 'animal, herd (reindeer, horse, cow)', PFP **marta* 'sterile cow' (maybe borrowed, like **mertä*, 'man', see *§3.5.3. Contacts with Indo-Iranian*), PFP **meši* 'sheep, ram', PFV **tika* 'pig', PFU **uči* 'sheep', PFP **uskalë* 'cow', PFP **uškë* 'ox, bull', PFV **u̯ača* or **u̯aća* 'young animal (reindeer, foal)', PFU **u̯äli* 'big animal (horse, cow, etc.)', PFV **u̯eti* 'cow, cattle' (Rédei 1988).

Words related to agriculture not borrowed from IE languages include, among others (excluding general words for plants and for gathering activities also used for agriculture): PFV **i̯aŋša* 'flour; grind', PUg. **këli(-ći)* 'millet', PFP **kënti* 'cereal, seed', PFP **norë* 'cereal, cereal grain', PFP **päni* 'oats, chaff', PFP **poše* 'sieve, clean (grain)', PFU **rekki* 'paste, mash' (hence 'flour'), PFP **riŋe-še* 'barn, oast, threshing barn', PFU **šänti* '(a kind of) cereal' (cf. also PFP **šuŋtë* 'thick meal, soup'), PFP **sorë* 'a kind of plant, cereal', PFV **śora* 'grain', PFV **śure* 'mash, groats, semolina, grain (barley)', PFP **u̯ešnä* 'a kind of cereal (wheat, spelt, durum)'.

Given the presence of these terms predominantly in the western area, and without considering the different layers of Proto-Indo-European loanwords, it could be argued that they were borrowed by expanding Uralians from the east. However, since the languages they would have replaced in the East European forest zone would have been in that case Indo-European, and these terms are not, the most likely explanation is that the western Uralic dialects represent the original situation of a farming economy during their expansion to the east.

The spread of agriculture into Finland and the East Baltic as an everyday subsistence activity developed no earlier than 1000 BC, leaving Corded Ware and heir populations of eastern Europe mainly as hunter-gatherers (Lougas, Kriiska, and Maldre 2007; Vanhanen et al. 2019), in line with the traditional reconstruction of everyday life of Uralic peoples. This confirms what Lindqvist (1987) wrote: "The late agricultural activities in north-eastern Europe as well as other Baltic Sea areas are probably due to the fact that the Corded Ware culture expanded into vast areas with dense forests and woodlands with fairly

rich large-game fauna, and coasts with extremely rich aquatic resources, supporting a comparatively dense population of more or less permanently settled, pottery-using hunters, fishers and gatherers.

2.3.2.3. Mythology

Epics and incantation poetry include data for the reconstruction of common myths. Sources for myths of modern Uralic peoples show a strong influence of forest zone hunter-gatherers and arctic populations with which they mixed, so it is difficult to distinguish the different layers acquired during these cultural exchanges (Siikala 2002; van der Hoeven and Hasselblatt 2012; Frog and Stepanova 2012):

The sky is held by the World Pillar or World Tree, *koiụa 'birch', reaching from the earth to the centre of the sky, located to the north (often precisely to the North Star). The underworld corresponds to the mouth of a river, a dark bitter cold place of death and illness, represented to the North, while the upper world is at the source of the river, on a mountain or in the heavens in the southern abode.

The southern abode, *suŋe 'sommer', is the land of the life-giving Mother Sun, and contains a reservoir of unborn children's souls awaiting birth by being transported by a mythical water bird, *śoδka 'diving duck'. This mythical bird also participates in the creation of the world from the World Egg, a myth that also present in the Vedas and in the Avesta. The Underworld is governed by a Devil whose home element is water, where he hides from Thunder.

The myth of the theft of the Sun and Moon involves Mother Sun and also the female ruler of death and illness. The governing god is the Sky God, *numä 'heaven, sky', also occasionally separated into opposed governing and sky god under the names *ịuma, or *(ị)ilma, possibly under influence of Indo-Iranian *diịu-mṇ-. The Thunder God is considered an introduction of neighbouring Scandinavian and Baltic peoples, due to the borrowing of names, although these could have replaced ancestral Uralic terms.

Death is considered a soul's journey over the water. There is a duality of the soul: a mobile part, *iće*, which can detach from the person during dreaming; and a corporeal soul or soul element vital to sustaining life, *leuli*. The shaman, *noita*, is capable of achieving trance and communicating with spirits, and can thus help the souls in their journey.

Rituals of animal ceremonialism include the complex myths and rites surrounding bear-killing, with a return of the animal's bones and body parts to its guardian spirit to promote its rebirth.

2.3.2. Late Uralic–Late Indo-European contacts

Potential Late Proto-Uralic borrowings, including some reconstructed for Proto-Finno-Ugric (PFU), are most likely to have happened during the late Repin / early Yamna culture expansion, through the close contacts of these peoples with Proto-Corded Ware groups in the Dnieper-Dniester area, i.e. during the late Common Indo-European / Disintegrating Indo-European stage. After the Corded Ware expansion, some Corded Ware groups were probably in close contact with Late PIE speakers from Yamna, which may account for some of the late borrowings during this stage.

Unlike in the previous stage, where the correspondance is assumed to have been PIE *H* ~ LPU *k* (roughly equivalent to Indo-Uralic, see above), this period shows a general equivalence LPIE *-H- → LPU *-š-*, except word-final, where laryngeals disappear. This important evolution is probably the result of independent phonetic changes in Uralic and in PIE (including laryngeal loss), which may suggest a period of separation between both communities.

The original proposal by Koivulehto (1991) included an initial LPIE *H-* → PU *k-*, but its similarity with older Indo-Uralic roots (or PIA ~ EPU borrowings) make such an assumption very difficult to prove with any example. Adding to this is the process of laryngeal loss, with laryngeals already disappearing during the Disintegrating Indo-European stage. The probability of finding a Late PIE dialectal loan with an initial laryngeal is consequently very small:

- A commonly cited example is Gmc. *aluþ* (<*hal-u-*?) 'ale, beer' (Kroonen 2013) ~ Finn. *kalja*, but even its PIE etymology is disputed: Hitt. *alu̯anz* 'being bewitched, affected by sorgery' is probably non-IE (Kloekhorst 2008); Ita. *alu-* 'bitter substance' may be cognate to Gk. *alú-*, and both in turn connected to Germanic-BSl. *alu-* 'beer'; but BSl. cognates are probably all loans from Germanic, and some of them (if not all) probably belong to a European substratum language (de Vaan 2008).

- Another example is Gmc. *agi̯ō-* (< DIE *hak-i̯ah-*) 'edge, blade' (Kroonen 2013) ~ Finn. *kasa* (<LPU *kaća*) 'point, edge', which is argued by Kallio and Koivulehto (2018) not to be reconstructible for the parent languages, hence a late borrowing. However, the authors seem to overlook[v] the difficulty in supporting Gmc. (or PIE) *-k-* ~ PU *-ć-* , and especially that there is also—from the same root as the proposed one—a reconstructed PIA *χek-*, found e.g. as Gk. *akḗ* (<**ħek-eħ-*) 'point, edge', and also behind other words for 'edge' and 'sharp' in Anatolian and non-Anatolian words. An Indo-Uralic origin is, therefore, possible, as is a CIE **ħâk-aħ* → Early PU loan (when the change of vocalism after laryngeal is already happening), but also— given the difficulties of reconstructing the intervocalic consonant—a fully different origin of the Finnic word.

- Another such proposal of late borrowing by Kallio and Koivulehto (2018) includes Gmc. *blada-* 'leaf' ~ Finn. *leśti* 'leaf', which also found as CIE *bʰl̥h-(o)tó-* in OIr., PT and Alb. derivatives with the same meaning, and whose peculiar vocalic changes from Germanic to Finnic are nevertheless left unexplained.

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[v] While Kallio has criticised in more than one occasion the proposal of hypothetic PIE cognates without a direct attestation of the source word (i.e. based on indirect evidence) to support potential loanwords in Uralic languages, this example proves that such a proposal in this case would have been *a priori* more reasonable than the proposed late borrowing – especially because the reconstruction of initial laryngeals for any Germanic or Pre-Germanic stage is not warranted.

2.3.2.1. Early loans with initial PIE laryngeal as PU *š*

Given the lack of clear Proto-Uralic examples of Indo-European loanwords with initial *k* (leaving potential Indo-Uralic cognates or early PIA ~ PU wanderwords aside), it is tempting to attribute a consistent LPIE *H* → LPU *š* in all positions, which seems typologically easier to defend. It also helps develop dialectal stages for both Late PIE and Proto-Uralic evolution.

Probably the most striking example of such a loanword is Early Proto-Finnic *šepo* 'horse' (cf. Finn. *hepo*, Est. *hobu*, Kar. *hepo*, Veps *hepo*, Liv. *ibbi*, Vot. *õpo, opo*), which would be reconstructed as PFU *šepä* < LPU *šepä* (Katz et al. 2003). This could in turn be from PIA, PA, or early CIE *heku* (or *hek:u*), or more likely[vi] from a late thematic *hekṷ-o-*, given that -*kṷ-* is not commonly reconstructed for PU, and that the evolution *kṷ-* ~ *kʷ-* ~ *p-* is typologically possible and not infrequent in IE languages; e.g. Ita. *ekʷos*, Cel *epos*, PGk. *hipos*, etc. and unlikely Ita-Gmc. *akʷa* < IE **ap-ā?*). In fact, different outputs of PIE *-gʷ-* have been proposed by Katz et al. (2003) for PFU, among them *-p-*, which shows the unstable adoption of labiovelars in Uralic, although many examples are disputed (Aikio and Kallio 2005). Horseback riding technique was very likely directly exported to neighbouring Uralic speakers by expanding Indo-Europeans, which strengthens this proposal, even if it lies on the findings of a late Uralic dialect, and on unattested sound substitutions[vii].

[vi] This loan, found in Finnic languages, is maybe even more likely to belong to a much later stage (maybe metathesised *ehpo* < Pre-Gmc. *ehʷo*-?), but it could belong to a Proto-Uralic stage coinciding with the first PIE expansions associated with the horse, and later replaced in most languages, e.g. in Proto-Ugric by root *luṷ-/*luɣ-*. Similarly, North Caucasian *ħi[n]čuĭ* may have been adopted at the same time, but the 'satemization' points possibly to Proto-Indo-Iranian influence (Dolgopolsky 1987).

[vii] Less likely is the adoption of *hōku-* in a similar period, cf. Fin. *hoppu*, Kar. *hoppu* 'hurry', and perhaps Ludian *hopp* 'quarrel', all probably from a source akin to Swedish *hoppa*, 'jump'. If it was in fact borrowed from LPIE, this would support not only the likely condition of *hekṷo-* as epithet, 'the swift one', probably substituting the previous name for the domestic animal, but also that the relationship between both words was still obvious in the Late Proto-Indo-European period.

Other potential loanwords from Proto-Indo-European into Proto-Uralic, marked by the presence of an initial laryngeal—i.e. CIE or early DIE, but some also potentially from Proto-Anatolian-like languages from the western steppes —include the following:

- FW **šalë* 'cheap' (Rédei 1988) ~ LPIE **ħalgʷʰ-C-* 'yield (as revenue)' (Kümmel et al. 2001).

- PFU **šaŋka-* 'branch' (Sammallahti 1988) ~ LPIE **ħank-* 'bend, bow', also 'angle; elbow' (Kümmel et al. 2001). Compare also IE **konka* 'plough' in Cel. **kankā* 'branch', Skt. *śā́kʰā* 'plough', potentially suggesting also a later loan from this word from a 'satemised' language.

- PFU **ša/ora* 'flood; lake' (Sammallahti 1988) ~ LPIE **ʕʷreiH-, ʕʷriH-,* 'flow, whirl; flood', from **ʕʷor-* 'move, start moving; stir'(Kümmel et al. 2001). More likely—if actually a borrowing—from a PIr. source (depending on vocalism, and if both meanings from the same loanword) derived from PIIr. **sara-* 'lake, marsh', from LPIE **selos-* 'marsh, sea' (Koivulehto 2001), alternatively PIIr. **srau̯-* 'flow, run' (see above in turn for its potential loan into NWIE).

- PFU **šärä-* 'let go' (Sammallahti 1988) ~ LPIE **ħarH-* 'disperse, disappear'(Kümmel et al. 2001).

- PFP **šéčV* (Sammallahti 1988) < PFU **šëčV* 'grow' ~ LPIE **hi-h(e)isħ-e* 'strengthen; press' (Kümmel et al. 2001).

- PFU **šiŋiri* 'mouse' (Sammallahti 1988) ~ LPIE **h(e)n-er-*, 'the inside', *hn̥-dʰer-(i)-* 'under, below', hence also 'the one below, the one below the earth', cf. Gk. *énero-*, Ita. **enðeros*, PIIr. **adʰáras*, etc. If related, probably due to the traditional view of mice as timid, hide-in-the-corners animals, cf. Hom. Gk. *gēgenéōn* 'earth-born', an epithet for mice, who live in the earth and are "born" from it (Christensen and Robinson 2018).

- PFU *ši/ura-* 'remove' (Sammallahti 1988) ~ PIE **herH-/hr̥H-* 'wash', as found in Hitt., Toch. (Kümmel et al. 2001).

- PFP *šoke-* 'say, speak' (Sammallahti 1988) ~ LPIE pres. *ħg-i̯e-* from PIE *χeg-* 'say' (Kümmel et al. 2001). More likely an Indo-Uralic root related to PIA *sekʷ-* 'say'.

- PFU *šoŋi-* 'ghost' (Sammallahti 1988) ~ LPIE *ħń̥h-* 'wind, breath' (Kümmel et al. 2001). Compare for the same meaning derivative *ħń̥h-mo-* in Toch. B. *āñme* 'self, soul', Gk. *ánemos* 'wind', Osk. *anams*, Lat. *animus* 'ghost, spirit', OArm. *anjn* 'person'.

- PFU *šorńi* or *šar(a)ńa* 'gold' (Sammallahti 1988) ~ LPIE *ħr̥g-n̥t-o*, 'silver', from *ħerg-* 'shine; glittering, white' (Kümmel et al. 2001); less likely from derivative *ħr̥g-u-n-o-*. Another possibility is an adoption from LPIE *gʰolʕʷ-*, 'gold', from a PIr. source (see *§3.5.3. Contacts with Indo-Iranian*).

2.3.2.2. Late or undefined loanwords

Loanwords showing general Late Proto-Indo-European features are listed first, and then those with potential links to western or eastern communities. Nevertheless, during these common LPIE stages it is likely that related vocabulary could be found from east to west without much distinctive traits, which—added to subsequent lexical reductions and expansions of the following stages of each branch—makes it extremely difficult today to assert a precise (western or eastern) origin or extension of a root:

- DIE *angʰ-* 'narrow, restrict, tighten, strangle' (< PIA *ħemgʰ-*, cf. Hitt *ḫamank* 'tie'; CIE *ħengʰ* → *hangʰ-*) ~ LPU *aŋke* 'painfully constricted'.

- DIE *es-ti* 'be, exist; have' ~ PFU *ešte* 'have time, get ready'.

- DIE *i̯ehgʷah* (< CIE *Hi̯ehgʷeħ*) 'young force, youth' ~ Pre-PF *(i̯)eskä* 'ability, possibiliy'; probably unrelated to PFU *eski* 'believe'.

- PFP *i̯eu̯ä* < DIE *i̯éu̯os* 'barley, cereal'. Although described as Pre-Proto-Indo-Iranian, the form would be the same as in LPIE before its transition to PIIr. *i̯áu̯as*.

- PFU **kurV-* < DIE zero-grade **gʷr̥h-* 'mountain, hill', with loss of final laryngeal; cf. BSl. **gor-/*gir*, Skt. *girí-* 'mountain, hill', Av. *gairi-* (Katz et al. 2003).

- PFU **louna* 'day, midday' < DIE **louksna* < CIE **louk-s-nħ* 'shiny, bright, gleaming' (Katz et al. 2003), cf. Lat. *lūna*, MIr. *luan*, OPru. *lauxnos* 'stars', OHG *liehsen* 'bright', Gk. *lúkʰnos*, OInd. *rūkṣá-*, Av. *raoxšna-* [adj./n.] 'light'.

- DIE **os-ko-* 'ash' (cf. Gmc. **aska-*, Arm. *hacʿi*), from PIE **ɣʷes-ko-* (cf. Hitt. *ḫa(š)ik, ḫaššika* 'a fruit tree', possibly 'olive tree') ~ Volgaic **ośka* 'ash-tree', Samoyedic cf. *azoi⁽ⁱ⁾*, *izo* 'poplar' (Blažek 2018).

- DIE root **ou̯-i-* 'sheep', has been proposed to be behind the root in PFU **u-či* (<*o-čë /**u-ti̯e) 'sheep', although this is disputable (Hyllested 2009).

- Pre-Permic **pe(u)šenV* 'wash' < DIE **peuh-e-no-* 'clean, winnow' (Kümmel et al. 2001) proposed as a Pre-PIIr. loan because of the Old Indian verb. The verb is nevertheless also found in Germanic, with the same meaning albeit with different vocalism, viz. Pre-NWIE **pouh-e-* → Pre-PF **po[u̯]š-ta* → **pošta-* (Koivulehto 1991). The proposal of both as PU loanwords of the same stem having different regional (eastern and western) origin (Koivulehto 2003), although possible, is weak, because a) both PU forms originate from the same stem, and b) both IE ablauting forms may have been widely distributed in Disintegrating Indo-European.

- LPIE **puH-tó-* 'clean' ~ LPU **pušta* (> Finn. *puhdas*).

- DIE **u̯ih-tah* (< CIE **u̯iH-teħ) 'line; way' ~ LPU **u̯išta* 'once; then' → Pre-PF **višta* (Koivulehto 1991).

It is sometimes difficult to distinguish the precise date and regional origin (i.e. Pre-NWIE/NWIE → LPU/PFU vs. NWIE → PFU/PFP vs. Pre-Germanic/Pre-Balto-Slavic → PFS) of certain loans that include neither

laryngeals nor dialectal traits. Loanwords reconstructed from western dialects include the following (Koivulehto 2003):

- Pre-NWIE *b^heh- 'warm' reconstructed exclusively from Germanic (Kümmel et al. 2001; Kroonen 2013) ~ PFU *$pešä$-/*$püšä$- 'roast, bake' (Koivulehto 1991). This PIE root has been related in the past to another, widely distributed DIE stem *b^hehg- 'bake, roast' (<CIE *$b^he\Omega^wg$-).

- Pre-NWIE *$dehti$- 'fact' (cf. Gmc. *$dēdi$-, Lith. *$dĕtis$*, OCS *$detъ$*) ~ Pre-PF *$tešte$*.

- Pre-NWIE *g^wehd^h- (with meaning 'shame, disgust' in Gmc. and BSl.) ~ Pre-PF *$kešta$- (Koivulehto 1991).

- NWIE *$lond^h$- (see *§3.2.4.1. Remade Late PIE stems*) ~ PFP *$lonta$/$lomta$*, cf. Votyak, Zyrian *lud* 'field, meadow', or Finn. *lansi* < PF *$lante$ (Koivulehto 2003). It could be a later, NWIE → Proto-Finno-Permic.

- NWIE *$meig^w$- (< DIE *$\hbar meig^w$-) 'exchange' (cf. Lat. *migrō*; against Palaeo-Balkan with vocalised initial laryngeal, cf. Gk. *ameíbō*) ~ PU *$mexe$ ~ *$meɣe$*, cf. Finn. *myy*, *myö*- 'sell, etc.', also 'give'.

- NWIE *$podo$- 'vat, vessel', cf. Gmc. *$fata$- (ON *fat*, OE *fæt*, OHG *faz*), Lith. *púodas* 'pot' ~ PFU *$pata$ 'pot', cf. Finn. *pata*, Hung. *fazék*.

- NWIE *$taįstos$ (< LPIE *$tahi$-s-to-) 'dough', cf. Cel. *taįsto*-, OCS. *tĕsto* (and remade Gmc. *$\vartheta eismo$-, *$deismo$-) ~ EPF *$taštas$*. A derivation from a Pre-NWIE (laryngeal) *$tahisto$-, as proposed by Koivulehto (2003), is also possible.

2.3.3. Schleicher's fable in Late Proto-Uralic

očë – luxët

očëna, aptëna e-u̯olëśa,	*luxëi̯ kokë;*
će läulä u̯ixim u̯ixitä,	*će enä kantam,*
će koi̯ëm suxëm kantata.	*očë luxëi̯ monë:*
"śiðʲämä aŋkë	*u̯irkäm luxëi̯ ai̯atam u̯äntitä."*
luxët monët: "kūlëk, očë!	*śiðʲämät aŋkë u̯äntitä:*
u̯irkä, u̯äki, očën aptëtä	*su päu̯i u̯erčäm teki,*
očën aptëna e-u̯olë."	*e kūlëmä očë kaŋkak pukeśa.*

Notes:

- NWIE **em-e/o-* (*<*hem-e/o-*) 'take, grasp' ('have, receive; buy' in Italic and BSl.) ~ Pre-PF **em-* 'there is', **oma* 'own, property'.

- PF **u̯ole* 'be, become', cf. Finn., Est. *ole-*, Mord. *ule-*, Mari *əla-*, *ula-*, Udmurt *vi̯l-*, *vôl-*, *vîl̂î.*

- LPU **monV* 'say', cf. Finn. Est. *manaa-*, Mord. *muńa-*, Mari *mana-*, Hung. *mond-*, Nenets *mān-*, Nganasan *muno-*. A late loan from PIE **men-* is possible from PIA to dialectal LPIE stages, although Yuk. *mon-* and parallel Altaic **man-* 'learn, try' suggest an older Indo-Uralic origin.

- LPU **päu̯e* 'warm, be warm', cf. Samic *bivvâ*, *pivva*, Komi *pi̯m* (Ud. P), *pøm*, Nenets *pīw*, Nganasan *feabemeʔ*, Selkup *pyy*, etc

3. Third stage

3.1. Tocharian

3.1.1. Tocharian as an archaic dialect

Tocharian archaisms are not comparable to Anatolian, and it certainly split from a parent language that showed common features with Late PIE dialects: common laryngeal evolution (see *§II.2. Laryngeal evolution*), development of the feminine, expansion of thematic stems, loss of productivity of the collective plural, shared LPIE developments of the case system (obscured by the innovative syncretism of Common Tocharian), of the verbal system (such as durational vs. non-durational, passive constructions, modal developments, etc.).

Tocharian has been traditionally described as closer to Italic and Celtic due to certain common morphological developments, but it has also been described as closer to Latin, to Germanic, or to Balto-Slavic. It was most likely part of an ancient Northern Indo-European dialectal region in common with North-West Indo-European dialects (see above).

Tocharian phonological and morphological archaisms may include the following:

- Potential remain of the 'original' CIE velar realisation as non-aspirated, voiceless stops (see below innovations).

- Tocharian inherited a full-fledged three-way gender contrast from LPIE, although there are some doubts regarding the supposed productivity of the athematic *-*iħ* forms, coupled with the apparent scarcity of thematic *-*eħ* forms (Fellner 2014), suggesting that the language split preceded the creation of the feminine paradigm of thematic adjectives (Kortlandt 2017).

- Marked paucity of inherited simple thematic presents (Ringe 2000).

- Class III preterite with -*s*- formant in 3sg. only, in contrast to classical PIE sigmatic aorist, cf. Hitt. *hi*- conj. Pret. 3sg. -*š* (Jasanoff 2003).

- LPIE subjunctive and Tocharian subjunctive show fully different categories, with LPIE showing the thematic suffix *-*e*/-*o*, and Tocharian not having a subjunctive suffix. This root formation may have been the initial subjunctive stage in LPIE (Peyrot 2013).

- Thematic optative *-*ih*- < *-*o-ih*- with deletion of thematic vowel as an i-stem (Jasanoff 2009).

- Abstracts and adjectives in *-*i̯o*- to o-stem bases (Jasanoff 2009).

- Mediopassive *-*r*- endings, also found in Hittite, probably reinterpreted later in LPIE, and then again later in individual dialects.

Tocharian "lexical archaisms", with meaning predating changes seen in all other Late PIE dialects, include the following (Winter 1968, 1997; Schmidt 1987, 1992):

- Toch. B *nekci̯e*, Toch. A *nakcu* '(yesterday) evening' ~ Hitt. *nekuz* (*meḫur*) 'evening time' < PIE *$nek^w t$*- 'evening', found as 'night' in DIE.

- Toch. AB *i̯äp*- 'enter' derived from CIE *i̯eb^h*- 'enter', where DIE shows 'have intercourse', cf. Skt. *i̯ab^h*-, Gk. *hoip^h o*, Russ. *ebu*.

- PT *arë* 'plough' < CIE *ħerʕ^w-o*-, where only derivative *ħerʕ^w-tro*- can be reconstructed for DIE.

- PT **kast* 'hunger' (possibly shared with Hittite), also behind Gk. *gastḗr* 'belly', pointing to both archaic languages as sharing the original meaning.
- PT **i̯okʷ-* 'drink' < CIE *(h)eħgʷʰ-*, cf. Hitt. *ekw-/akw-*, lost in DIE dialects in favour of root **peʕʷ-* (Kim 2000)
- Toch. B *käri̯eñe* 'stone, rock', where a more specific 'millstone' is observed in DIE, cf. Skt. *grāvan-* 'stone for pressing out soma', W *breuan* 'handmill', OCS *žrŭnŭ* 'handmill'.
- Toch. B *śran-* '(adult) man', not 'old', from CIE **gerħ-on-*, from verb **gerħ-* 'mature, grow', where DIE shows 'old', cf. Gk. *géront-* 'geriatric', Oss. *zärond* 'old'.
- Toch. A *u̯ir* 'young' < LPIE **u̯iHró-* 'man', potentially showing an early meaning 'young man', maybe 'vigorous' (the contrast then akin to Lat. *mulier* 'woman', from *mollior* 'softer, weaker'), lost in the DIE community.

3.1.2. Tocharian evolution

Innovations include (Hackstein 2017; Pinault 2017): LPIE vocalism suffered some important changes in Common Tocharian (see table below).

- LPIE system of stops underwent major reductions in Proto-Tocharian, with the collapse of the three PIE manners of articulation (unvoiced, voiced, and voiced aspirated) into deaspirated voiceless articulation.
- LPIE syllabic liquids and nasals disappear (with previous epenthetic vowel).
- Common Tocharian weakening of PT **-a-* → CToch. **-ä-* in medial post-tonic syllables.
- Tendency to eliminate vowel length.
- Development of specific accent rules in West Tocharian.
- Development of feminine for pronouns.

PIE	Pre-PT	Late PT	TA	TB
*aH(_C), *ā	*ā	*ā̄	ao	o
*oH(_C), *ō	*ō	*ā	ā	ā/a
*H(C_C and U_(C)#), *a	*a	*ā	ā	ā/a
*i, *u	*i, *u	*(')ä	ä	a/ä
*e	*e	*'ä	ä	a/ä
*iH(_C-), *ī	*ī	*(')äi̯	i	i
*uH(_C-), *ū	*ū	*äu̯	u	u
*o	*o	*æ	a	e
*eH(_C), *ē, *ei̯e	*ē	*'æ	a	e
*eu	*eu	*'äu	u	u
*ou	*ou	*æu	o	ê_u (MQ), au
*ei	*ei	*'äi	i	i
*oi	*oi	*æi	e	ei, ai
*eu	*eu	*'æu	o	ê_u (MQ), au
*ēi	*ēi	*'æi	e	ei, ai
*ōu	*ōu	*āu	o	au
*ōi	*ōi	*āi	e	ai

The first documents of written Tocharian date to the early medieval period, along the northern Silk Road, within the Tarim basin. Tocharian A manuscripts come from the eastern area (Shorchuk and Turfan), and Tocharian B texts found throughout the whole area, although texts from the western part appear to be more archaic than the central dialect (Penney 2017).

The earliest dated texts come from AD mid–7th c., with the Tocharian script likely being developed at the end of the 4th or beginning of the 5th century, with radiocarbon dates available ranging ca. 400–900 (and up to 1200) for Tocharian B, and ca. 700–1000 for Tocharian A documents. The existence of two (likely three[viii]) distinct dialects place a Common Tocharian language

[viii] Another language, Tocharian C, probably existed in the Lop Nor Basin, more closely related to Tocharian B than Tocharian A, which would support a continuum of Tocharian dialects along the north side of the Tarim River which developed into two standard, written languages, one around Kucha, the other around Loulan/Kroraina. Tocharian A would have been closely related, but outside that continuum. Information from an online report by Douglas Q. Adams (2019), on findings in the book by Schmidt (2018).

some time ca. 500 BC – 1 AD, whereas the split of Pre-Tocharian from the parent Late Proto-Indo-European is assumed to be older than any other dialect.

3.1.3. External influences on Tocharian

3.1.4. Tocharian–Uralic contacts

In spite of the lack of lexical borrowings, phonetic Uralisms are described based on Tocharian coalescence of the three manners of articulation, similar to the adoption of loanwords in Uralic dialects (i.e. PIE *T*, *$^\text{?}D$*, *D* → *T*) and on the later palatalisation trend. This would have been quite likely due to contacts with a branch related to Ugric or Samoyedic (Kallio 2001).

3.1.4.1. Tocharian–Indo-Iranian contacts

Common developments with Indo-Iranian and Indo-Aryan include (Carling 2005):

- Innovative transition from inflection to agglutination and group inflection attributed to a non-Indo-European influence. This includes:
    - The collapse of the eight-case system, most likely at an early date and partly due to the loss of final syllables, although this must have taken place over a long period (and be still active e.g. by the time 'Buddha was adopted as CmToch. *put* > *pät*, and other Indo-Aryan borrowings in both Toch. A and Toch. B). This process paralleled that of Indo-Aryan evolution from Old Indo-Aryan (Vedic and Sanskrit) to the break down in Middle Indo-Aryan as a result of internal pressures and phonological erosion extending over a period of more than a thousand years, but the circumstances and periods are different, so at best one could propose a similar 'areal contact' influencing both branches.
    - Restructuralisation of the verbal system, determined by factors such as valence and *aktionsart*, an innovation proper to Tocharian.
- PT *kercäpā-* (<*$g^hord^hob^ho$-*) is equivalent to Skt. *gardab^{h}á-* (<*$g^hord^heb^ho$-*), both meaning 'donkey, ass', with common PIE suffix

for animals *-*bʰo* (cf. Gk. *elapʰós* 'red-deer', Skt. *vr̥ṣabʰá-* 'bull'). It has been suggested that it was an early borrowing, before the merger of non-high vowels in Indo-Iranian, or else we would expect *kertepo* (Adams 2013). The change of stem may suggest a rather early loanword, possibly during the migration of Pre-Tocharian to the east through Pre-Proto-Indo-Iranian territory.

- Skt. *śroṇi* 'the hips and loins, buttocks' is translated as Toch. B *oñi* 'hip, groin', which is probably from Indo-Iranian/Indo-Aryan *āni → PT *āni*, since later Indo-Aryan borrowings do not show the change PT *ā → Toch. B *o* visible here (Pinault 2003).

- PT *u̯i̯aime → Toch. B. *ime* (Toch. A *ime* is a loanword from Toch. B) 'consciousness, awareness; thought; memory, recollection' has been proposed to be a loanword from the same source as Skt. *vidmán-* 'knowledge', from LPIE *u̯i̯eidmen-* (Adams 2013) which would put the borrowing around the Proto-Indo-Iranian period.

- CmToch. *iścäko 'clay, brick', corresponds to an Indo-Iranian group of words of non-IE origin meaning 'brick', cf. Ved. *íṣṭakā-*, OPers *išti*, NPers. *xišt* (see below *§3.4.3. Asian agricultural substratum*). A similar donor language with the characteristic *-ka* suffixation may be behind Toch. B *ṣecake*, A *śiśäk* 'lion', Skt. *siṃha-ka-* 'lion', including Arm. *inj* 'leopard', also found in two distinct borrowings in Old Chinese.

- A West Semitic loan *ḫāru* 'donkey' is probably the origin in Mesopotamia of Proto-Indo-Iranian *kʰara-*, Toch. B *koro* 'mule' (Kroonen, Barjamovic, and Peyrot 2018).

Other, later Indo-Aryan and Iranian contacts are reviewed in detail in Carling (2005).

3.1.4.2. Tocharian–Chinese contacts

Old Chinese and Tocharian contacts are also described in detail by Lubotsky and Starostin (2003), and are interesting in so far as they suggest the early presence of Proto-Tocharian in Chinese Turkestan at least by the mid–2nd millennium BC:

- PT *mi̯ät*, CmToch. *mi̯it* → OCh. *mit*, Mid. Ch. *mjit* 'honey'.
- Terms for chariot and chariot gear.
- OCh. *C-luu-ʔ* 'rice, rice-paddy' → CmToch. *klu* 'rice'.
- OCh. *raap* 'winter sacrifice' → CmToch. *rāp-*.
- CmToch. *ri̯e* (<DIE *u̯rih-ah*?) ~ OCh. *rə-ʔ* 'walled city' (attested in 11th-9th c. BC), with direction of borrowing unclear. A potential IE origin could be found in *u̯riH-én*, from *u̯er* (<**dʰ-u̯er*?) 'close', potentially connected to Lat. *urbs* (Adams 1980)
- OCh. *truŋ* 'middle' or maybe Mid.Ch. *du̯ŋH* (< OCh. *looŋ-*) 'cave, grotto' → CmToch. *trunk* 'hollow, cave'.

Further borrowings, clearly after the Old Chinese period and during the Early Middle Chinese (transition period ca. 200 BC – AD 400) are relatively abundant and cover semantic fields of economy, techniques, and institutions, and are shared with neighbouring Sogdian and Khotanese languages.

3.1.4.3. Tocharian–Turkic contacts

Turkic borrowings are probably late, although some early contacts have been proposed:

- CmToch. *kënёk* 'cotton cloth', cf. Chor. *kcynyk* 'silk fabric'.
- CmToch. *tmān-* 'ten thousand, a myriad', apparently a Central Asian wanderword occurring in Altaic, Iranian, and probably Chinese.
- Toch. B *kaṃ*, A *koṃ* 'sun, day' compared with Uigh. *kün*, Turkm. *gün* etc. 'sun, day', probably from a Common Tocharian stage.
- Toch. B *pärśeri* 'flea', cf. Tatar *börce*, Kumyc *bürce* 'flea'.

3.1.5. Schleicher's fable in Proto-Tocharian

<center>*āu̯u̯ i̯äku̯ās-u̯ai*</center>

āu̯u̯ këtë i̯oku̯ëns mā stākāt	*i̯äku̯ëns li̯ākā;*
cëm krāmrent kleṅkeṃ kleṅkā,	*cëm mākā krāmäreṃ,*
cëm ćāumom drumër preñtsam.	*u̯ëñāne āu̯u̯ i̯äku̯ëns:*
"āräñce ñäś upatāpi krunär,	*eṅku̯em lākānt i̯äku̯ëns ākent."*
i̯äku̯ās u̯ëñānte: "päkli̯eu̯ş au̯i!	*āräñce u̯ësäm upatāpi krunär lākānt,*
eṅku̯e, ćaiske, au̯insä i̯oku̯ëṃ	*mi̯äkcë emäli̯em u̯ästˢi kläutkāsktär,*
au̯insä-u̯ai i̯oku̯ë mā nësti."	*tëm kekli̯eu̯şoş āu̯u̯ u̯erpii̯em mäkātă.*

A common PT nom. pl. cannot be reconstructed: Toch. B points to a remade plural in *-i* (as in Italic and Greek), while Toch. A points to a remade plural in *-nes*. Here, the common PIE pl. *-es* (thematic *-ōs*) is used.

3.2. North-West Indo-European

3.2.1. North-West Indo-European community

The North-West Indo-European (NWIE) proto-language is the reconstructible ancestor of Italic, Celtic, Germanic, and Balto-Slavic, and probably other fragmentary European languages like Venetic, Lusitanian, Messapic, Ligurian, or Elymian (Oettinger 1997, 2003; Adrados 1998; Mallory and Adams 2007; Mallory 2013; Beekes 2011). NWIE refers to a long-lasting linguistic community spanning from an early or Pre-NWIE stage, coinciding with a common western development within Early Yamna after the separation of Tocharian ca. 3500–3300 BC, to a post-NWIE Sprachbund, to be identified probably with European Early Bronze Age cultures, in close contact through the Pan-European Bronze Age trade networks including Únětice, until ca. 1600 BC.

Genetic research indicates that there was a patrilineally related community in close contact in the Carpathian Basin, formed first by Yamna settlers in the early 3rd millennium BC, and then by the Classical or East Bell Beaker group from the mid–3rd millennium BC on (Olalde et al. 2018; Wang et al. 2018). A reconstructible Classical NWIE language is then to be associated with this central European population in the centuries before and after 2500 BC (Harrison and Heyd 2007; Mallory 2013; Quiles 2017).

Patrilineally related East Bell Beakers expanded successfully in a short period into wide territories of western, northern, and eastern Europe, areas whose languages later evolved into Celtic, Italic, Germanic, and Balto-Slavic, allowing for certain innovations to spread between these languages. The spread of Bell Beakers ca. 2400–2300 BC is to some extent coincident with the areas of Old European hydronymy (Krahe 1964, 1949; Nicolaisen 1957), a quasi-uniform name-giving system for water courses that shows Indo-European water-words and suffixes following rules of Late Proto-Indo-European word formation (Adrados 1998).

3.2.2. North-West Indo-European evolution

The North-West Indo-European proto-language can be reconstructed based on phonological, lexical, and also morphosyntactical traits[ix]. These are some common features:

Phonology:

- Final process of laryngeal loss (see *§II.2. Laryngeal evolution*).
- Maintenance of a conservative consonant system[x], in contrast with coeval Proto-Indo-Iranian (satemisation and palatalisation) and Balkan languages (devoicing of voiced stops).

Nominal system:

- Full development of the known case system, with stable dative-locative-instrumental endings, probably with an origin in PIE adverbial *-b^hi- (see above Late PIE): ins. sg. *-b^hi, ins. pl. -b^his, dat.pl. *-b^hos, expanded to the thematic declension. Compare for example for dat. pl. *-b^hos Lat. *matribus* 'for the mothers', Gaul. *atrebo* 'for the fathers'; Lusitanian *Lugubo Arqueienobo*, Venetic *louderobos* 'for the children', Messapic *logetibas* 'for the logetis'. Germanic and Balto-Slavic show a characteristic "Northern European" bilabial substitution for *-m- e.g. dat. pl. *-(o)mos*, cf. Gmc. *-(a)mz* in Goth. *-am*, ON *-m*; OLith. *sunúmus* 'to/for sons', *výrams* 'to/for men'; OCS *kostĭmŭ* 'to/for bones', *gradomŭ* 'to/for cities' (see below *§4.5.3. Northern European*).
- The dual continues a process of loss, remaining as an archaic feature linked to objects naturally occurring in pairs.

[ix] For detailed information on North-West Indo-European phonology, morphology, and syntax, you can read specialised works published at <https://academiaprisca.org/>.

[x] In the unlikely case that three series of velars could be reconstructed for Late PIE, the NWIE stage would represent a 'centum' dialect (with the merge of 'palatovelars' with plain velars), with a later satemization trend in Balto-Slavic different from Indo-Iranian.

- Morphophonological developments affect 'unstable' declensions (viz. proterodynamic, hysterodynamic, etc.) simplified into stable vocalic paradigms and known lexical isoglosses.

Verbal system:

- Further reduction of the use of athematic stems, with development of semithematic ones, with preterite forms in *-$\bar{e}$-, *-$\bar{a}$-.

- Expansion of thematic inflection (including new root verbs), i.e. in *-e-, *-$i̯e$- (particularly in *-$\bar{e}i̯e$-).

- Further development of the middle and passive systems[xi].

- Further expansion of the tense–aspect system for modal stems.

- Simplification with progressive fusion of aorist or perfect stems in an ancient preterite.

- (Late) trend to develop compound preterites, formed by adding an auxiliary stem to the main stem. The second stem is found made from root *-b^heu- 'become' in Italic and Baltic; and more controversial *-$d^h\bar{e}$- or *-$d\bar{o}$- 'do' in Sabellic (Piwowarczyk 2011) and Germanic, as in Greek; as well as *-es- 'be' in Slavic, and possibly in the Latin perfect (Yoshida 1988). These variable endings suggest a common ancestral innovation of the European migrants with alternating formations initially, i.e. not integrated as grammatical desinences into the verbal system.

[xi] The most widespread view nowadays holds that (eventive) long and short passives can be reconstructed as a *function* for Late PIE, but that there was no specialised passive morphology in the common stage; so e.g. the passive or 'medial-intransitive' found in Greek together with its middle system. Judging by the use of inherited DIE *-r alongside *-i, as well as personal endings and stative periphrastic constructions in North-West Indo-European dialects, it can also be assumed that both options were present in the common language, possibly dating as far back as the Indo-Anatolian stage (Kloekhorst 2012), and that they were simplified in later dialectal stages. The use of impersonal *-r Old Indian, its presence in Tocharian (separated first from the Northern Indo-European group), in Italic and Celtic, and its survival up to Proto-Slavic (see below *§4.5.3. Northern European*)—a dialect that selected mediopassive endings in *-i—may point to this original NWIE (unstable) system. The New Phrygian inscriptions with middle forms further support this alternation in European dialects: αββερετορ 'affertur' < *ad-$b^heretor$ and αδδακετορ 'afficitur' < *ad-$d^haketor$.

    o   The dual progressively loses its limited scope, accompanying the nominal declension.

Vocabulary and culture (Benveniste 1969):

- NWIE has the richest set of shared lexical isoglosses connecting any Late Proto-Indo-European branch (see below *§3.2.7. Statistics of lexical isoglosses*), and many innovative stems are closely intertwined with its morphophonological innovations. The introduction of agricultural nouns from non-Indo-European languages points to a shared linguistic community, until its eventual separation into cultures already incorporating limited agriculture, in contrast with the previous herding-based economy.

- Instruments in the field of *nomina agentis* in *-*lo*-, cf. OHG *scūvala* 'shovel', Lat. *capulus* 'handle', Lith. *baȓškalas* 'rattle', etc. See below for example NWIE *tekt-lā 'axe'.

- The term *pekū supports the maintenance of (or specialisation into) a livestock economy based mainly on cattle, unlike Graeco-Aryan dialects, which include sheep and goats within the term: cf. Lat. *pecū*, Gmc. *fihu*. The appearance of farmers in Greek, *geōrgói*, and the Iguvine Tablets *castruo frif* (Lat. *castra fructus*) point to the late adaptation of the tripartite function of society to the incorporation of agriculture in the subsistence economy. The late relevance of agriculture may be possibly inferred from the increased relevance of the stormgod, *perkʷunos, built from the root for 'oak'.

- The trifunctional sacrifice includes the pig, instead of the Graeco-Aryan goat, probably (at least initially) as the less valuable animal of the traditional three; so e.g. in the Roman *suovetaurilia*, in the Lusitanian inscription from Cabeço das Fráguas, in East Slavic fairytales, in a stone art of Bilbilis in Celtiberia, and in archaeological remains of sheep, oxen and pigs hoarded together in Scandinavian sites (Prósper 1999). The new economy including swineherding was probably

adopted in contact with south-east European cultures, since it is also found in the Greek *trittoíai*.

- Expansion of the terms (and concepts of) *g^hostis* 'guest', and *$ghosti$-$potis$* 'guest-host' i.e. 'host' (see below *§3.2.4.1. Remade Late PIE stems*), closely linked to the use of verbal root *mei-t-* 'exchange', noun *moinos* 'common', and *keiṷos* 'household', probably due to the increased relevance of guest relationships and gift exchange in the NWIE society, compatible with the incorporation of Bell Beaker traditions to the classic IE traditions of exchange and reciprocity.

- The chiefs of the political and military groups become increasingly formed in *-nos* rather than *-potis*: cf. Lat. *dominus*, 'chief of the house', *tribunus* 'chief of the tribe'; Goth. *kindins* < *genti-nos* 'chief of the gens'; Goth. *druhtins*, OHG *truhtin* 'chief of the escort'; Goth. *þiudans* < *teuta-nos* 'chief of the people, king'.

- The patrilineal society continues, in contrast with Indo-Iranian, with the use of *nepōts* as 'nephew (usually the son of the sister)', cf. Lat. *nepōs*, Cel. *nefot, Gmc. *neφan-, OLith. *nepuotis*, Sla. *netĭjĭ (< *neptiṷos*). The presence of this meaning in Greek *a-neptios*, and conservation of the meaning 'grandson' up to the Latin period points to the survival of the custom of marriage between cross-cousins at least until the separation of the different branches.

- A shared ancestral folk tale in NWIE (da Silva and Tehrani 2016) is "The Grateful Animals" (MFTD 554), whereby a youth earns the thanks of several animals (ants, fish, etc.) and with their help wins the princess by performing three tasks imposed upon him (brings a ring from the bottom of the sea, etc.). More shared tales appear in West Indo-European languages.

Close contacts with Uralic languages in terms of shared vocabulary, especially in the Pre-NWIE and Post-NWIE stages (but apparently not during its classical stage) further contribute to locate the community in space and time.

3.2.3. Early European isoglosses

Early lexical isoglosses shared with Palaeo-Balkan languages include the following:

- NWIE *aik-tlo-* 'point of a spear, arrow', from PIE *aik-* 'barb', in Swe. *egel*, *äjel*, OPru. *ayculo*, Russ. *iglá*; compare also in *-smo-* Gk. *aikʰmḗ*, OPru. *aysmis*, Lith. *(j)iešmas*.

- NWIE *ank-ro-* 'valley', cf. Lat. *ancrae* f.pl. 'valley, gorge', Gmc. *angra-* 'lowland, meadow, enclosed piece of land', and Gk. *ángos* n. 'valley'.

- NWIE *ar-ie-* 'plough', cf. Lat. *arāre*, OIr. *airid*, Goth. *arjan*, ON *erja*, OHG *erien*, Lith. *árti* (*ariù*), Ltv. *ar̃t*, OCS *orati*; here also Gk. *aróō* 'plough, plant'. It is assumed that Hitt. *ḫarrai - ḫarranzi* 'grind, splinter up, crush' is related, showing the original meaning of the PIE root (Kloekhorst 2008).

- NWIE *as-* 'ash-tree', basis for stems in *-n-* (cf. Lat. *ornus*, MIr. *onn*, MW *onn*, also extended OIr. *uinnius*, Russ. *jásen'*), in *-k-* (cf. Gmc. *aska*, Alb. *ah*, Arm. *hac'i*), in *-i-* cf. OPru. *woasis*, Lith. *úosis*.

- NWIE *bʰeidʰ-éie-* 'to force', cf. Gmc. causative *bīdan-* 'wait', and for its use in mediopassive 'be persuaded' > 'to confide in, trust', cf. Lat. *fīdere*, Gk. *peitʰomai*.

- NWIE *bʰāgo-* 'beech' in Lat. *fāgus*, Gaul. *bāgos*, Gmc. *bōk(j)ō*; cf. Gk. *pʰāgós*, Dor. *pʰagós* 'oak'. Maybe here also Russ. *boz* 'elder'.

- NWIE *bʰi-lo-* '(one's) equal', cf. OIr. *bil* 'good', Gmc. *bila-* 'equal, even', also Gk. *pʰílos* 'friendly, dear, related, own'.

- NWIE *bʰl̥-no-* m. 'ball, sack; member, penis' (from *bʰel-* 'to swell up'), cf. Lat. *follis* 'bag, sack; ball, testicle', OIr. *ball* 'member, penis', W *balleg* 'sack, purse', ON *bollr*, E *ball*. Here also Gk. *pʰallós* 'penis'.

- NWIE *deuk-e-* 'pull', in Lat. *dūcere*, Osc. *duc-/doc-*, and Gmc. *teuhan-*, as well as MW *dwc* < *duk-e*, Toch. A. *śuk*, *tskāt*, and also Alb. *n-duk-*. Compare in zero-grade with suffix *-ie-* mediopassive Gk.

da-dússomai 'is ripped'. Its wide distribution in Tocharian, Italic, Celtic, and Germanic makes it most likely an ancient western isogloss.

- NWIE **gerbʰ-e-* 'carve', cf. OIr. *cerbaid* 'hack; lacerate', Gmc. **kerban-*, OCS *žrĕbŭ, žrêbij*, Russ. *zérebej*; also zero-grade Gk. *grápʰō*, 'to scratch, carve, write'.

- NWIE **gleubʰ-e-* 'carve, cut out', in Lat. *glūbō*, Gmc. **kleuban*; also Gk. *glúpʰō*, OCS *glǫbokŭ*, Ru. *glubókij* 'deep'.

- NWIE **gli̯ā /glinā* 'glutinous substance, clay', cf. Gmc. *klaii̯a-*, Lith. *gléinė*, Russ. *glej, glína*; also Gk. *glía, glínee*, MArm. *kałǰin*.

- NWIE **gōb-i̯o-* 'barley', cf. Lat. *gōbius*, Gk. *kōbiós* 'goby, gudgeon', SCr. *gûb*, Sln. *gúba* 'barbel'.

- NWIE *gʷel-* 'wound', cf. OIr. *at-baill*, W *a-ballu* 'die', Gmc. **ku̯elan-*, Lith. *gélti* 'sting, hurt', Ltv. *dzelt* 'to sting'; also Arm. *keł* 'wound, sore, ulcer'.

- NWIE **kan-e-* 'sing', cf. Lat. *canō*, OIr. *canaid*, OW *canam*, preserved in nouns in **kan-o-* 'singer', cf. Gmc. **xanan-* 'rooster, singer', Gk. *ēi-kanós* 'rooster', MDu. *-hane* 'singer'.

- NWIE **kiker-* 'chick pea', cf. Lat. *cicer*, OPru. *keckers*, also Gk. *kíkerroi*, Arm. *siseṙn*, Alb. *thjer(r), thíerr*.

- NWIE **kna-i̯e-* 'scratch', cf. OIr. *-cná*, W *cnoi*, OHG *nōen*, Lith. *knója*, Gk. *knaíō*.

- NWIE **klep-e-* 'steal' cf. Lat. *clepere*, Gmc. **xlefan-*, in **-t-* in Gk. *kleptō*. Derived from European root **klep-*, compare derivatives in **-ni-* OIr. *cluain* 'deceit', agentive in **-tu-* Goth. *hliftus*, p. part. in **-to-* OPru. *au-klipts* 'concealed', and noun in **-ā-* Cz. *klopa* 'lapel, flap'.

- NWIE **kʷap-o-* 'smoke, steam', cf. Lat. *vapor*, Goth. *-hvapjan*, MHG *-wepfen*, Lith. *kûpêt*; also Gk. *kapnós*.

- NWIE **lap-na-* 'lick', cf. Lat. *lambere*, Gmc. **lappōn*, **labbōn*, Lith. *lapènti*, Russ. *lópat'* 'gobble up'; further Gk. *láptō*, Alb. *lap* 'lick up water'.

- NWIE *leud^his '(free, common) people', cf. ON _lýðr_, OHG _liut_, Lith. _liáudis_, Ltv. _ļaudis_; and *leud^h-eros 'free', cf. Lat. _līber_ (<Ita. *louðeros), Gk. _eleút^heros_.

- NWIE *leug- 'bend', cf. OIr. _-loing_, Goth. _-lūkan_, as well as Lat. _luctāre_, Lith. _lùgnas_, Gk. _lúgos_ (see below also NWIE *leug^h- 'lie').

- NWIE *loub^h- 'rind(?)', cf. Lat. _liber_ 'bark, rind', Gmc. *lauba- 'leaf, foliage', Russ. _lub_ 'bast', Lith. _lubà_ 'blank', OPru. _lubbo_ 'bast, plank, shelf'; further Alb. _labē_ 'rind, cork'.

- NWIE *lokus 'lake, pond, pool', cf. Lat. _lacus_, OIr. _loch_, Gmc. *lagu-, OCS _loky_; further Gk. _lákkos_ 'pond, cistern, pit, reservoir' < *ļk-u̯o-.

- NWIE *lu(n)k- 'lynx', cf. MIr. _lug_, OHG _luhs_, Lith. _lū́šis_, dial. _lyn̑šis_, OPru. _luysis_, Russ. _rýsь_; also Gk. _lúnks_, gen. _lunkós_, Arm. *lusan-n.

- NWIE *mori-/mrei- 'sea', cf. Ita. *mari, Cel. *mori, Gmc. *mari, BSl. *marja, and maybe Arm. _mawr_ (possibly in combination with *meuH- 'make wet, wash'). Compare with potential eastern derivative PIIr. _mari̯ā́dā_ 'shore, limit, boundary'.

- NWIE *musi̯a- 'fly', cf. Gmc. *musī-, OPru. _muso_, Lith _mùsė_, Ltv. _muša_, OCS muxa, Russ. _múxa_, or Gk. _muia_; also Lat. _musca_ < *mus-kā-.

- WIE *not-o- 'back' cf. Lat. _natis_ 'rump, buttocks', Goth. *nota 'rear of a ship', cognate with Gk. _nōton_ n. 'back'.

- NWIE *oi-no- 'one', in Ita. *oino-, Gel. *oino-, Gmc. *aina-, Bal. *oino-; cf. also Gk. _oinḗ_, OCS _inŭ_ 'some(one), other'. Derived from root *oi-, compare cognates Skt. _éka-_ < *oi-ko-, Av. _aēuua-_, OPru. _aiva_ < *oi-u̯o-.

- NWIE *oi̯u̯a 'type of tree', cf. Lat. _ūva_ 'grapes', OIr. _eó_ 'yew', OHG _iwa_ 'yew', OPru. _iuwis_ ''yew', Lith. 'bird-cherry', Russ. _íva_ 'willow', Cz. _jíva_ 'willow'; compare also Gk. _oíē_ 'service-tree', Arm. _aygi_ 'vineyard; vine'.

- NWIE *pā-no-* 'cloth' cf. Lat. *pannus*, Gmc. **φanan-*, Gk. *pḗnē*; maybe also here OCS *o-pona* 'curtain'.

- NWIE *pā-u̯o-* 'small, few' cf. Lat. *parvus*, *paucus*, Gmc. **φau̯a-*, Gk. *pauros*.

- NWIE *pel-en-* 'skin', cf. Lat. *pellis*, Gmc. **φella-*, OCS *pelena*, and Gk. *pello-ráphos* 'sewing skins together'.

- NWIE *plṓ-u̯e-* 'swim', cf. Gmc. **φlōan* 'flow', OCS *plaviti* 'to let swim', PGk. **plṓu-e-* 'to swim'.

- NWIE *sal-ik-* f. 'willow', cf. Lat. *salix* 'willow, osier', OIr. *sail*, gen. *sailech*, MW pl. *helyg*, MBret. *halek*, Gaul dat. *salico-genne*, Gmc. **salixōn-* 'willow, sallow' (ON *selja*, OE *sealh*, OHG *salaha*). Compare **selik-* in Gk. Myc. *e-ri-ka* /helikā/, Arcadian *helíkē* 'willow' < **sel-ik-ā*.

- NWIE *sēmen* 'seed', cf. Ita. **sēmen*, **sēmō* (collective), Gmc. **sēman-*, BSl. **sēmen*, also found in Gk. *hēma* (<**sē-mṇ*). From common PIE root **seh-* 'press in, introduce → sow', cf. Hitt *sai-* 'press in, sow'.

- NWIE *skabʰ-e-* 'scrape', cf. identical Lat. *scabere* 'to scratch', Gmc. **skaban* 'to shave, scrape', and full-grade Lith. *skóbti* 'hollow out'; further Gk. *skáptō* 'to dig (out), work the earh' < **skabʰ-ie*, and OCS *skoblĭ*, Russ. *skóbelĭ* 'plane'.

- NWIE *sleim-ak-* 'slug' cf. Lat. *līmāx*, Russ. *slimák*, Gk. *leímaks*; further Gmc. **slīma-* (probably also here **slīu̯a-* 'tench'), Lith. *sliēnas* m.pl., OCS *sliny*.

- NWIE *smerd-* 'hurt' as basis for Lat. *mordēre* 'bite', Gmc. *smertan* 'hurt', Lith. *smirdéti*, OCS *smrŭdĕti* 'smell'; also Gk. *smerdnós* 'terrible, dreadful', Arm. *mart* 'fight, battle'.

- NWIE *(s)nē-* 'spin', cf. Lat. *nēre*, OIr. *sníid*, W *nyddu*, Gmc. *nēan-*, Lith. *nýtis*, Ltv. *nĭtis*, Russ. *nit'*; further Gk. *neō*.

- NWIE **tpel-u̯ā-* 'willow, elm' cf. Lat. *tilia*, Gmc. **φelu̯o*, possibly Russ. *topol'*; also Gk. *pteléa*, Arm. *t'ełi*.

- NWIE **teutā* 'people', the most common ethnic self-designation in European languages, cf. Ita. **touta*, Cel. **toutā*, Gmc. **ϑeudō,* Ltv. *tàuta*, Lith. *tautà*, OPru. *tauto* 'country', or Messapic *taot-*; also found in Balkan languages, cf. PAlb. **tetan* 'all; people', Phryg. acc. pl. *teutous*, or "Illyrian" *Teutana* 'queen'. Possibly a PIE word that evolved from a more general meaning, cf. the uncertain cognates Hitt. *tuzziš* 'army, camp', Sogd. *twð'k* 'crowd', Persian *tōda* 'heap, pile'.

- WIE **u̯ogʷ-* 'wet', cf. Pre-Ita. **u̯og⁽ʷ⁾-edʰo-*, Pre-Cel. **u̯ogʷ-lo-*, Pre-Gmc. **u̯ogʷ-o-*, PreGk. **ug⁽ʷ⁾-ro-*.

- NWIE **u̯ogʷʰ-ni-* 'ploughshare' cf. Lat. *vōmer*, Gmc. **u̯agnis-an*, OPru. *wagnis*, also Gk. *opʰnís*.

- NWIE **u̯rad-i-* 'branch, root' cf. Lat. *rādīx*, Cel **u̯radi-o-*, ON *rót*, Goth. *waurts*, also Gk. *rʰā́dīks* Alb. *rrënj/ë, -a*, maybe Toch. B *u̯itsako*.

- NWIE **trozd-u-* 'thrush', cf. Lat. *turdus* (<**torzd-o-*), Gmc. **ϑrastu-*, Bal. **strozd-o*, Sla. **drozd-o-*. Compare with Arm. *tordik* 'thrush' < **dorzdʰ-*.

3.2.4. Classical North-West Indo-European

Lexical isoglosses not shared with other IE languages include different categories (Oettinger 2003):

3.2.4.1. Remade Late PIE stems

Most likely a term inherited from Late PIE, but remade in form or meaning from the same or other root:

- NWIE **bʰei-* 'hit', cf. OLat. *perfines* 'you shall hit', OIr. *-ben, -benat*, perf. *bí, béotar*, Gmc. **bi(i̯)ēn-*, OCS *bii̯ǫ, bi, bišę*. Stem not found in other IE languages, although maybe here Alb. *(m-)bin*.

- NWIE **bʰor-i̯e-* 'fight', in Lat. *ferīre* 'strike', Gmc. **bari̯an-* 'fight', OCS *brati* 'fight', Russ. *borót'* (*borjú*) 'overpower, throw to the

ground'; here also Lith. *bárti* (*barù*), Ltv. *bãrt* 'scold' (in *-*e*-), and OIr. *barae* 'anger, hostility' (in *-*n*-). Probably also related derivatives in *-*ā*- Lat. *forāre*, Gmc. **burōi̯an*-.

- NWIE *dʰgʰmōn 'man, human', usually reduced to *gʰmōn, cf. Ita. *hemō (OLat. *hemō*, Osc. *humuns*, Umbr. *homonus*), Gmc. *gum-an-, Bal. **žm̃õ* (OLith. *žmuõ*, OPru. *smoy*). A different reduction is found in OIr. *duine* < **don-i̯os*, probably from metathesised form **gdon-i̯os* from extended **gʰdʰmon- + *-*i̯os*. Comparable with LPIE **dei̯u̯os* 'god', from **di̯eus* 'sky', hence "celestial", as opposed to this term "earthly", from *dʰgʰem-, 'earth'.

- NWIE *gʰóstis 'guest', cf. Ita. *hostis, Cel. *gostis, Gmc. *gastiz, Sla. *gostъ, probably from *gʰes- 'eat'. Also found in compound **gʰost(i)potis*, 'host', cf. Ita. *hostipotis, Sla. *gospodъ. Comparable with parallel Skt. *átitʰi-pati*-.

- NWIE *gʷʰor-mós 'warm', cf. Ita. *formos, Gmc. *warmaz, OPru. *gorme* (and *gormapada*), Lith. *gorme*, Ltv. *gaȓme*. In contrast, compare Palaeo-Balkan *gʷʰer-mós in Gk. *tʰermós*, Phryg. *Gérmee*, Arm. *ǰerm*, PAlb. *dźerm-. PIIr. *gʰarmá*- is probably a parallel development of an o-stem, pointing to an original LPIE paradigm *gʷʰór-mo- 'heat', *gʷʰr-mós 'warm'.

- NWIE *gʰórdʰos 'enclosure, fenced circle', cf. Gmc. *gardaz*, BSl. *gardas, also in Toch. B. *kerccī* < **gʰórdʰi̯o*-; dubious is the origin of Alb. *gardh* 'fence'. The change is the development of an o-stem from **gʰr̥dʰós*, cf. Hitt. *gurtas*, PIIr. **gʰr̥dʰás*.

- NWIE **kéi̯u̯os* 'household', cf. Ita. i-stem **kei̯u̯is*, Gmc. *hīu̯on* 'married couple, household', Ltv. *siẽve* 'wife (< household)'. Shift in meaning to the extended family group, including personal relationships such as the spouse and 'friends'—i.e. those with reciprocal (moral) obligations—comparable to the Greek *philos* (Benveniste 1969). Compare for the original meaning Skr. *śéva*- (<*ĉái̯u̯as*) 'dear, precious,

friendly'. Compare also **koimos* 'home', cf. OIr. *cóim* 'dear', Gmc. **xaimas* (probably borrowed in Baltic, cf. Lith. *káimas*, Ltv. *cìems*, OPru. *caymis*), Gk. **koimo-* 'bed'.

- NWIE **kéu̯-er-os* 'northern (wind?)', from CIE **k(e)hu-er-o-*, cf. Lat. *caurus*, Lucr. *cōrus* (< Ita. **kau̯ero-*) 'north wind; the north-west wind', Lith. *šiàurė* 'north', *šiū́ras*, *šiūrùs* 'cold, northern', OCS *sěverŭ* 'north'; from the same root MW *cawad* 'gust, shower', OBret. *couatou* 'showers' (<Cel. **keu̯-Vt-*), which confirms that *-r-* belongs to the suffix. Goth. *skūra windis* 'storm (of wind)', OHG *skūr* 'rain shower' and Arm *c̣owrt* 'cold' are probably not related.

- NWIE adj. **mói-nos* 'common, shared', from **mei-* 'exchange', cf. Ita. **moi-ni-*, **moinos* 'duty, obligation, task', Gmc. **mainas* 'common', Lith. *maĩnas* 'exchange', OCS *měna* 'exchange, substitution'. Also here **kom-moinos* 'common, general', cf. Lat. *commūnis*, Goth. *ga-mains*, OE *ge-mǣne*, OHG *gi-mein*, etc. Possibly here also verb **moi-t-éie-* 'exchange', cf. Lat. *mutāre*, Goth. *maidjan*.

- NWIE **pérkʷus* 'oak-tree', cf. Ita. **kʷerkus*, Cel. **φerkus*, Gmc. **φerxuz*; with possible derivative **pérkʷūnos*, the stormgod (with wife *pérkʷūni̯ā*), a main god of the European pantheon, possibly linked to the stronger agricultural character of the new population; cf. Cel. *Ercunia* (< fem. *Φerkuniā*, probably a forest goddess), ON. *Fjörgyn* ('Earth', moder of Thor), probably also here Gmc. **φerkuni̯a-* 'mountain', Lith. *Perkūnas* (borrowed in Finn. *Perkele*, Mordv. *Pur'gine-paz*), and Thrac. *Perkōn/Perkos*. Possibly remade are Sla. *Perun*, Alb. *Perëndi*. For a comparison probably here belongs (with the same obscured phonological developments of mythological names, usually caused by taboos), OInd *parźáni̯a* 'rain god'; interesting also Gk. *keraunós* 'thunderbolt'. See below for the god's magical hammer **meldʰ-n-*, lightning, and for the WIE epithet **tr̥ˀnos*, 'thunder'.

- NWIE **pol-u̯o-* 'pale', cf. Lat. *pullus*, Gmc. **φalu̯a-*, Lith. *pal̃vas*, OCS *plavŭ*. The uo-suffix for colour names is used in this European stem, instead of that found in Pre-PIIr. **pelu-so-*.

- NWIE **réidʰ-e-* 'ride, hurry', in Cel. **rēd-o-* (cf. OIr. *réidid*, W *rhwydd-hau* 'to hurry'), Gmc. **rīdan-*, Lith. *riedėti*. Also found as 'ride' with sexual connotation, cf. Gmc. **ridra-* 'penis' with instrumental ending (Kroonen 2013). Classified as of unknown origin in Oettinger (2003), it seems—at least phonologically and morphologically—a remade Indo-European root (Kümmel et al. 2001). The stem seems related to root **rei-* 'arrange', whose semantic evolution includes the meaning 'ready, quick', then to 'easy, simple' cf. NWIE **reidʰ-i-* e.g. in OHG *bi-reiti* 'ready', OIr. *réid*, 'even, light, easy', OW *ruid*, Lith. *raidùs* 'ready, quick' (Matasović 2009).

- NWIE **rótos* (<DIE **Hró-tos*) 'wheel', cf. Ita. **rotā* (collective) Cel. **rotos*, Gmc. **raθaz*, Lith. *rãtas*, Ltv. *rats*. The Proto-Balto-Finnic loan may have been Germanic or Baltic. Other languages (including NWIE) show other derivatives from **Hret-* 'roll'.

- NWIE **u̯eik-* 'defeat, conquer', cf. Lat. *vincō*, OIr. *-fich*, *-fechad* 'fight', ON *vega*, Goth. *-waih* 'fight', Lith. *veikiù*; contrasting with Graeco-Aryan root, cf. Skt. *źái̯ati* 'defeat', Gk. *bíā* 'violence'.

3.2.4.2. Peculiar semantic or sound developments

New terms with peculiar semantic or sound developments:

- NWIE **dreu-o-* 'certain', from 'tree, wood', hence 'strong', cf. OIr. *derb* 'certain', Gmc. **treu̯u̯u-* 'loyal, trustworthy', *trūēn-* 'trust', OPru. *druwit* 'to believe'. For a similar shift of meaning, compare Lat. *rōbustus* adj. 'made of oak; strong', from *rōbur* 'oak, strength'.

- NWIE **gr̥ʔnóm* 'grain', cf. Ita-Cel. **grānom*, Gmc. **kurną*, BSl **źirʔna-*.

- NWIE *lond^h-* 'open land, waste', cf. Cel. *landā* (<*lṇd^h-), Gmc. *landa-* (*lond^{h}om*), OPru. *lindan* (<*lṇd^h-), maybe here Russ. *ljadá*. Probably originally from an ablauting paradigm nom. **lōnd^h-s*, gen. *lṇd^h-os*, Acc. *lond^h-ṃ* (Matasović 2009).

- NWIE *selb^h-o-* 'self', in Gmc. *selba(n)*, Venetic *sselboi-sselboi* 'to oneself' (reduplication similar to Lat. *ipsipse*). The lack of relation of both languages probably points to a common North-West Indo-European origin. It has been suggested that this stem is derived from *s(u)e-* 'self'.

- NWIE *(s)kel-* etc. 'commit a crime, be guilty', in Lat. *scelus* 'crime', Goth. *skal* 'be guilty, must', Lith. *skelù* 'be guilty'.

- NWIE *stab^{h}os* m. 'beam' in identical roots behind OIr. *sab* 'shaft, pole' Goth. *stabos* 'letters', ON *stafr* 'staff; stave', OE *stæf* 'staff, stick; letter', OHG *stap*, LIth *stābas* 'post'. The original Cel.-Bal. correspondance in *-a* points to it as the original vowel; further in *-ro-* cf. Swe. *staver* 'fencepost', ODa. *stavær*, OCS *stoborŭ* 'pillar'.

- NWIE *steup-* 'to bend', in W *ystum* 'bend, turn', Bret. *stumm*, Gmc. *stūpēn* 'to stoop, to bend'; Ltv. *staūpe* 'horse track' (cf. Nor. *staup* 'puddle; deep track; sharp turn').

- NWIE *ụod^h-* etc. 'bail, surety', cf. Lat. *vas*, Goth. *wadi*, Lith. *vãdas*, etc.

3.2.4.3. Combinations from roots and affixes

New combinations from roots and affixes:

- NWIE *al-no-* 'all, whole', cf. Osc. *allo*, OIr. *uile*, Goth. *alls*, ON *allr*, Lith *aliaĩ*. New is the formation in *-no-* from LPIE *al-*, 'other', with controversial original laryngeal (*ħ or *ʕʷ) and vocalism (*a or *o).

- NWIE *áksis* 'axis', cf. Lat. *axis*, W *echel* (< Cel. *aksi-lā*), BSl. *aśis* (Lith. *ašis*, Sla. *osĭ*). Common is the formation in *-i*.

- NWIE *$b^h\bar{a}$-i̯e-* 'speak', cf. Lat. *fārī*, OE *bōjan*, OCS *bajati*, *bajǫ*. Common is the suffix *-i̯e*.

- NWIE *$b^h l\bar{e}$-i̯e-* 'to bleat', cf. Lat. *flēre*, Gmc. **blēi̯an*, Ltv. *blêju*, ORuss. *blějati*.

- NWIE *$g^h\acute{o}rnos$* 'gut', cf. Lat *hernia*, Gmc. **garnō*, Lith. *žárna*. Common is the noun in **-no-* (extended in Lat. **n-i̯o-*).

- NWIE *$g^{wh}ou̯\bar{e}i̯e$-* 'watch; be considerate of; worship', cf. Lat. *faveō*, ON *gá*, OCS *govějo*, *gověti*. Common is the combination of suffix *-ēi̯e-*.

- NWIE *$g^{wh}r\acute{e}nd^h$-e-* 'grind' cf. Lat. *frendere*, OE *grindan*, Lith. *gréndžiu <*-ie-* 'to plane, scour'.

- NWIE *d^hul-(n)o-* 'blind; fool' cf. Cel. **du̯allo-* 'blind', Gmc. **dula-* 'foolish, crazy', Ltv. *duls* 'furious'.

- NWIE *d^hus-e-* 'to lose one's senses', in Lat. *furere* 'be mad, rave', Gmc. **dusēn-* 'to slumber', Lith. *dūstù* 'suffocate', Ltv. *dust* 'to gasp', OCS. *duxŭ* 'breath', Lith. *dùsas* 'short breath, asthma'; cf. Cel. **du̯allo-* 'blind', Gmc. **dula-* 'foolish, crazy', Ltv. *duls* 'furious'. Here also *d^hus-k-* 'obscure', cf. Lat. *fuscus*, Gmc. *duska-* 'dark', and also with different suffix *d^hus-no-* 'brown', cf. OIr. *donn*, OHG *tusin*, OE *dosen*.

- NWIE *$\bar{e}dsk\bar{a}$* 'food, feed', cf. Lat. *ēsca*, Lith. *ėskà*, Ltv. *êska*.

- NWIE *k(V)l-ni-* 'mountain path', cf. Lat. *callis*, Sla. **kol-ni-ki* (cf. Serb. *klánac*, Czech *klanec*).

- NWIE *$k\underset{.}{l}$-men-* 'hill', cf. Lat. *culmen*, *columen*, ON *holmr*, *holmi*, OE *holm*, Lith. *kálnas*.

- NWIE *$k\acute{\bar{a}}ros$* 'dear; love', cf. Lat. *cārus*, OHG *huor*, Ltv. *kārs*.

- NWIE *ker-n-* 'wild boar', from an original 'horn', cf. OIr. *craín* 'sow', W *cranan* 'wild sow', Lith. *šeřnas*, Old Late Frankish *chranni-chaltia* 'pig's den'.

- NWIE *$k^w eg^h$-ne- 'crouch down, flinch, be startled', cf. Lat. *conquinīscō* (perf. -*quēx*- < *$k^w ēg^h$-s-), Gmc. *$x\underset{.}{u}ekkan$-, OCS *čeznǫti*, *is-čeznǫti*.

- NWIE *$k\underset{.}{r}'sro$- 'hornet', cf. Lat. *crābrō*, OE *hyrnet*, Lith. *šìršė*, ORuss. *s(t)ršenĭ* etc.

- NWIE *krōpo- m. 'shed', cf. OIr. *cró*, MW *creu*, Gmc. *$xrōφa$-, OCS *stropŭ*.

- NWIE *kūtis f. 'skin', cf. Lat. *cutis*, Gmc. *xūdiz*; further OPru. *keuto*, Lith. *kiáutas*, and also MIr. *codal*, Lith. *kiáuklas*.

- NWIE *lāmā 'bog, hollow', cf. Lat. *lāma*, Ltv. *lâma*, OCS *lam*.

- NWIE *lentos 'soft', cf. Lat. *lentus* 'pliant, flexible; tough; sticky; slow', Gmc. *$linϑa$ 'flexible, soft', Lith. *leñtas* 'quiet, calm'.

- NWIE *$meld^h$-n- 'lightning; thunder weapon of the stormgod', cf. Gmc. *$meldun\underset{.}{i}az$, W *mellt*, Ltv. *milna*, OCS *$ml\underset{.}{u}n\underset{.}{i}ĭ$.

- NWIE *$m\underset{.}{r}t\underset{.}{u}o$- 'dead', in Lat. *mortuus*, Sla. *mrŭtvŭ*.

- NWIE *oinoko- 'unique', in Lat. *ūnicus*, OS *ēnag*, etc. OCS *inokъ*.

- NWIE *oketā 'harrow', cf. Lat. *occa*, OW *ocet*, Gmc. *$agiϑō$- Lith. *akěčios*, OPru. *aketes*.

- NWIE *pelen-, *$p\underset{.}{l}n$- (ablauting) 'fine flour, milldust', cf. Lat. *pollen*, OPru. *pellane*, Lith. *pelenaî*, Ltv. *pęlni*.

- NWIE *plek-te- 'to plait, braid', in Lat. *plectere*, Gmc. *$φlextan$-, OCS *pletǫ*, *plesti*. Extension of the root *plek-*, compare Gk. *plékō*, Skt *praśna-*.

- NWIE *porkelo- 'piglet, hoglet', cf. Lat. *porculus*, OHG *$φarxeli$, Lith. *parselis*. Common is the newly formed diminutive, which turns NWIE *porkos into a more general meaning 'pig', evolved from the older LPIE 'piglet' found in PIIr. *párĉas. Similarly, from LPIE *sūs* 'pig', diminutive *$su\underset{.}{i}nos$ is formed, cf. Lat. *suīnos*, Gmc. *$su\underset{.}{i}naz$, Ltv. *sivēns*, Slav. *svinŭ*, *$svin\underset{.}{i}a$.

- NWIE **pr̥ˀmó-* 'first', cf. Lat. **prāmo-* (in *prāndium*), Faliscan *pramo*, Gmc. *φurmaz, Gaul. *ramus*, Ligurian *pramion*, Lith. *pìrmas*. Common is the suffix *-mo-*, which sets it appart from other LPIE developments in **-u̯o-* (Indo-Iranian), **-to-* (Greek), etc.

- NWIE **reudʰ-o-* 'red', cf. Lat. dial. *rūfus*, *rōbus*, Umb. *rofu* (acc. pl.), OIr. *rúad*, W *rhudd*, Goth *rauþs*, Lith. *raũdas*, OCS *rudŭ*; contrasting with eastern DIE dialects forming it in **-r-*, cf. Toch. B *ratre*, Skt. *rudʰirá-* 'bloody', Gk. *erutʰrós*.

- NWIE **rudʰēi̯e-* 'be red' ('become red'), cf. Lat. *rubeō*, OIr. *ruidi*, OHG *rotēn*, ORuss. *rŭdeti se*, Lith. *rudĕti*.

- NWIE **salu̯o-* 'drab, dull-brown or -gray' cf. W *salw*, ON *solr*, ORuss. *slavo-očii̯e*.

- NWIE **souk-nā-* 'suck', in identical Lat. *sūgere* (cf. *sūcus* 'juice'), Gmc. **sukk/gōn*; further Ltv. *sùkt* (notice lack of satemisation), OCS *sŭsǫ*, Russ. *sosú*.

- NWIE **stengʷ-e-* 'to push back', cf. Lat. *re-stinguere* 'to push back, suppress', Gmc. **stinku̯an* 'to thrust, clash; to stink', Lith. *sténgiu* 'to exert oneself'. Nasal infix present from root **stegʷ-* (Kroonen 2013).

- NWIE **stor-on-* 'starling', cf. Lat. *sturnus*, Gmc. **staran-*, also Cz. *sternad* 'bunting'. Comparable with zero-grade root in **-lo-* in Gk. *astralós* 'starling'.

- NWIE **strengʰe-* 'be stiff, tighten', cf. Lat. *stringere*, Gmc. adj. **strang(i̯)a*, *strangi, **strunka-*, **strunga-* (which imply an underlying verb **strengʰ-e-*), Lith. *stringù* 'to stick', Ltv. *stringt* 'to stiffen; to wither', adj. *strangs* 'brave'; Pol. *za-strząc* 'to come to a halt'.

- NWIE **strou-eie-* 'to strew', cf. Lat. *struere* 'to arrange, construct, compose, build', OIr. *sruïd* 'to throw', OBret. *strouis* 'to strew', Gmc. **strau̯i̯an* 'to strew' (cf. Goth. *straujan*, ON *strá*, OE *strēowian*, OHG *strewen*, etc.), OCS *o-strui̯ǫ* 'to destroy'. NWIE causative or intensive

formation from LPIE *str-neu- 'to strew', compare Lat. *sternere*, Gk. *stórnūmi*, Skt. *stṛnā́ti*.

- NWIE *tekt-lā 'axe', cf. Lat. *tēlum*, OIr. *tál*, OHG *dehsala*, ORuss. *tesla*. Common is the formation in *-lo-* in the field of *nomina agentis*, see above.

- NWIE *tlokʷ-e- 'talk', cf. Lat. *loquor*, OIr. *ad-tluchedar* 'gives thanks', *do-tluchedar* 'demands', Russ. *tolk* 'sense, meaning'.

- NWIE *u̯erb-es- 'twig, rod', cf. Lat. *verbera* pl. '(rod for) punishment', *verbēnae* pl. 'twigs of the laurel', Lith. *vir̃bas* 'twig, rod', Ltv. *vir̃bs* 'thin stick', Pru. *arwarbs* 'langwyt', Sla. *vĭr̃ba* 'willow / Salix'. From Balto-Slavic borrowed into Proto-Balto-Finnic, cf. Finn. *virpa, varpa*, Est. *vir̀b, varb*. From PIE root *χ/ɣʷu̯erb-, *χ/ɣʷu̯r̥b- 'willow', cf. Hitt. *ḫurpasta(n-), ḫurpusta-*, 'leaf, peel', Gk. *rhábdos* (*rhabi̯os) 'twig, rod, staff'. Possibly related to an Afroasiatic root, cf. Semitic *ɣurab (cf. Akk. *urbatu-,* Hebrew *ʕărābā* 'willow, Euphrates poplar'), Egyptian *ʕꜣb* "a kind of tree" (Blažek 2018).

- NWIE *u̯ēros 'true', cf. Lat. *vērus*, Cel. *u̯īros*, Gmc. *u̯eraz*, OCS *věra*. Likely cognates Gk. *ḗra* 'please' and Hitt. *uarr-* 'help' show a different, probably original meaning.

- NWIE *u̯r̥mis 'worm' cf. Lat. *vermis*, W *gwraint*, Gmc. *u̯urmiz*, Lith. *var̃mas*, OPru. *wormyan, warmun*, Sla. *vĭrmi̯e*; probably here Alb. *rrime*. Common the formation in *-is, compare Gk. *rhómos*, OArm. *ordn* (uncertain). Cognates in Indo-Iranian and Armenian include a proto-form *kʷr̥mis.

3.2.4.4. Different function from LPIE

New words substituting common PIE terms for stems with a different function in Late PIE:

- NWIE *bʰars, *bʰarsinā 'barley', cf. Lat. *far, farinā* 'spelt, flour', Faliscan *far*, Cel. *bargos, *barginā* 'cake, bread', Gmc. *barizaz, *bariz-īnaz*, Sla. *barsina-*. Instead of LPIE *i̯eu̯o- 'barley, cereal'.

- NWIE *$b^h ard^h ā$* 'beard', cf. Lat. *barba* (<Ita. *farβā*), Gmc. *bardaz*, BSl. *bardā́*. Instead of LPIE *smokru-*.

- NWIE *$b^h erg^h$-e-* 'protect', cf. OIr. *commairge* < *$kom-b^h org^h-iā$-*, Gmc. *bergan*, OCS *brĕgǫ* 'care', Lith. *birginti* 'save'. Probably connected to *$b^h erg^h$-* 'mountain' hence 'to take high ground', whence 'to keep safe'. Balto-Slavic words are sometimes rejected because of the lack of satemisation in these forms (and thus derived from late dialectal innovation from *$b^h erg^h$-* 'safegard'), although satemisation is late and irregular in Balto-Slavic (see below *§4.13.1. Balto-Slavic evolution*).

- NWIE *$b^h lad$-* 'invocation', Lith. *blódeti*, Ltv. *blādêt*, also in loanword Fi. *luote* 'enchantment'; impossible to know the true source of Lat. *flāmen* 'priest', Gmc. *blōtan-* 'to sacrifice', if *$b^h lad$-* or *$b^h lag$-* (see above *§2.2.2.4. Ritual and religion*).

- NWIE *mais-* 'more' cf. Osk. *mais* (adv.), W *mwy*, Goth. *maiza*, OPru. *muisieson* (adv.). Instead of Late PIE *pleh-is-*.

- NWIE *piskos*, cf. Ita. *piskis*, Cel. *ɸēskos*, Gmc. *ɸiskaz*, Sla. *piskor'*, *piskar'.* Contrasting with eastern isogloss *$d^h g^h u$-* (see below *§4.13.3. Contacts with Palaeo-Balkan languages*).

3.2.4.5. Root variant or parallel root

New formations with a root variant or parallel root, usually further obscured with dialectal innovations on the newly created, unstable forms:

- NWIE *ag-r-o-* 'tree fruit' cf. Cel. *agṛn-io-*, *agr-on-a*, Gmc. *akrana-* (see above *§2.2.3.2. Northern Indo-European* for root *ag-*).

- NWIE *$b^h el$-* 'henbane' cf. Cel *belesa*, Gmc. *bel-uon-*, Sla. *bel-(e)n-o-*.

- NWIE *$b^h ei$-* 'bee' as basis of forms in *-k-o-* (cf. Lat. *fūcus*, OIr. *bech*, W *begegyr*, OCS *bicela*), in *-n-* (Gmc. *bion-*), or *-ti-* (Lith. *bìtė*, OPru. *bitte*).

- NWIE *b^hreus-* 'breast, chest', in *-t-* (cf. OIr. *brúasach*, Gmc. *breusta-*), in *-o-* (cf. Russ. *brjúxo*), in *-n-* (cf. OIr. *brú*, gen. *bronn*, MW *bru*, *bron*; OIr. *bruinne*).

- NWIE *d^hlg^h-e-* 'owe', *d^hlg^h-o-* 'debt', cf. Cel. *dligid, dliged*, Gmc. *dulga*, OCS. *dlŭgŭ*.

- NWIE *el-o-* 'auk, swan', as basis for Lat. *olor < Ita. *elōr*; OIr. *elu < *el-jā?* W *alarch < *el-r-sko*; Swe. *al-*, Ice. *-ella*, ON *alka*, OE *ealce*, apart from those in *el(b^h)-*, cf. Gmc. *albut*, Sla. *elbedь*, *olbǫdь*, etc. The alternation *e/*a may point to the influence of *alb^hos* 'white', on the root.

- NWIE *$geld^h$-e-* 'payment, compensation' cf. OIr. *gell < *geldo-* 'pledge surety, promise', Gmc. *geldan < **gelde-* 'pay, be worth something', OCS. *žlěsti (žlědǫ) < *gelde* 'to pay, compensate'.

- NWIE *geb^h-* 'gnaw', as basis for OIr. *gop* 'muzzle, snout, beak', Gmc. *kebra(n)-* 'gnawer' in OE *ceafor, cefer*, OHG *kevar(o)* 'beetle', ODu *kevera* 'grasshoper', OCS *o-zobati* 'to spoil', Russ. *zobát'* 'eat, peck', etc.

- NWIE *g(e)r-s-e-* 'make sound', basis for Lat. *garrio* 'to chatter', Gmc. *kerzan-* 'to creak, to cry (of birds)', iter. *kurzōn-*, Lith. *gar̃sas* 'sound, rumour, glory'.

- NWIE *$gleb^h$-* 'round object (?)', as basis for Lat. *globus* 'round object', *glēba* 'lump of earth, clod', Gmc. *kulba(n)* 'round object', Lith. *glébiu* 'to embrace, clasp', Ltv. *glêbt* 'to guard, protect'.

- NWIE *g^hlend-e-* 'shine, look', cf. OIr. *as-gleinn* 'to examine', Gmc. *glintan* 'to shine, look', Ltv. *gleñst* 'to (scarcely) perceive', OCS *ględati* 'to look at, see' Russ. *gļiadét'* 'to look at'.

- NWIE *grem-* 'push', cf. Lat. *gremium* 'lap, bosom, armful', Gmc. *krimman-*, 'crumble', *krummōn-* 'squeeze', Lith. *grùmti* 'to push, shove, cram'.

- NWIE *$g\underset{.}{u}os$-d^h-o/i- 'nail, wheel hub' cf. W *both*, Gaul. *bottos*, MIr. *bot*, OCS *gvozdĭ*.

- NWIE *$\bar{\imath}$-lo- 'empty land, clearing', as basis for W *ial*, OE *idel*, OHG *ital*, Ltv. *jêls*, Russ. *jályj, jálovyj*.

- NWIE *$kank$- 'jump (related to horses)', with derivative *$kankisto$- 'stallion', cf. W *caseg*, Runic */hangist-/*, Lith. *šankùs, šankinti*.

- NWIE *$kerd/t$- 'gird' cf. OIr. *cris, crys*, Russ. *čeres*, etc.

- NWIE *$kost\bar{a}$, *$kost$-i 'rib, bone' cf. Lat. *costa*, ORuss. *kostŭ*.

- NWIE *$kreng^ho$- 'ring', cf. Umbr. *críngatro*, ON *hringr*, OCS *krǫgŭ*.

- NWIE *$kors$-e- 'to card', cf. Lat. *carro* <*krs-e-, Gmc. *$xarz\underset{.}{u}a$- <*$kors$-$\underset{.}{u}o$- 'flax', Lith. *karsiù*, Ltv. *kārst* < *$kors$-ie-.

- NWIE *$kout$-no- 'testicle', cf. Lat. *cunnus* 'vagina', W *cwd* 'bag, sack', Gmc. *$xau\vartheta an$- 'testicle', Lith. *kutỹs* 'pouch'.

- NWIE *$kreis$-, cf. Lat. *crīnis* 'hair', ON *hrís* 'brushwood', OE *hrīs* 'branch, brush', OHG *hris* 'twig, branch; shrubs', OPru. *craysi* 'talk', crays 'hay'.

- NWIE *$kret$- 'tremble' as basis for Ir. *crothaim*, ON *hrata*, OE *hratian*, MHG *razzen*, Lith. *kretù, krintù*, Ltv. *krist*, etc.

- NWIE *$k\underset{.}{r}$-ti- 'door', cf. Lat. *crātis* 'construction of wickerwork, hurdle', Gmc. *$xurdi$, from *ker- 'hinge', cf. Gmc. *$xer(r)an$-; here possibly OPru. *corto* 'fence'.

- NWIE *$k\underset{.}{u}end^h$-r- a type of plant, cf. Lat. *combrētum* 'kind of rush' < *$k\underset{.}{u}end^h$-r-, Ir. *contran* 'water horehound' < *$kund^h$-r-, Lith. *šveñdrai* 'cattails' < *$k\underset{.}{u}end^h$-ro-, also here ON *hvǫnn* < *$k\underset{.}{u}ond^h$-$n\bar{a}$-.

- NWIE *$leug^h$-e- 'lie', cf. OIr. *fol-lugaid*, Gmc. *$leugan$-, OCS *lŭgati*. Possibly originally 'bend (oneself)' (Kümmel et al. 2001), see above *$leug$- .

- NWIE *$leig$- 'bind', cf. Lat. *ligāre* 'fasten, bind', Gmc. *$l\bar{\imath}ka$- 'leech-line, bolt-rope', Russ. dial. *po-lyhaty-s'a* 'to connect'; maybe here Alb. *lidh* 'bind, tie'.

- NWIE *mazd-o-*, *mazd-to-* 'wooden stick' cf. Lat. *mālus*, OIr *mátan*, ON *mastr*, OCS *mostŭ*.

- NWIE *mein-* 'think', as basis for OIr. *mían* 'desire, inclination', Gmc. *mainian-*, OCS *měniti*, probably also OLat. *meinom*.

- NWIE *mus-o-* 'moss', cf. Lat. *muscus* (< *mus-ko-*), Gmc. *musa(n)-*, Lith. *mùsos*, Russ. *mox*.

- NWIE *old^h-* 'hollowed out tree trunk; boat', basis for Gmc. *aldo(n)-*, Sla. *old^h-ia-*. Probably an Indo-European root for boat, retained in Northern languages.

- NWIE *(s)pen-d-* 'pull, draw' cf. Lat. *pendeō*, OLith. *spándau*, OCS *pęndĭ*.

- NWIE *pen-i̯o-* 'swamp' as basis for MIr. *an*, *en*, Gaul. *anam*, Gmc. *φani̯a-*, OPru. *pannean*.

- NWIE *pe-pel-* 'butterfly' cf. Lat. *papilion-*, Gmc. *φīφaldra*, OPru. *pepelis*, *penpalo*, Lith. *píepala*, Ltv. *paîpala*, Russ. *pérepel*.

- NWIE *per-* 'to be with young' as basis for Lat. *pariō*, Gmc. *φarz-* Lith. *peréti*; cf. Gk. *poreĩn*, OInd. *pūrd^{h}í* 'give'.

- NWIE *pleu-d-* 'flow, drift', cf. OIr. *luaid-*, ON *fljóta*, OE *flēotan*, Lith. *pláusti*, *pláudžiu*.

- NWIE *pleu-s-* '(wool) flock' cf. Lat. *plūma*, OIr. *ló*, MHG *vlies*, Lith. *pláuzdinis*.

- NWIE *plout-o-* 'transverse board' cf. Lat. *pluteus* 'movable screen of wood or wickerwork, parapet', ON *fleiðr* 'cross-beam', Lith. *plaũtas*, Ltv. *plàuts* 'shelf, sideboard', SCr. *plúto* n. 'flotsam'.

- NWIE *pol-kā* 'arable land', cf. Gaul. *olca*, Gmc. *φalgō-*, also behind Pre-Bal. *plek-ie-* 'plough' cf. Lith. *plešiu*, Ltv. *plest*.

- NWIE *preg-* 'desire', in OBret. pl. *rogedou* 'orgies', W *rhewydd* 'lascivious', Gmc. *φreka-* 'avaricious', Pol. *pragnąć* 'yearn for'; cf. Pol. *prażyć* 'stew', Slov. *prážiti* 'stew'.

- NWIE *pr̥k-* '(smouldering) embers' as basis for OIr. *riches*, W *rhys-yn*, Lith. *pirksnys*, Ltv. *pìrkstis*.

- NWIE *segʰ-* as basis for *seg(ʰ)-lo-* 'sail', in Ir. *séol*, W *hwyl*, Gmc. *segla-* 'sail, canvas'; cf. also Lat. *sagum* 'coarse woollen cloak', Lith. obs. *sãgė* 'shawl, warp'.

- NWIE *sent-* 'feel', in Lat. *sentiō* 'sense, feel', Gmc. *sinnan-* 'head for, long for'; cf. Lith. *sintéti* 'think', OCS *sęštĭ* 'sensible, wise'.

- NWIE *skerdʰ-* 'cut', cf. OIr. *scerdaid*, Gmc. *skertan*, Lith. *skerdžiù*.

- NWIE *skok-e-* 'tremble', cf. OIr. *scuichid* 'to move, start, go', MW *ysgogi* 'to move, stir, tremble', Gmc. *skakk/gon-* 'shake', OCS *skočiti*, SCr. *skòčiti* 'to jump, leap'.

- NWIE *skt-e-* 'jump; gush forth' (for the semantic connection of both meanings, compare with English 'spring'), cf. Lat. *scatere*, Gmc. *skut(t)ōn-*, Lith. *skàsti* (*skantù*, *skataũ*).

- NWIE *soit-* 'charm, spell', cf. OCo. *hudol* 'magus', W *hudol* 'charming, illusory', ON *seiðr*, Lith. *saĩtas*, *seĩtas* 'magic'.

- NWIE *streig-* 'to stroke', cf. Gmc. *strīkan* 'to stroke', OCS *strišti* 'to cut, slip'; with nasal infix Lat. *stringere* 'to skim, scratch'.

- NWIE *tek-(i)e-* 'ask, request', cf. Gmc. *ϑegi̯an-*, cf. Bret. *tizaff* 'receive', Lith. *tèkti* (*tenkù*) 'to reach (for)'; originally 'reach out the hand'.

- NWIE *tn̥k-e-* 'thrive, prosper', cf. Cel. *tnk-o-*, *tonk-eto-*, Gmc. *tenk-e-*, Bal. *tn̥k-e-*, Sla. *tn̥k-neu-*. For potential cognates of *temk-*, see (Kloekhorst 2008).

- NWIE *tenk-s-* as basis for an expansion of the meaning 'pole', cf. Lat. *tēmō* (<*tenk-s-mon-*), Gmc. *ϑinxs-lo-*, OPru. *teansis* < *tenk-s-i*. An original root **tengʰ-* could be deduced from Slavic and Iranian cognates.

- NWIE *teuk-o-* 'thigh, hip', cf. Cel. *tuk-nā*, Gmc. *teuk-o*, BSl. *touk-o-*.

- NWIE *$t\mathring{r}b$-o-* 'crowd, village', cf. Cel. *$treb\bar{a}$, Pre-Gmc. *$t\mathring{r}b$-o-*, Pre-Bal. *$trob\bar{a}$. Maybe here also Ita. *$turb\bar{a}$, PGk. *$turb\bar{a}$.

- NWIE *(s)tronk-o-* 'dirty', cf. Cel. *(s)tronko-*, Gmc. *$\vartheta ranxa$-*, Bal. *$tronk$-$\bar{a}$-*. Maybe here also Gk. *truks* 'wine residue'.

- NWIE *$\underset{\sim}{u}id^h$-o-* 'forest, tree', OIr. *fid*, OW *guid* < *$\underset{\sim}{u}id^h$-u-*, Gmc. *$\underset{\sim}{u}idu$*, possibly also Lat. *dīvidēre*, Lith. *vidùs* n. 'middle' (< "forested area between two centres of habitation"), O. Pru. *widdewū*.

- NWIE *$\underset{\sim}{u}ol$-t-* '(cut) tuft of hair, curl', as basis for OIr. *folt*, *falt* (in *-o-*), OE *weald* (in *-u-*), Lith. *váltis*, Ukr. *vólotĭ* (in *-i-*).

- NWIE *$\underset{\sim}{u}ors$-* 'callus, wart', cf. Lat. *verrūca* < Ita. *$\underset{\sim}{u}e/ors$-*, Gmc. *$\underset{\sim}{u}arza$*; maybe here OPru. *warsus* 'lip' < $\underset{\sim}{u}ors$-u- (cf. Gmc. *$\underset{\sim}{u}erilas$* 'lip').

3.2.5. European agricultural substratum

The presence of words of non-Indo-European origin is particularly interesting to assess the routes of expansion of European languages. Their 'Neolithic' and 'Chalcolithic' nature—related to agriculture and to metallurgy, respectively—connects them to the Neolithisation wave that brought Middle East farmers from Anatolia mainly into South-East Europe, to the south of the loess belt of the European plain, where the first metallurgic centres developed close to the steppe. The finding of a NWIE substrate common to Palaeo-Balkan languages is still more indicative of the origin of the substrate language, which should be located in the north Pontic and north-west Pontic area around the lower Danube.

The following lists contain 24 stems shared with Palaeo-Balkan languages, which may be attributed to a common period of expansion of west Yamna settlers ca. 3300–2800 BC, and 45 stems only in North-West Indo-European—which should be added to the ca. 25 stems in West Indo-European and Northern European—which may be attributed to the period of isolation of Yamna settlers in Hungary, and to the formation and expansion of East Bell Beakers, i.e. ca. 2800–2300 BC.

3.2.5.1. Substratum common to NWIE and Palaeo-Balkan

Pan-European substratum words include:

- NWIE **aig-* 'oak', in Lat. *aesculus* 'winter oak', Gmc. **aik-*, OPru. *ansonis*, Lith. *áižuol-*, *áužuolas*, Ltv. *uôzuōls*, and also Gk. *aigílōps* 'kind of oak'.

- NWIE **agʷs-i-* 'axe', in Lat. *ascia* < **ask-iā-*, Gmc. **aku̯esī* < **agʷis-ī*, Gk. *aksínē* < **agʷs-i-*. Formal incongruences suggest a non-IE origin, maybe comparable with Akkadian *ḫaṣṣinu* 'axe' and Aram. *ḫaṣṣīnā*. Here possibly Myc. *a-qi-ja*, too.

- NWIE **aḵṛ-*, adj. **aḵṛ-no-* 'maple', cf. Lat. n. *acer*, adj. *acernus*, Gmc. **axurna-*, adopted in Sla. **avor-ovŭ* 'made of maple', Lith. *aornas*; possibly here Gk. *ákastos*, *ákarna*.

- NWIE **ar-* '(a tree with) nuts or cones', cf. Gaul. **arua* & **araua*, Pru. **reisas*, Lith. *ríešas*, dial. *ruošutỹs* Sla. **orexŭ*, **orĭxŭ*; Gk. *árua*, *auará* (<**arau̯a*?), Alb. *árrë*. Compare Proto-Basque **hurr* "hazelnut" (Blažek 2018).

- NWIE **ard-* (<**Hṛd-*) 'heron', cf. Lat. *ardea*, OIce. *árta* 'a kind of duck'; from **rod-* cf. Sla. **roda*, Gk. *erōdiós*, *rhōdiós*.

- NWIE **bak-(t)lo-* 'stik', in Lat. *baculum*, Gmc. **pagila-*, also OIr. *bacc*, MW *bach* 'hook' < **bakko-*, cf. Gk. *báktron*.

- Pre-Gmc. **digʰ-ā-* 'goat', also in Balkan IE **dig-i̯ā-* cf. Gk. *dizda*, Alb. *dhi*. The incongruence of both forms points to a non-IE substrate word.

- West IE **eregʷ-o-*, **eregʷ-indʰ-o-* 'pea', cf. Lat. *ervum*, OIr. *orbaind* pl. 'kinds of grain', Gmc. **aru̯īt-*; cf.Gk. *erébintʰos*, *órobos* '(chick)pea' (Kroonen 2012).

- NWIE **gnid-* 'nit', cf. Ita. **gnind-ā*, Gmc. **knid-*, Pre-Bal. **gnind-ā*, Pre-BSl. **knid-ā*; also Gk. *konís*, *konídos*, Alb. *thëní*, both from **k(o)n-id-*, and Arm. *anic* 'louse'. All forms point to an original source ***c~ʕ(o)n-ĩd* (Kroonen 2012).

- NWIE *g^hersd-* 'barley', cf. Lat. *hordeum*, Gmc. *$gerstō$; also here Palaeo-Balkan *$grisd^h$-*, cf. Arm. *gari*, Gk. *$krit^h\acute{ē}$*, Alb. *drithë*. Irregular forms point to a non-IE agricultural substratum (Kroonen 2013).

- NWIE *i(o)rk-* 'goat', cf. Lat. *(h)ircus*, W *iwrch*, Bret. *yorch*, OHG *irah*, *ireh*, *irh*; further Gk. *íorkes*, Arm. *ors*. Unexplained consonantism and vocalism may point to a non-IE source.

- NWIE *kailo-* 'the whole', cf. Ita. *kailo-* 'sky', W *coel* 'presage, omen' OBret. *coel* 'priest', Gmc. *$xaila$-* 'whole, sound', *$xail-sōn$-* 'give oaths, interpret omens', OCS *cělŭ* 'whole', OPru. *kailūstiskan* 'health'. Possibly a term in the augural sphere, in contrast with *temple* 'the part' (de Vaan 2008).

- NWIE *kanab-* 'hemp', cf. Gmc. *$hanapa$* 'hemp', Russ. *konopĭ* 'rope' (> Bal. *$kanapi$-*), Gk. *kánnabis*. Probably an old Wanderwort, maybe of oriental origin, cf. Sumerian *kunibu* 'hemp'.

- NWIE *$kl̥{}^ʔk^w$-(n-)* 'heel; ankle, tarsal joint', cf. Lat. *calx*, *calcis*, BSl. *$kul^ʔk$* (de Vaan 2008).

- NWIE *krem-u-* 'wild garlic, ramson', cf. Cel. *$krm̥-u$-* 'garlic' Gmc. *$kre/om-us$-(o-)*, Slavic cognates from **$kerm-(o)us-i̯a$*, Baltic from **$kerm-us-i̯a$*; cf. Greek from **$kre/om-us-o$-*. Kroonen (2013) assumes that all forms are remade from an underlying amphidynamic paradigm *krem-uos*, *$kr̥m-us-ós$*, acc. *krom-ués-m̥*.

- NWIE *$mr̥k$-/$br̥k$-* 'wild carrot', cf. Gmc. *$murxōn$-*, Russ. *borkan* (into Fi. *porkkana*), Ru. *morkóv'*, Gk. n. pl. *brákana* 'wild vegetables'.

- NWIE *$ploud^h$-* 'lead', cf. Lat. *plumbum* (<*$plumd^h$-*), MIr. *lúaide*, Gmc. *$lauda$-*, also *$blīu̯a$*, and same word behind Gk. *mólubdos*, etc. Possibly through the same source as Lyd. *mari̯uda-* 'the dark metal', cf. CLuv. *maru̯ai-* 'black, dark-coloured (?)'.

- NWIE *$rāp$-* 'turnip', Lat. *rāpum*, OHG *ruoba*, *ruoppa*, Lith. *rópė*; compare Sla. *rěpa* (<*$rēp$-*), Gk. *rhápus*, *$rháp^hus$* (<*rap/*rap^h-*).

Alternating vocalism and vacillation in Gk. *p/pʰ* suggests a loanword (de Vaan 2008).

- NWIE **sam(n̥)dʰ-o* 'sand', cf. Lat. *sabulum* < **sadʰ-lo-*, Gmc. **samda-*, Gk. *psámmos* < **sam-ndʰ-o-*.

- NWIE **(s)gʷʰongʰ-o-* 'sponge, mushroom', cf. Lat. *fungus* < **gʷʰong⁽ʰ⁾-*, Gmc. **su̯a(m)b/ppan-*, OCS *gǫba* <**g⁽ʰ⁾umb⁽ʰ⁾-*; further Gk. *spʰóngos* < **skʷ⁽ʰ⁾ong-*, Arm. *sunk* < **suongʷʰ-* (Kroonen 2013).

- NWIE **upno-* 'oven' cf. Gmc. **uφna*, OPru. *wumpnis* < **u(m)p-no-*? Myc. *i-po-no-*, Gk. *ipnós*. Dubious are Lat. *aulla*, Skr. *ukhá*. Maybe here also Hitt. *ḫappen-*, *ḫapn-* 'baking film, fire-pit, broiler (oven)'.

- NWIE root **u̯r̥k-* 'heather', cf. Cel. **u̯roiko-*, Gk. *ereíkē* <**u̯er-eik-o-*, PSl. **versŭ*, **verskŭ* (<**u̯erk-*), Lith. *vìržis*, Ltv. *vìrsis* (<**u̯r̥k-*).

Words restricted to the Mediterranean area (probably because of their natural distribution) include:

- **el(e/a)i̯u-* 'olive, oil', cf. Lat. *oleum*, Gk. *elaíā*, *elaios*, *elaion*, Arm. *ewł*;

- **tʰu̯ōiko-* or *tū(i)ko-* 'fig', cf. Lat. *fīcus*, Gk. *sũkon* (Boeotian *tũkon*), Arm. *tʿuz*.

- **u̯éinom* 'wine', in Ita. **u̯īnom*, Arm. *gini*; **u̯óinos* in Myc. *wo-no*, Gk. *u̯oînos*; **u̯ih(o)n-* in Hitt. *u̯i̯anis*, *u̯ini̯ant-*, Luw. *u̯ini̯a-*, *u̯i̯an(i)-*. It may be explained as derived from PIE **u̯ehi-* 'turn, bend', but it could have been a Mediterranean loan; cf. Kartvelian **ɣu̯ino-*, Semitic **u̯ain-*.

3.2.5.2. Substratum words only in North-West Indo-European

Substratum words in NWIE have sometimes the suffix **-is-* or **-(e)n-*, and include the following (Matasović 2013; Oettinger 2003):

- NWIE **ab(e)l-u-* 'apple', in Osc. *Abella*, Cel. **abul*, Gmc. **aplu-*, **ap(a)laz*, Bal. **ābel-*, **ābul-*, OCS *ablŭko*. Dubious is the appurtenance here of Dacian *kinoúboila* (<**kun(i)-ābulo-*) and Thracian *dinupula* (<**kun-ābulo-*), or Gk. *abíllion* (< **abúlion*), as well

as the origin in Semitic *ʔabul-* (or *ʔubal-*?) 'various kinds of fruits and cultural trees or plants' (Blažek 2018). It bears resemblance to a South European isogloss *mālom* 'apple' cf. Lat. *mālum*, Gk. *melon*; it contains the marginal IE phoneme *b* (which is bilabial like southern *-m-*); and contains a non-IE prefix *a-*, so both words are possibly related to the same substrate language, with different (later) regional influences.

- NWIE *als-* 'alder', cf. Ita. *alsno-*, BSl. *al(i)snio-*, *alisā*, Gmc. *als-*, *alis/zō*. The suffix variation *-s-* / *-is-* and vocalic vacillation in BSl. points to a non-IE origin (de Vaan 2008).

- NWIE *au̯eksna* 'oats', cf. Lat *avēna*, Sla. *ovĭsŭ* 'oats', Lith. *avižà*, Ltv. *àuza*, OPru. *wyse*; shape of suffix *-eks-/*-iks-* (possibly in *-gs-*) points to a substratum origin.

- NWIE *bʰabʰ-* 'bean', cf. Lat. *faba*, Faliscan *haba*, Gmc. *baunō* <*bab-nō*, Sla *bobŭ*. Germanic form in *-no*, and the Palaeo-Balkan root in *-k-* (cf. Gk. *pʰakós*, Alb. *bathë*) suggest that its origin is a European language belonging to a deeply agricultural culture (Kroonen 2013).

- NWIE *b⁽ʰ⁾at-* 'strike, hit' as basis for Lat. *fatuus*, Gaul. (through Latin) *battuo*, *anda-bata*, Russ. *batŭ*.

- NWIE *bʰog-* '(water source)', cf. Gmc. *baki̯a* 'creek', Sla. *bagno* 'swamp, marsh', MIr. *búal* 'water; bathing, healing, cure' (Kroonen 2013).

- NWIE *edʰ-lo-* 'conifer', cf. Lat. *ebulus*, Lith. *ẽglė*, Ltv. *egle*, OPru. *addle*, OCS *i̯ela*, etc. Here probably *odʰ-o-ko-* in Gaul. *odocos*.

- NWIE *epr-* 'boar', cf. Pre-Ita. *apr*, Pre-Gmc *epr*, Pre-Sla. *u̯epr*.

- NWIE *gʰaid-* 'goat', cf. Lat. *haedus* 'kid, young goat', Gmc. *gait*, OCS *koza*; cf. Semitic *gadi̯-* 'goat', cf. Arab. *gadi̯uⁿ*, Hebr. *gᵉδī*, Berb. *agaid* (Kroonen 2012).

- NWIE *$g^h lad^h$-* 'even, flat', cf. Lat. *glaber*, OHG *glat*, Lith. *glod(n)ús*, OCS *gladŭkŭ*.

- NWIE *gramma* 'gramiae, rheum in the corner of the eye', cf. Lat. *grāmiae, grammōsus*, Sla. **grŭmĕždĭ, *krŭmeḷĭ*, OIce. *kramr* 'damp' Goth. *qrammiþa* 'moisture'. Maybe related to Gk. *glámōn* 'blear-eyed', then with liquid dissimilation (de Vaan 2008).

- NWIE **(s)grap/b^h-* 'hornbeam', cf. Lat. *carpinus*, Lith. *skrõblas*, Sla. **grabrŭ*. Maybe here Umbrian *Grabovius* (epithet of Jove) and Ancient Macedonian *grábin* 'a kind of tree'.

- NWIE **kabu-* 'falcon', cf. Pre-Ita. **kapu-*, Pre-Gmc **kab^h ug-*, Pre-Sla. **kab^h uk-*, also in Etruscan *capu < *kapu*. Considered a late *Wanderwort* because of the impossible IE *$*p \sim *b^h$* correspondance, it could have been influenced in Italic by *capere* 'to take' ("the snatching bird").

- NWIE **kars-* 'willow (wool)', cf. Lat. *carrō*, Lith. *karšiù*.

- NWIE **kasni-* 'garlic', cf. Cel. **kasninā*, Sla. **česnъ*, possibly Slavic vocalism influenced by root **kes-* 'to comb (?); to peel'.

- NWIE **kattos* 'cat', cf. Lat. *cattus*, Cel. **katto-*, Gmc. **kattōn-*, Russ. *kótka*. A non-Indo-European word usually believed to have entered Europe from North Africa (cf. Nubian *kadīs* 'cat', Arabic *qiṭṭa*) through Latin *catta*, but this is not proven.

- West IE **knu-* 'nut', cf. Lat. *nux < *knuk*, Cel **knū-s*, Gmc. **xnut <* Pre-Gmc. **knud-*. Because of its nature as root noun, it has been proposed that it is likely to be the result of the vowel-less coda of the word in the source language (Kroonen 2012).

- NWIE **koilo-* 'lean, naked', cf. OIr. *cóil, cél*, W *cul*, Ltv. *kails*.

- NWIE **kolomb^h-* 'pigeon, dove', cf. Lat. *columba*, Sla. **golǫbĭ*; cf. also cf. Lith. *gelumbẽ* 'blue cloth', OPru. *golimban* 'blue' vs. Russ. *golubój* 'pale blue', OPru. *gołęby* 'greyish, blue-grey' (Derksen 2008).

- NWIE **kos(u)lo-* 'hazel-tree', cf. Lat. *corulus* 'hazel-tree' *< *kosulo-*, OIr. *coll*, W *coll < Cel. **kos-lo-* 'hazel-tree', OHG *hasal*, OIce. *hasl <*

Gmc. **xaslaz* 'hazel-tree', OLith. *kasulas* 'hunting spear'. The diverging suffixes, restriction to Europe, and the fact that it concerns a tree-name could point to a non-IE origin (de Vaan 2008).

- NWIE **ku̯os-* 'basket made of wicker' as basis of Lat. *quālum*, *cōlum* (*<*ku̯os-lo-*) and OCS *košŭ* (*<*ku̯os-i̯o-*).

- NWIE **lens-/*lent-* 'lentil', cf. Lat. *lēns*, OHG *linsa*, Sla. **lętĭi̯a*. Gk. *lát^huros* 'pulse, chickling' probably unrelated.

- NWIE **leisā* 'furrow, plough furrow', cf. Lat. *līra*, OHG *-leisa*, OCS *lĕxa* (but cf. Goth. *lais*).

- NWIE **ml̥s-* 'taste, savour', as zero-grade basis for Cel. **mlasso* (in **-to-*), Russ. *molsát*, Czech *mlsati* (in **-o-*).

- NWIE **mokinā* 'belly', cf. Cel **mok-inā* 'bellows', Gmc. **magan (<*mok-on-)* 'stomach', Sla. **mok-inā* 'pouch, purse, scrotum'. The plain *k* may point to a non-IE origin (Kroonen 2013).

- A common non-Indo-European source for 'many, much' is behind Cel. **menekki-*, Pre-Gmc. **monog^h-o-*, Pre-Sla. **munog^ho-*.

- NWIE **morā* 'incubus, nightmare', cf. OIr. *Morigain*, OHG *mara*, Ukr. *móra*, SCr. *mora*.

- NWIE **nāti-* 'nettle', cf. Cel. **ninati*, Gmc. **natōn*, **natilōn*, Lith. *nõtrynė* 'nettle', OPru. *noatis*, perhaps also Sla. **natĭ*; a non-IE form.

- NWIE **plout-o-*, **plut-e-o-* 'board(-construction)', cf. Lat. *pluteus*, ON. *fleyðr*, Lith. *plaũtas*.

- NWIE **polk-ā-* 'ploughed, turned', cf. Gaul. *olca*, OHG *felga*, Russ. *polosá*.

- NWIE **poug^(h)-o-* 'upright, aloud', cf. OIr. *óg*, *óge*, Czech. *pouhý*.

- NWIE **rouk-o-* 'garment', cf. Celt **ruxtu- < *roukkā-*, Gmc. **rukkaz*, OCS *ruxo* 'garment' (Matasović 2009).

- NWIE **ruk-s-o-* 'clothes' cf. Cel **roukk-*, **ruk-*, Gmc. **rukkaz*, Sla. **ruxo*; alternation between geminate and simple **k* (and **x* in Slavic) looks non-IE.

- NWIE **silubʰr-* 'silver', cf. Celtib. *silabur*, Gmc. **silubra-*, Sla. **sĭrebro*, Lith. *sidābras*, *sidabras*; cf. Basque *zilhar* (Kroonen 2013).

- NWIE **sekūr-* 'axe', cf. Lat. *secūris*, OCS *sekyra*, etc.

- NWIE **sku̯oi-/skui̯-* 'thorn, needle (from tree)', cf. Cel. **sku̯i̯at-* 'thorn bush', Bal. **sku̯i̯ā* 'needle from tree', Sla. **xvoi̯a* 'needles of a coniferous tree'; root of non-IE shape.

- NWIE **sku̯erb⁽ʰ⁾-* 'sting with a thorn' as basis for Corn. Bret. *spern* (with *rn < rbn*), Lith. *skverbiù*, *skver̃bti*.

- NWIE **(s)līu̯o-* 'bluish' in Lat. *līvidus*, OIr. *lí*, W *lliw*, OCS *sliva*; compare also **sloīkʷo-* in OHG *slēha*, *slēwa*, OE *slāh*.

- NWIE **slougo-* (collective **slougā*) 'attendant' in OIr. *slóg*, *slúag*, W *llu*, **tego-slougo-* in OIr. *teglach*, OW *telu*; Lith. *slaugà*, *slaugýti*; OCS *sluga*, *služiti*.

- NWIE **sorb-* 'berry', cf. Lat. *sorbus* 'service-tree', Lith. *serbentà* 'blackberry, redcurrant', dial. *sarbentà*, Russ. *sorobalina* 'rose hip, blackberry'.

- NWIE **spar-* 'sparrow', cf. Lat. *parra* 'a kind of bird', Cel. **sfrau̯o-* 'crow', Gmc. **sparu̯a(n)-*, OPru. *spurglis*; also compared to Gk. *sparásion* 'sparrow-like bird'.

- NWIE **terp-* 'be rigid, stiff', present **tr̥pēi̯e-* in Lat. *torpeō*, Lith. *tir̃pti* (*tirpstù*, *tirpaũ*), OCS *u-trŭpěti*.

- NWIE **tlokʷ-*, *tl̥kʷ-* 'interpret', etc. Lat. *loquitur*, OIr. *ad-tluchedar*, *do-tluchedar*; OCS *tlŭkŭ*, ORuss. *tlŭkŭ*.

3.2.6. Old European topo-hydronymy

The latest stage of the classical period, after the expansion of the East Bell Beaker folk over all of Europe, may be identified in linguistics with the expansion the Old European hydronymy (Krahe 1949, 1964; Tovar 1977; Udolph 1994; Kitson 1996), as found in Central Europe, France, Italy, the British Isles, Iberia, Scandinavia, and the Baltic (Figure 5). The language of

hydronyms can be classified as of Common Indo-European nature (Tovar 1977; Kitson 1996; Adrados 1998), with the typical a-vocalism evidencing a post-laryngeal stage:

- Interesting from an etymological point of view are those related to IE *danu- 'river', and *ụeis- 'flow, flood'. Other common roots found in old river names are *al- (e.g. *Alma), *alb- (e.g. *Alba) *draụ-, *kar-, *sal- (e.g. *Sala), *ụer-; cf. also *Isara.

- Common affixes include *-l-, *-m-, *-n-, *-r-, *-s-, *-st-, *-k, *-ụ- and *-i̯-.

- To the north of the Alps the most common endings are in *-a, while to the south the most common are in *-os, which may reveal a later vocalisation (i.e. Germanic–Balto-Slavic vs. Celtic–Italic) of previous names.

Karte 4 · Sal-/Salm-

1 Sala	31 Salia > Saja
2 Seile	32 Salia > Sella
3 Seile	33 Salo > Jalón
4 Sálantas	34 Salmantica
5 Salótas	35 *Salé > Sol', Solja
6 *Salia > Hail	36 Sala > Saa
7 *Salia > Hail	37 Saliaco > Sayago
8 *Salia > Hayle	38 Saliencia
9 Hayle	
10 Haill	
11 Saale	
12 Salica > Selke	
13 Sale	
14 Saale	
15 Saale	
16 Salusia > Selz	
17 Sala	
18 Salm	
19 Salmarus > Saumur	
20 Salmana > Salm	
21 Salmasa > Salmsach	
22 Saalach	
23 Zala, Szala	
24 *Salica > Sölk	
25 Salon	
26 Salara > Saudre	
27 Salanza	
28 Salanfe	
29 Seille	
30 Salence	
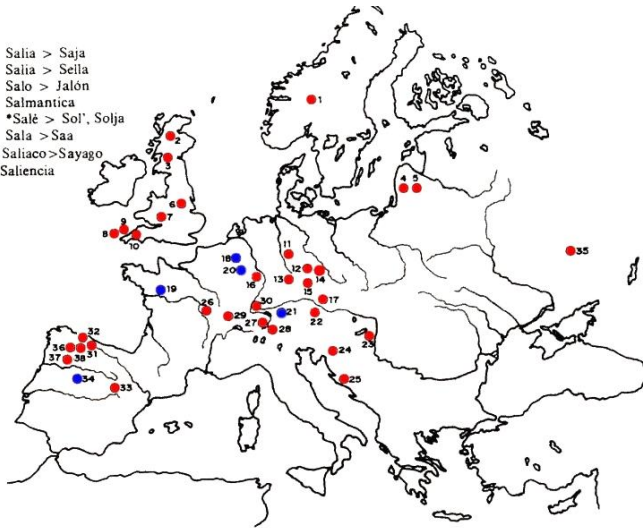
Figure 5. Old European hydronymic map for the root *sal-, *salm-. Modified image from Krahe (1964).

The following is a simplified schema of possibilities for two common roots:

-a -o	-i̯a -i̯o	-u̯a -u̯o	-ma -mo	-na -no	-ra -ro	-la -lo	-nta	-s(i̯)a -s(i̯)o	-sta -sto	-ka -ko	-ta -to
Ala	Ali̯a	Alau̯a	Alma	Alna	Alara		Alanta	Alsa	Alesta		
Drau̯a	Drui̯a			Druna			Dru̯anti̯a	-			Druta

Regarding the stratigraphy of topo-hydronymy in Europe, there are Old European layers of hydronyms in *ab-/ub-/ap-/up-/ur-* 'water, river', as well as toponyms in *kerso-*, *turso-*, *alau̯o-*, *lako-*, *mido-*, *silo-*, *tibo-*, or *basto-*, which function as first members of compounds in different regions of Europe, including those historically inhabited by non-Indo-European speakers (such as Iberian and Basque in Spain and France, or Etruscans in Italy). This supports the huge social and linguistic impact of the expansion of Bell Beakers all over Europe, before the later emergence and spread of Indo-European and non-Indo-European speakers over that ancient Indo-European linguistic layer (Villar Liébana et al. 2011; Villar Liébana 2014).
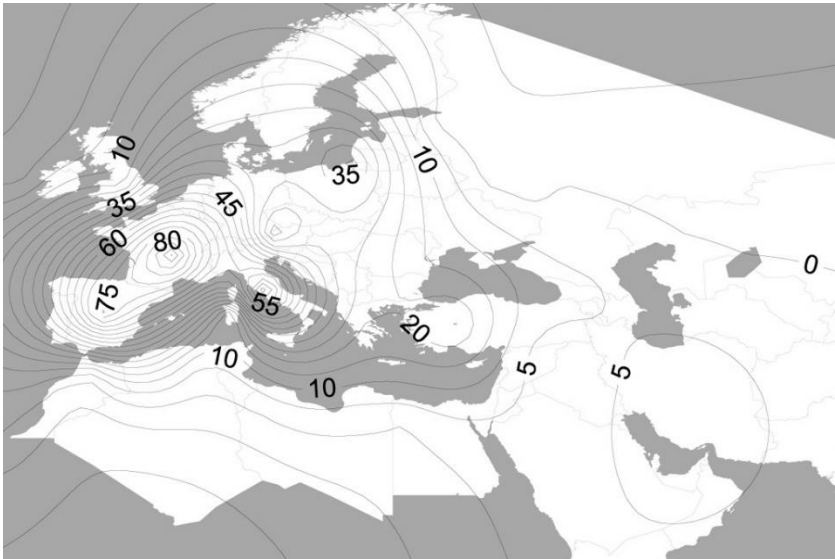
Figure 6. Old European topo-hydronymy, European block. Frequency projection using the Kringing method. Baltic data have been compensated to diminish the regional weight of the Baltic series. The high density of topo-hydronyms in the Baltic area, due to the active use of some terms in ancient and modern Baltic languages, makes their

prehistoric distribution around the West Baltic (and its statistically inferred projection to the east and north) dubious. Image modified from Villar Liébana et al. (2011).

3.2.7. Statistics of lexical isoglosses

The reconstructed NWIE vocabulary can be summarised as follows [xii]
(Table 1):

Table 1. Shared isoglosses related to the North-West Indo-European language.

ISOGLOSSES	CERTAIN	UNCERTAIN
Northern IE (IE)	*~15*	
NWIE + Balkan (IE + non-IE)	70	
NWIE + Balkan (IE)	46	
NWIE + Balkan (non-IE)	24	
NWIE (IE + non-IE)	172	
NWIE stems (IE)	67	
NWIE substrate (non-IE)	45	
NWIE roots (IE)	58	
West IE	*~115*	*~25*
West IE stems + roots (IE)	*~100**	*~25*
*West IE substrate (non-IE)	*~15*	
*Italic-Celtic-Germanic	*~35*	
*Celtic-Germanic	*~40*	
*Italic-Germanic	*~35*	
Italo-Celtic	*~15*	
Northern IE (IE + non-IE)	25 (~45)	*~15*
Other European	*~300*	*~50*

Rows with obscured background: main layers of NWIE vocabulary. In bold: numbers counted for statistics of the North-West Indo-European vocabulary. In italics: approximate numbers or estimations.

- Core NWIE lexicon of ca. 172 stems: 67 identical stems and 45 substrate words, unique to the group, all of them connecting at least three non-neihbouring languages. Apart from that, ca. 60 shared roots of Indo-European origin, suggesting that the terms they represent were

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[xii] Please note: statistics were made before the final version of the manuscript, so it is possible that some more shared stems or roots were added, or some data was corrected or deleted. Because of that, approximate total numbers are given instead of exact ones.

possibly recent innovations before the disintegration of the NWIE community. Some uncertain cognates have not been included.

- Core NWIE lexicon shared with Balkan languages of ca. 70 stems: listed above are 46 stems of Indo-European origin, and 24 of non-IE origin, although the number including uncertain roots is bigger. Still more interesting is that the NWIE stem usually shows a consistent form, different from Balkan cognates, which suggests that, even though tthe word was probably adopted at an early time, the NWIE language developed later independently; that is, these adopted substrate words in NWIE either underwent the same innovation, or remained without change, contrasting with what happened in Balkan languages.

- 'West Indo-European' isoglosses shared among Italic, Celtic, and Germanic are ca. 130, exluding the many early and late borrowings, i.e. before any of their respective sound shifts (see below *§4.5.1. West Indo-European*): 115 are of IE origin, and 15 likely of non-IE origin (Kroonen 2013). Around 25 of them are uncertain, and a third is approximately shared between Celtic and Germanic, and another third between Italic and Germanic. Shared Italo-Celtic (IE and non-IE) stems may be around 15 (de Vaan 2008; Matasović 2009), which—if we presuppose a non-genetic relationship between both—should be added to the common Western IE isoglosses. Many West IE cognates are identical stems, which further supports its inclusion as ancestral, NWIE vocabulary.

- Shared vocabulary between Germanic and Balto-Slavic has been recently set to ca. 25 stems (see below *§4.5.3. Northern European*), which seems the more conservative number of true ancestral cognates. Nevertheless, Kroonen (2013) listed ca. 220 broadly described 'Northern European isoglosses' (related stems excluded), with 40 of them listed as uncertain, and approximately one third of them shared only with Baltic, and one third only with Slavic languages, which leaves

a general estimation of ca. 60 shared stems or roots. It is often unclear how many of these shared stems or roots are loanwords from later periods, though, because of the later attestation of these languages. Also, the number of reconstructed Proto-Slavic words of Germanic origin is bigger (Derksen 2008), as is probably that of Proto-Baltic.

- 'Whole European' isoglosses, adding NWIE and Balkan languages, comprise more than 300 independent stems, including any North-West Indo-European branch (in combination with other branches, or not): ca. 300 with 50 uncertain cognates shared with Germanic (with or without other NWIE cognates) were included by Kroonen (2013), and a similar number of ca. 300 terms shared with Italic are found in de Vaan (2008). Without a closer inspection beyond a summary description of a European isogloss, it is unclear how many of these hundreds of (stem or root) cognates may be shared with other branches, or if they may be later (i.e. Bronze Age) borrowings.

Since there is no stronger genetic relationship between any of the four main branches of the group, all reconstructed stems pointing to an ancestral Indo-European form should suggest shared vocabulary within the parent NWIE proto-language. Furthermore, earlier isoglosses shared with Balkan languages and with Tocharian are often remade stems in NWIE, showing peculiar innovations (or else maintaining a more archaic shape), and most should be therefore also included as part of the NWIE community.

The vocabulary reconstructed for a NWIE proto-language can be thus so described:

- Basic lexical inventory of ca. 255 NWIE stems or roots, as a conservative estimation.
- Extended NWIE vocabulary of ca. 380 stems or roots, including West Indo-European (without Italo-Celtic) and Northern European cognates (mainly confirmed stems).

- • With a lesser degree of confidence, the number of Pan-European isoglosses (i.e. excluding at least Indo-Iranian) would lie between 600 stems or roots and 900 potentially ancestral and common shared items, including all uncertain and dialectally quite restricted cognates. In any case, more than half of these reconstructed common terms are found exclusively among NWIE proto-languages, without Balkan cognates.
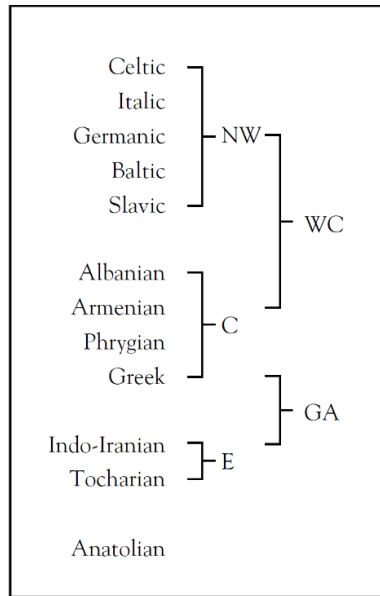
Figure 7. The levels of Indo-European reconstruction (Mallory and Adams 2007).

Compared with the strict Proto-Indo-European inventory of less than 1,500 units (Mallory and Adams 2007), the shared NWIE lexicon of 255/380 items represents a fairly large proportion, especially when we consider the different stages—Indo-Uralic, Early PIE, Middle PIE, early Late PIE—where distinct layers of vocabulary were accumulated (Figure 7). For comparison, Italo-Celtic, which is supposed to have shared a short common period of development (probably during the Early Bronze Age) based on morphosyntactic similarities, has a common lexicon of less than 20 items; whereas Balkan languages, probably neighbouring each other during the whole Bronze Age, share less than 50 lexical units.

Languages with strong foreign influence show a marked reduction in Indo-European heritage. Hittite, for example, has an estimated inherited Indo-European lexicon of ca. 422 words (Tischler and del Monte 1978), which may have probably been enlarged in more recent research, although some etymologies have also been rejected (Kloekhorst 2008). This proportion of inherited vs. loaned vocabulary of about 5:3 or 2:1 is not much different from what we see in Greek (Zeilfelder 2017), but it seems larger than what is found in North-West Indo-European or Proto-Indo-Iranian.

3.2.8. Schleicher's fable in North-West Indo-European

<p align="center">*óu̯is éku̯ōs-kʷe*</p>

óu̯is i̯ósi̯ās u̯l̥ʾnā né est	*éku̯ons dedórke;*
tom gʷr̥ʾu̯úm u̯ógʰom u̯égʰontm̥,	*tom mégām bʰórom,*
tom u̯īróm ōkú bʰérontm̥.	*óu̯is éku̯obʰos u̯eukʷét:*
"kērd ágʰetor moi,	*gʰmónm̥ éku̯ons ágontm̥ u̯idn̥téi."*
éku̯ōs u̯eukʷónt: "kl̥néu, óu̯i!	*kērd ágʰetor nos u̯idn̥tbʰós:*
u̯īrós, pótis, óu̯i̯om u̯l̥ʾnām	*sébʰei gʷʰórmām u̯éstim kʷr̥néuti.*
óu̯i̯om-kʷe u̯l̥ʾnā né esti."	*tod keklu̯u̯ós óu̯is ágrom bʰugét.*

A recitation[xiii] of the text is available at <https://youtu.be/_6ne-xvC0TU>.

[xiii] As in other tonal languages, stress accent has been placed on heavy syllables during recitation. Just like Mandarin Chinese, PIE must have had both stress and pitch accent. Both were important, since some syllables must have had more prominence than others, and high pitch seems to have been more prominent – vowel length appears in most Anatolian words on PIE stressed syllable (DeLisi 2013). As a rule of thumb – as e.g. in the reconstructed Ancient Greek pronunciation, in Arabic, or in the Sezer stress pattern in Turkish –, syllable weight (the length of the syllable) marks the stress of words in this rendition of the fable. Whenever possible, then, syllables that include a long vowel or a diphthong (CVV) and those with more than one consonant (CVCC) are stressed. If in conflict, those with a combination of both (CVVCC) are probably the stressed ones. Nevertheless, according to Kortlandt: "When comparing PIE with other tonal languages, the best candidate is Japanese, which means that the "stress" falls on the last high syllable of a word form or sequence of connected word forms."

Voiced consonants at the end of syllable (such as *-d*, *-gʰ-*, etc.) are pronounced voiced, because LPIE or NWIE did not have final obstruent devoicing as a rule (Byrd 2010). However, there are certain known cases of regressive assimilation, such as

Notes:

- For **(dʰ)gʰmon-*: The other PIE word apart from **u̯īrós* (possibly **u̯irós* already appearing in the NWIE stage), **ner-*, commonly used to translate 'man' in the fable, is not used here because of its more specialised use in NWIE exclusively as 'manly, strong' and mostly in archaisms, cf. Italo-Celtic **ner-* (as Lat. *neriōsus*, OIr. *nert*), Gmc. **ner-* (OHG *Nerthus*), Bal. **ner-/nor-* (Lith. *Nertėti*, OPru. *nertien*).

3.3. Palaeo-Balkan

3.3.1. A Palaeo-Balkan community

It is unclear whether Balkan languages formed at some point a genetic unity, or different Yamna communities just settled in neighbouring regions in the Balkans. Nevertheless, it seems common ground to speak about an ancestral Graeco-Armenian community, which split into Armenian and Graeco-Phrygian, which in turn split into Graeco-Macedonian and Phrygian.

Common features of Palaeo-Balkan languages include (Hajnal 2003):

- Vocalisation of word-initial laryngeals before consonants.

- Retention of the original restriction of initial **r-*, as found in Anatolian[xiv].

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*DT→*TT, hence **tod* in the last sentence may be more exactly pronounced as **tot-kekluu̯ṓs*.

[xiv] This potential retention of the original situation in Palaeo-Balkan languages would put an isolated Indo-Iranian as an innovative branch within the Graeco-Aryan group. Corbeau (2013) summarises the question: "an important remark is made by Kortlandt (2003:77): "The reconstructed absence of initial **r-* from Proto-Indo-European is not based on its absence in Greek or Armenian, (…) but on the absence of unextended PIE roots with an initial **r-*, which Lehmann demonstrated a long time ago (1951:17) (...)". This 'unextended' is a term from the root structure theory as described by Benveniste in his *Origines de la formation des noms en indo-européen* (1935). In this book, PIE roots are presented as having a basal structure of two consonants, frequently extended by a third. Between these consonants, the ablaut vowel can occur. Vowel initial roots did not exist. Thus, an unextended root is one that consists of exactly two consonants. Lehmann (1951) clearly builds upon these root structure principles. He reasons as follows: the reconstructed roots **rei-*, **reu-* and **rep-* all have a meaning like 'break' or 'tear', so they are in fact extended stem variants of one root. (...) PIE

- Relatively systematic vocalisation of LPIE *-iħ as *-i̯ă (Albanian less clear, although cf. *zonjë* 'lady' from **desi̯ās-potni̯ă*), in contrast with the more widespread *-ī alternative.
- Formation of identity adjectives and patronymics in *-ei̯o-.
- Spread of locative plural in *-si, in contrast with the alternative *-su.
- Relevance of sigmatic preterite(-aorist?) formations.
- Outcome of 3p.sg. in *-(e)s < *(e)st, and plural *-(e)san < *(e)s-n̥t (pointing to a loss of final consonant).

Lexical correspondences include (Martirosyan 2013):

- *an(e/ō)rio- 'dream' cf. Arm. *anurǰ-kʻ*, Gk. *anar- onar-*, Alb. *adërrë* <*andërrë.
- *bʰe/or-(e)n- 'load ("that is borne"), freight', cf. Arm. *bern*, Gk. *pʰernḗ*, Alb. *bárrë*. Probably a European isogloss retaining the original meaning; compare for a cognate with shift in meaning NWIE *bʰornā- 'child, baby' in Goth. and ON *barn*, Lith. *bérnas*.
- *sk⁽ʰ⁾odoro- or *sk⁽ʰ⁾orodo- 'garlic', cf. Arm. *xstor*, *sxtor*, Gk. *skór(o)don*, Alb. *húrdhë*, also *húdhër*.

3.3.2. Graeco-Armenian

Common features of Graeco-Armenian include:

- Trend to devoicing of voiced stops (with further developments in the different branches).
- Development of *s → *h (also in Phrygian), although it may have been due to parallel developments.

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root structure then requires there to have been a consonant preceding the *r* — for else, stems like *re-i-, *re-u- and *re-p- would turn out to have monoconsonantal roots. Summarising, Lehmann's article basically renders the idea that lack of r-initial inherited words in Greek, Armenian and Anatolian are indicative for the PIE situation." Similarly, the argument can be extended for Proto-Indo-Uralic (Kortlandt 2004) as a vowel prosthesis before *r-, e.g. into *er-, where any vowel would be phonetically preceded by a glottal stop *her-, and then followed by syncope into *hr-.

- e-augment: a Graeco-Aryan feature that was kept or expanded in Greek, Phrygian, and Armenian.

- Formation of specific verbs in *-*nu*- restricted to these dialects.

- Productive -*n*-presents beside root aorists (also present in Indo-Iranian and Tocharian).

- Instrumental singular in *-*bʰi*; locative (singular) Arm. -*oǰ* ~ Gk. -*otʰi*.

- Innovative inflectional class in -*olā*-.

- Verbal suffix *-*sk*- in forms restricted to past time.

- Certain verbal reduplications not found in other branches.

Other common words include the following (Martirosyan 2013):

- **agu(s)i̯ā* - cf. Arm *acu* 'garden-bed', Gk. *aguia* 'street, road'.

- **aleu̯r* 'flour', cf. Arm. *alewr*, *aliwr*, Gk. *aleuron*, *aleuros*.

- **ām-(ō)r*, gen. *am-(e)n*-, cf. Arm. *awr*, gen. *awur*, Gk. *ēmar*, Dor. *améra*.

- **an(t)ēr* 'cave', cf. Arm. *ayr*, Gk. *ántron*.

- *ar- 'to fix, put together', cf. Arm. *ar-ar-i* 'make, create', Gk. *ararísko* 'fit, equip'.

- *bʰa-ti-, cf. Arm. *bay* 'speech, word, verb', Gk. *pʰásis*, *pʰátis* 'declaration, enunciation, rumour'.

- *dʰesó- (<*dʰhs-ó-) as the name of god, cf. Gk. *tʰeós*, Arm. *di-k* 'gods' (plural). It substituted the common PIE **dei̯u̯o*-.

- **du̯ā-ro*- cf. Arm. *erkar* 'long', Gk. **du̯ārós*; maybe here Cilician Τβερημωσις, Τβερασητας, Hitt. *tuwala*-.

- *egʷʰi- 'viper', cf. Arm. *iž*, Gk. *ekʰis*. Maybe here also Skt. *áhi*, Av. *aži*, although probably from LPIE **n̥gʷʰ-i*- 'snake'.

- **k(e)r-iā*- 'band', cf. Arm. *sari-kʼ*, Gk. *kairía*, *keiría* (see above *§2.2.3.1. Graeco-Aryan* for shared verb **k(e)r*- 'to tie, bind').

- **oi̯u-kʷi(d)* 'no', possibly a parallel development, cf. Arm *očʼ*, Gk. *ouk*, *oukí*.

- *okʷkʷon- 'eye', cf. Arm. *akn* gen. *akan*, Gk. (Hesychius) *okkon*.

- **osrā* 'harvest, summer', f. Arm. *ara-*, Gk. Lac. *op-ára*; this agreement is also found in *(s)kḷ-ne/o-* 'harvest, mowing time', cf. Arm. *k`ałel*, Gk. *skállō*.
- **obʰel-* 'broom, sweep; increase', cf. Arm. *awel*, Gk. *opʰéllo*.
- **pr(ē/ō)kt-*, cf. Arm. *erastan-kʿ*, 'buttocks', Gk. *proktós* 'anus'.
- **pter-* 'feather, wing, blade', cf. Arm. *ter*, Gk. *pterón*.
- **tumbo-* 'mound', cf. Arm. *tʿumb*, Gk. *túmbos*.
- ** u̯es-nu-* 'to clothe, to put on clothes', cf. Arm. *z-genum*, Gk. *hénnumi*.

For a full reference of potential Armenian-Greek correspondences, see Danka and Witczak (1995), Kortlandt (2003), and Martirosyan (2013).

3.3.3. Agricultural substrate of Graeco-Armenian

Interesting are the words of non-Indo-European (and thus probably substrate) origin found only in Graeco-Armenian, pointing to a common period in the Balkans, already separated from other Yamna settlers (Martirosyan 2013):

- **antʰ(-r)-* 'coal', cf. Arm. *antʿ-eł*, dial. *antʿ-(a)r-*, Gk. *ántʰraks*.
- **drepan-ā*, cf. Arm. *artewan-un-kʿ* 'eyelashes; eyebrow', Gk. *drepánee*, *drépanon* 'sickle' (the human eyebrow is taken as sickle-shaped).
- **sep⁽ʰ⁾-s-* 'to boil, cook', cf. Arm. *epʿem*, Gk. *epsō*.
- **t(a)rp-ā* 'large wicker basket', cf. Arm. *tʿarpʿ / tʿarb*, Gk. *tárpē*, *tarpós* 'large wicker basket'.
- **gingl(u)m-* 'hinge', cf. Arm. *cłxni*, Gk. *gínglumos*.
- **kalam-* 'aspen; plane', cf. Arm. *kałamax(i)*, Gk. *kalamín-dar*.
- **kast(an)-* 'chestnut' c.f Arm. *kask-eni*, Gk. *kástanon*.
- **karid-* 'crayfish', cf. Arm. *karič*, Gk. *karís, -ídos*.
- **gori̯o-* 'drain', cf. Arm. *kori*, Gk. *gorgúrion*.
- **gʷ(e)m/bʰuri̯ā* 'bridge', cf. Arm. *kamurj*, Gk. *gépʰura*. For non-IE languages compare Hatt. *ḫamuru(wa)* 'beam', Abkhaz **qə(m)bələ-ra* 'beam over the hearth, cross-beam'.

- **mosgʰ-o/io-* 'young bovine', cf. Arm. *mozi*, Gk. *móskʰos*.
- **notii̯ā* 'wetness', cf. Arm. *nay*, Gk. *notía*.
- **olur-*, cf. Arm. *oloṙn* 'pea, bean', Gk. *olurai* 'spelt; rice-wheat', cf. Akkad. *ḫallūru*, *hi/ullūru*, etc.
- **osp-* 'pulse, legumen', cf. Arm. *ospn*, Gk. *osprion*.
- **portʰo-* 'sprout, young twig', cf. Arm. *ort*, Gk. *p(t)órtʰos*.
- **kʰsan-t(e)r-* 'wool-carder, comb', cf. Arm. *santr*, Gk. *ksaínō*, *ksantēs*.
- **si/ekʰu-* 'melon, gourd', cf. Arm. *sex*, Gk. *sikúa*, *sékoua*.
- **keno-/ken(e)u̯o-* 'empty', cf. Arm. *sin* 'empty', Gk. **kenu̯ós*, Epic *kene(u̯)ó*.
- **srungʰ-* 'snout, nostrils', cf. Arm. *ṙungn*, Gk. *rʰúgkʰos*.
- **ps(e)ud-e/o-* 'false, lie', cf. Arm. *sut*, Gk. *pseudos*, *psudos*.
- *skórp-i-*, gen. *(s)kr̥p-i-ós*: Arm. *karb* 'basilisk, asp', Gk. *skorpíos* 'scorpion; a sea-fish'.

3.4. Indo-Iranian

3.4.1. Indo-Iranian evolution

Important phonological developments from Pre-Proto-Indo-Iranian up to Proto-Indo-Aryan (PIAr.) and Proto-Iranian (PIr.) include:

- Pre-Proto-Indo-Iranian:
    - Late DIE laryngeal developments:
        - Lengthening of colourised vowels before and after merged laryngeal and progressive laryngeal loss (see below *§II.2. Laryngeal evolution*).
        - Interconsonantal *$*h$ → $*i$, although Iranian shows some exceptions in initial syllables. For other evolutions of the merged laryngeal *$*h$ specific to Pre-PIIr, see e.g. Lubotsky (2018).
    - Early satemisation trend:
        - Velars become palatovelars, with exceptions (e.g. before *$*r$): *$*k$→$*k^j$, $*g$→$*g^j$, $*g^h$→$*g^{jh}$.
        - Labiovelars become (and merge with) plain velars: *$*k^w$→$*k$, $*g^w$→$*g$, $*g^{wh}$→$*g^h$.
    - Brugmann's Law: *$*o$ in an open syllable lengthens to *$*ō$; *$*dohtór-m̥$ → Pre-PIIr. *$*dōtŏ́r-m̥$.
    - Merge of syllabic *$*ḷ$ → $*ṛ$. Trend to the merge *$*l$ → $*r$ too, with exceptions found in PIAr. and PIr.
- Proto-Indo-Iranian:
    - *ruKi*-rule: phonetic retraction of sibilant to *$*š$ (or *$*ž$) after *$*r, u, K, i$; it becomes phonemicised only in the separate branches. *$*š$ remains a marginal phoneme in Proto-Indo-Iranian.
    - Bartholomae's Law (continues in PIAr. and PIr): an aspirate immediately followed by a voiceless consonant becomes voiced stop + voiced aspirate, cf. DIE *$*ub^hto-$ → Pre-PIIr. *$*ubd^ho-$ 'woven,

made of woven material'; *aug^h-tá-* → Pre-PIIr. *augd^{h}ó-* 'said'. In
addition, DIE *d^h+t* → Pre-PIIr. *dzd^h*; as, DIE *u̯dhto-* → Pre-
PIIr. *u̯̥dzd^{h}o-*, 'complete, mature'.

- o Satemisation (*law of palatals*):
    - ▪ Palatalisation of palatovelars: *k^j* →*$ć$, *g^j* →*$j́$, *g^{jh}* →*$j́^h$*.
    - ▪ Plain velars, when before a front vowel (*i* or *e*) or the glide *i̯,
      are palatalised to affricates: *k*→*$č$, *g*→*$ǰ$, *g^h*→*$ǰ^h$*; as, *ke* →
      *$če$ 'and', *$gī̯u̯eti$* → *$ǰī̯u̯eti$* 'lives', *g^hénti* → *ǰ^{h}anti* 'slays'.
- o Merge of Pre-PIIr. *e, o* → PIIr. *a*, Pre-PIIr. *$ē, ō$* → PIIr. *$ā$*.
- o General *$ń$* → *a*. Also, * $m̥$* → *a*, except in word initial position
  before resonants *mnV-*, *mrV*, etc.
- o Trend *$u̯$*→ *v* (continues in PIAr. and PIr.).
- o Loss of laryngeal remains, likely the glottal stop (continues in PIAr.
  and PIr.?).

- Proto-Indo-Aryan:
    - o *$ć$→*$ś$, *$j́$→*$źdᶹ, *$j́^h$→*$źᶹ^h$. Merge of *-$źd^h$- < *-$źᶹ^h$-t-* with *$žd^h$ < PIE
      sd^h after *i*, *u* or *$r̥$*.
    - o *s* and *z* between stops are lost, including "intrusive" *s* inserted
      between two heteromorphemic dental stops, e.g. DIE *u̯id-s-tó-
      'seen' PIAr. *vit-tá-*.
    - o PIIr. *$j́^h$* and *ǰ^h*, and sporadically other voiced aspirates, were
      debuccalised and became /h/.
    - o PIIr. *$š$* (or *$ž$*) from the ruKi rule (and from *$ć$, *$j́$ before voiceless
      dental stops) phonemicises and becomes retroreflex *$ṣ$*.
    - o PIIr. *n* →*$ṇ$* when immediately followed by a retroreflex stop.

- Proto-Iranian:
    - o Voiced aspirated plosives PIIr. b^h →*b, d^h →*d, $j́^h$→*$j́$, g^h →*g*.
    - o PIr. voiceless fricatives *f, *$ϑ$*, and *x* as a result of spirantisation of
      consonant clusters, of voiceless aspirated stops p^h, t^h, k^h,
      assimilation of aspiration, or PIIr. *s* before *u̯ in initial position.

- o PIIr. *s →*h in most positions. A source of PIr. *s < PIIr. *sć.
- o Double dental law: the "intrusive" *s is kept, the first dental is lost (ruKi-rule does not affect it, cf. Av. *cisti-* 'insight', OInd. *cittí-*).
- o Phonemic *š is found as a result of PIIr. *ćs or the groups PIE *ć/j + t.
- o After a labial *s →*š (or *ž after a voiced aspirate), e.g. PIIr. *drapsa 'banner' in Av. *drafša*, MP *drafš*.

3.4.2. Influence from Uralic

There are some obvious phonetic similarities between Uralic and Proto-Indo-Iranian, in contrast with Late PIE. The eastern LPIE dialect seems to have undergone multiple processes of phonetic *uralisms*, since Uralic languages had, in general, plenty of palatalised sounds, but only voiceless stops (Kallio 2001):

- Satemisation, i.e. affrication and assibilation of stops by front vowels: LPIE *K pronounced through PU *ć, *ś, *j.
- Delabialisation of labiovelars: LPIE *K^w through PU *k.
- Loss of sonorisation and aspiration: LPIE *T, *D, *D^h through PU *T.
- ruKi-rule, as part of the adoption of affricates and sibilants typical of Uralic languages.
- The vocalic merge from Pre-PIIr. to PIIr, i.e. *e/o→*a, *ē/ō→*ā, seems to have a parallel in the evolution from PFU to Proto-Ugric: *ō → *a, *ē → *ä, *o → *a (in most cases, with some cases of *a → *o), and also *e → *i under certain circumstances (Häkkinen 2009).

Uralic lexical influence on Indo-Iranian is underresearched, with continued contacts with Proto-Iranic[xv]. The direction of the borrowing is sometimes unclear (Kümmel 2019):

- PU *weŋćä 'knife' ~ PIIr. **wā́ćī-* 'axe'.
- PU *pëŋka 'mushroom' ~ PIIr. **bʰanga-* 'narcotic'.

[xv] There are probably more loanwords in extinct Northern Iranic.

- Substitution of Indo-European reflexive **s(u̯)á-* (which loses its nature as strict reflexive marker in Indo-Iranian languages) for, among other possibilities, the reflexive pronoun PIIr. **tanū́-* 'self' < 'body' (Orqueda 2018), comparable with the use in Samoyedic and Finno-Ugric languages of 'body' as reflexive pronoun (see below *§3.5.1. Disintegrating Uralic* evolution and *§4.19.2. Samoyedic evolution*).

- Isolated Indo-Aryan form **aika-* 'one' (with ancient PIA vocalism, as in Mitanni Aryan *aika-*), different from Proto-Iranian **aiu̯a-* (cf. Gk. **oiu̯o-*), shows a striking parallel with Ugric forms in *ek-*, *uk-*, *ak-* derived from PFU **ükti* 'one' (Fournet 2010). Since a borrowing into Finno-Ugric in **-t-* is not likely, and the form cannot be reconstructed for an older Indo-European stage (suffixes like LPIE **-ko-* are added to the stem, not the root), a contamination from Finno-Ugric (or Ugric) into Late PIIr. or Early PIA is a plausible explanation.

- P(F)U **kota* 'hut' ~ PIr. **kata-* 'house'.

- PU **kaδu̯a* 'female animal' ~ PIr. **gadu̯ā-* 'bitch', PIr. **kaϑu̯ā-* 'female donkey'.

- PFU **katV-* 'steal, thief' ~ PIr. **gada-* 'robber, thief'

- PU **kala* 'fish' ~ PIr. **kara-* 'big fish'

3.4.3. Asian agricultural substratum

Loanwords of a non-Indo-European language, attributed to the close contact of Proto-Indo-Iranian speakers with the Bactria-Margiana Archaeological Complex (BMAC), whose language may have been related to the modern Burushaski language isolate, are dated to the period between the Pre-Proto-Indo-Aryan/Proto-Finno-Ugric contacts and the appearance of Indo-Aryan words in Mitanni (Witzel 2003; Pinault 2003, 2006; Parpola 2015).

The following are examples of the adopted words (Lubotsky 2001, 2010):

- Construction: **jʰarmiĩa-* '(permanent) building'; **sikatā* 'sand, gravel', **ištĩa-* 'brick', although for a potential IE etymology see Mayrhofer (2005) and (Adams 2013); **maĩūkha* 'wooden pin'.

- Land cultivation: **ĩawīĩa-* 'irrigation channel'; **čāt* 'well'; **kʰā-* 'wellspring'.

- Religion: e.g. gods **Indra-* (also attested in Mitanni), **Ćarṷa*, **Gʰandarṷa*; **atʰarṷan-* 'priest'; **magʰa* 'ritual offering, sacrifice'; **r̥ši-* 'seer'; **anću-* 'Soma plant'.

- Local fauna: **uštra-* 'Bactrian camel'; **kʰara-* 'donkey'; **kaćĩapa-* 'tortoise'; **kapauta* 'dove', *ĩajʰuka 'hedgehog', *matsĩa* 'fish', etc.

- Social life: hairstyles (**kaića-/*gaića-*, **stuka*), dress (**atka-* 'cloak', **paṷastā* 'cloth'), utensils (**kapāra* 'dish', **naiĩi(s)* 'skewer'), etc.

The phonological and morphological features of the dozens of proposed Indo-Iranian loanwords are strikingly similar to those of loanwords found only in Sanskrit (i.e. after Indo-Ayrans had crossed the Hindukush), which suggests that continued contacts can only be traced back to peoples speaking similar dialects in Central Asia (Lubotsky 1999).

3.4.4. Mitanni Indic

Mitanni Indic shows features of dialectal Indo-Iranian or Old Indo-Aryan, such as diphthongs merged in Vedic Indic, e.g. *aika-* 'one' instead of Skt. *éka-*. Pre-Vedic Indo-Aryan is therefore supposed to have been spoken in the Middle East, strongly linked to the Mitanni state (16th–14th c. BC). Evidence include (Kroonen, Barjamovic, and Peyrot 2018):

- The text in Hittite CTH 284 dating to the 15th-14th centuries BC gives detailed instructions by "Kikkuli, master horse trainer of the land of Mitanni." Indo-Iranian (possibly Indo-Aryan) terms include *wa-ša-anna-* 'training area', and *a-i-ka*, *ti-e-ra-, pa-an-za-, ša-at-ta-, na-a-wa-ar-tan-na-* 'one, three, five, seven, nine rounds'.

- Names of Indo-Aryan derivation among the ruling class of the (mainly Hurrian-speaking) Mitanni population (Mayrhofer 1982; Witzel 2001).

- Indo-Aryan adjectives denoting horse colours are from the texts of the provincial town of Nuzi on the eastern frontier of Mitanni, including *pabru-nnu-* 'reddish brown', *parita-nnu-* 'gray', *pinkara-nnu-* 'reddish brown' (Mayrhofer 1982).

- Divine witnesses of Mitanni in the treaty CTH 51 between its ruler Šatiwazza and Šuppiluliumas of the Land of Hatti include "the Mitra-gods, the Varuna-gods, Indra, and the Nāsatya-gods" (Beckman 2016)

- Personal names with apparent Indo-Aryan etymologies survived accross a large territory, as far as Nuzi in the east and Palestine in the west.

An early letter from Tell Leilān in Northern Syria dating shortly before the end of Zimri-Lim's reign in 1761 BCE (Eidem 2014) makes reference to *mariannu*, which could extend the Indo-Iranian linguistic presence in Syria back two centuries prior to the formation of the Mitanni state. The word is generally seen as a Hurrianised form of the Indo-Aryan word **marįa-* 'man/youth' and taken to refer to a type of military personnel associated with chariot warfare across the Near East (Dassow 2008).

It is believed that the rise to power of an Early Indo-Aryan-speaking elite among a heterogeneous population might have given a mark of elite warrior-class identity to the language and names for dynastic succesors, which survived among certain groups during the Late Bronze Age.

Based on the presence of Mitanni Indic in the 15th century, and on the archaic language inferred from the Rig Veda and the Avesta, it is often assumed that Proto-Indo-Iranian may be dated to the centuries around 2000 BC.

3.4.5. Schleicher's fable in Proto-Indo-Iranian

Pre-Proto-Indo-Iranian

óu̯is ék^ju̯ōs-ke

ou̯is i̯osiās u̯ŕ̥ʔnā ne ēst	*ek^ju̯ons dédorke;*
tom gr̥ʔúm u̯óg^{jʰ}om u̯ég^{jʰ}ontm̥,	*tom meg^jám b^hórom,*
tom u̯īróm ōk^jú b^hérontm̥.	*ou̯is ek^ju̯ob^hi̯os éu̯euket:*
"k^jŕ̥d mō riši̯eti,	*nérm̥ kékk^ju̯i ék^ju̯ons ág^jontm̥."*
ék^ju̯ōs éu̯eukont: "krud^hí hou̯i!	*kr̥d nōs riši̯eti kékk^ju̯i,*
nēr, pótis, ou̯i̯i̯ōm u̯ŕ̥ʔnām	*su̯eb^hi g^hermóm u̯estrom kr̥néuti,*
ou̯i̯i̯ōm-ke u̯ŕ̥ʔnā ne hesti."	*Tod k^jek^jru̯u̯ós ou̯is ág^jrom éb^huget.*

Proto-Indo-Iranian

áu̯is áću̯ās-ka

áu̯is i̯asiās u̯ŕ̥ʔnā na āst	*áću̯ans dádarća;*
tam gurúm u̯aj^ham u̯aj^hantam,	*tam maj^{(h)}ā́ntam b^haram,*
tam u̯īrám āćú b^hárantam.	*áu̯is áću̯ab^hi̯as áu̯aučat:*
"j^hŕ̥d mā riši̯ati,	*náram čaćšu̯i áću̯ans ájantam."*
áću̯ās áu̯aučánt: "ćrud^hí áu̯i!	*j^hŕ̥d nās riši̯ati čaćšu̯i,*
nār, pátis, áu̯īnām u̯ŕ̥ʔnām	*g^harmám u̯ástram tanáu̯ai kr̥náuti,*
au̯īnām-ka u̯ŕ̥ʔnā na asti."	*Tad ćaćru̯u̯ás áu̯is ajrám áb^hujat.*

Proto-Indo-Aryan

ávis áśvās-ka

ávis i̯asiās ū́rnā na āst	áśvans dádarśa;
tom gurúm váham váhantam,	tom mahā́ntam bʰáram,
tom vīrám āśú bʰárantam.	ávis áśvabʰi̯as ávaučat:
"ź̌ʰr̥d mā risi̯ati,	náram čátsati áśvans áźantam."
áśvās ávaučan: "śrudʰí ávi!	ź̌ʰr̥d nās risi̯ati čátsati,
nār, pátis, ávīnām ū́rnām	gʰarmám vástram tanávai kr̥náuti,
ávīnām-ka ū́rnā na asti."	Tad śuśruvás ávis aźrám ábʰužat.

Proto-Iranian

ávih áćvāh-ka

ávih i̯ahiāh várnā na āht	áćvanh dádarśa;
tom gurúm vájam vájantam,	tom majā́ntam báram,
tom vīrám āćú bárantam.	ávih áćvabi̯ah ávaučat:
"i̯r̥d mā riši̯ati,	náram čašati áćvanh ájantam."
áćvāh ávaučan: "ćrudí ávi!	i̯r̥d nāh riši̯ati čašati,
nār, pátih, ávīnām várnām	garmám váhtram tanávai kr̥náuti,
ávīnām-ka várnā na ahti."	Tad ćaćruváh ávih ajrám ábujat.

Notes:

- The evolution of **u̯* into **v-* and the laryngeal loss in **u̯r̥ʔnā* must have happened at roughly the same time, given the differing outputs in both PIAr. and PIr. In the PIIr. version of the fable, both traits are therefore left intact.

- For PIIr. **maj^{(h)}āntam* - 'great, large, big', cf. Ved. *mahā́nt-*, YAv. *mazā́ṇt-*, an enlargement of inherited **maj^{(h)}ā-* after **bʰr̥jʰ-ant-* 'high' (Schmitt 2018).

- For PIIr. **raiš-*, pres. **riš-i̯a-* 'suffer, be hurt', cf. OInd. *risi̯ati*, Av. *raēš-*, *iriš-*.

- For PIIr. perf. part. *čákšuš < *kʷékʷkus- 'looking at something', cf. Ved. *cákšuš-*, with a shift in meaning to 'eye', similar to derivative in *-men-*. More appropriate for the Post-PIIr. stage seems to be the reduplicated desiderative forms in *-s-* PIIr. *čaćsati < *kʷéks-ṇti, PIAr. *čáṭṣati, cf. OInd. *cákṣate*.

PIIr. gen. pl. *-nām comes probably from the extension of feminine gen. pl. **-ā-ām (to distinguish it from the accusative), hence a Proto-Indo-Iranian innovation after the merge of vowels. Stems in *-i-* and *-u-* share a long vowel before the new ending, probably due to the generalised (previous allophonic) IE endings in *-iị-, -uu̯-*, which is not found in genitives made in *-ām. In this precise case of *áu̯i-, the root shares an acrostatic paradigm with other LPIE languages.

3.5. Disintegrating Uralic

3.5.1. Disintegrating Uralic evolution

Common Finno-Ugric traits which were probably shared by Samoyedic before its separation include the following:

- General OV order.
- Further development of copula support, including copular verb, indefinite/definite terms, third/non-third persons, present/past and indicative/non-indicative oppositions.
- Cases:
  - o Collective marker *-*k*.
  - o Ablative or separative *-*ta*/-*tä*.
  - o Innovation trend with further distinction of the three local cases, although precise details for a common stage are obscured by later developments.
  - o Locative adverb in *-*t(t)*.
- Coaffix *-*s*- from western languages is probably to be traced back to the expanding lative of this period.
- Verbal developments:
  - o Past tense marker *-*i/į*, apart from the common in *-*ś*.
  - o Past perfect *-*ma/-mä* and present in *-*pa/-pä* may be traced back to this stage, too.
  - o Development of a common passive construction can be attributed to this stage, although the innovation continues differently in Proto-Finno-Permic and Proto-Ugric.
- Development of subordinating conjunctions to combine sentences (apart from the use of nonfinite constructions), probably under the influence of neighbouring Indo-European languages.

- Reflexive probably formed at this stage from demonstrative pronouns **e-* + **čV*, but also possibly from a noun meaning '(shadow) soul' (compare the reflexive developed in Proto-Samoyedic).
- Regular phonetic changes include:
  - In the first syllable, LPU **äx* → PFU **ē*, LPU **ax* → PFU **ō*, as well as **VV* → **V* in a closed syllable, and **o* → **u* in open syllables before a second syllable **-i*.
  - In the second syllable, the opposition **i* vs. **ë* is probably already neutralised, and only **i* is retained. This leads eventually (in a process that continued in the different dialects) to the abolition of **ë*—and **ē̈*—in the first syllable, and **i* may then be found with **a* or **ä* in the second syllable.
  - The consonantal system undergoes little change, with only one systematic evolution of **Vx* → **VV* before a consonant.

3.5.2. Dialectal division

Jaakko Häkkinen (2009) has suggested that Proto-Uralic was early on split into three dialectal groups: West Uralic (later split into Samic, Balto-Finnic, and Mordvinic); Central Uralic (split into Mari and Permic, or both separate from the beginning); and East Uralic (later split into Samoyed, Ob-Ugric, and Hungarian). The Western and Central Uralic groups may have remained united for some time after the separation of the eastern group, since several innovations may be singled out. This phylogenetic tree (Figure 8) is gaining traction among a varied group of Uralicists, including Juha Janhunen (personal communication, 2012), Asko Parpola (2013), or Petri Kallio (2015).
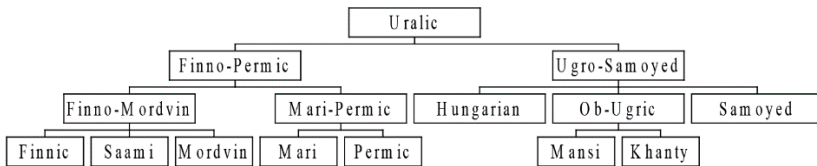
Figure 8. The revised family tree of the Uralic branches (after Häkkinen 2007, 2009). Image modified from Kallio (2015).

The virtual identity of Proto-West-Uralic and Proto-Uralic suggests that Proto-Uralic spread fast (Parpola 2013), likely around the mid-third millennium BC (Kallio 2015), in all likelihood related to the expansion and evolution of Eastern Corded Ware groups, including Battle Axe, Fatyanovo-Balanovo and Abashevo, all of them particularly linked through a shared Corded Ware ancestry and dominated by closely related paternal lineages. This supports a late group of clans (A-Horizon?) which expanded with Corded Ware groups from the Vistula to the east, with Fennoscandian groups maintaining close contacts with populations up to the Urals through the Upper Volga.

All nine well-attested subgroups (Balto-Finnic, Samic, Mordvinic, Mari, Permic, Hungarian, Mansi, Khanty, and Samoyed) are believed to have split soon within the next millennium, because their shared phonological and morphosyntactic isoglosses are rather limited (Kallio 2015). The early expansion of Ugric-Samoyedic (Häkkinen 2012) with Abashevo-related groups into the Andronovo-like cultural horizon through the Seima-Turbino phenomenon seems straightforward (Parpola 2013). However, such a simplistic division of the western group cannot be so easily done, due to convergence and divergence phenomena among Uralic dialects in north-eastern Europe. The possibility of a Finno-Permic-speaking Fatyanovo-Balanovo seems to be preferred in the current literature, with Fatyanovo/Netted Ware expanding West Uralic to the north-west (Parpola 2018), and Balanovo/Chirkovo-Kazan expanding Central Uralic to the north-east.

Nevertheless, it seems certain that the Battle Axe culture must have spoken—if not the actual Finno-Samic dialects—a Para-West Uralic dialect in continuous contact with the West Uralic area, based on 1) the early separation of Samic from the core West Uralic area (Parpola 2013); 2) the lack of non-Uralic substrates in Balto-Finnic (Kallio 2015); 3) the scarce non-Uralic topo-hydronymy in the East Baltic and around the Gulf of Finland (Saarikivi 2004), comparable to that on the Upper Volga region; 4) the strong influence of a Balto-Finnic-like substrate on Pre-Germanic (see *§4.12.2. Finno-Samic*

influence on Pre-Germanic) and Proto-Balto-Slavic (see *§4.13.2. Uralic influence on Balto-Slavic*); 5) the Palaeo-Germanic and late Balto-Slavic / early Proto-Baltic superstrate on Balto-Finnic (see below *§4.18. West Uralic*); and 6) the easy replacement of that hypothetic Para-West Uralic dialect by incoming Balto-Finnic peoples.

3.5.2.1. Finno-Permic

The following is the likely phonetic evolution of Disintegrating Uralic to the Proto-Finno-Permic stage (Sammallahti 1988):

- In stressed syllables $*\ddot{e} \rightarrow *\ddot{e}$, $*\bar{\ddot{e}} \rightarrow *\bar{o}$ (through an intermediate $*\bar{\bar{e}}$?); $*\ddot{e} \rightarrow *\ddot{u}$, $*a \rightarrow *u$, although PFU $*i$ had already started lowering towards $*a$.

- The consonantal paradigm remains largely the same, although $*u \rightarrow *v$ (with secondary $*u$ developed word-initially in Proto-Permic).

- The phonotactic system is somewhat different from the previous one: there are several PFP stems with word initial $*r$; geminate consonants may have also contained $*\check{c}\check{c}$.

3.5.3. Contacts with Indo-Iranian

Contacts between Disintegrating Uralic and Proto-Indo-Iranian were intense and long-lasting, as revealed by the different loanwords proposed to have been acquired in different stages (Koivulehto 1991; Carpelan and Parpola 2001; Katz et al. 2003; Blažek 2005) —even if some are disputed (Aikio and Kallio 2005)—which have survived in spite of strong posterior Indo-European influences, such as that of Palaeo-Germanic on Finno-Samic (see below *§4.18.4.1. Palaeo-Germanic borrowings*).

Pre-Proto-Indo-Iranian loanwords in Disintegrating Uralic[xvi] include the following:

[xvi] Samoyedic is less well investigated, hence the overwhelming majority of shared loanwords mostly between Finno-Permic and Ugric. However, there are some (Pre-)PIIr. borrowings common also to Samoyedic, and there are some loanwords found only in Samoyedic, including PIIr. and potentially PIr. stages (Kümmel 2019), which

- PFU *aiša* 'shaft'< Pre-PIIr. *aīšā́* 'shaft' (< CIE *ħihseħ/ʕʷihseħ 'shaft'), cf. OInd. *īšā́*, Av. *aēsa-*.

- PFU *i̯en-ti* < Pre-PIIr. *gʲen-ti* <*genh-* 'be born'.

- PU *inš-mi* → *išmi* 'wonder, sign' < *gʲṇ-né/n-ʔ-* 'know, recognise' (Koivulehto 1991). Similarly, PFU *inši* 'man' < PIIr. *gʲṇʔ-(i)e* 'generate' (Kümmel et al. 2001) hence 'offshoot; creation, being; kin, family'. The substitution of *gʲṇ-* by *in* is explained by the impossibility of the consonant group **i̯n-* in Uralic (Koivulehto 1991), while the presence of a laryngeal may be explained by the late survival in specific groups (see below *§II.2.5.2. *CRHC*). Compare for the adoption from a palatalised velar PFU *seu̯i-* 'eat' < (Pre-)PIIr. *i̯i̯eu̯- <*gʲi̯eu̯h-* 'chew' (Koivulehto 2003).

- PFU *kekrä* 'cycle' < Pre-PIIr. *kekro-*, cf. Skt. *cakra-* 'wheel, cycle'.

- PFU *kesträ* 'spindle, spin' < Pre-PIIr. *kētˢtro-*, cf. Skt. *cāttra-m* 'spindle'.

- PFU *mertä* 'man, person' < Pre-PIIr. *mṛ-tó-* 'death; mortal' cf. OInd. *mṛtá, OAv. mərəta* 'dead', also in other LPIE dialects 'mortal, person'. For o-grade Pre-PIIr. *mor-to-* 'mortal, man', cf. OInd. *márta*, Av. *masa-*, hence PFP *marta*, 'dry(cow), farrow' < PIIr. *márta-*.

- Maybe from this period LPU *oča* 'see; beware, guard; wait' ~ Av. *axša-* < Pre-PIIr. *ok-se-* 'watch' < *Hokʷ-se-* 'see; watch', although it is difficult to explain the apparent Pre-PIIr. *-ks-* → PU *-č-*, so possibly a later, PIIr. loanword that diffused also to Samoyedic. This word has also been explained as from the same root as PU *att-* (*ott-*) 'see, look', also 'watch, guard, etc.', although the medial *-t(t)-* → *-č-* is equally difficult to explain.

- Ob-Ugric *peečəɣ* 'cattle' ~ Pre-PIIr. obl. *pečeu-* points probably to an early, Pre-PIIr. loanword, before the evolution into PIIr. *pačau-*.

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attests to continued contacts of Proto-Samoyedic with the Eurasian steppes from the Pre-Proto-Indo-Iranian stage to the Proto-Iranian stage.

The PFP equivalent, *poča(u̯)*, may point thus to a slightly later PIIr. stage, which may in turn suggest more continued contact of Finno-Permic with Indo-Iranian languages after the separation of the Ugric community.

- Difficult to pinpoint is the origin of PFP *porćas* 'piglet' ~ PIr. *párĉah (cf. Av. *pərəsa*), because of the adoption with *o*-vocalism, which suggest an ancestral (palatalised) *porĉos*.
- PFU *-teksä* 'ten' < Pre-PIIr. *dek-s-, cf. Skt. *daśa-* 'ten'.

Proto-Indo-Iranian loanwords include:

- PFU *aru̯a* 'value, price' < PIIr. *argʰa- < *algʷʰa- 'value, price', also applied to the value of a slave (see above *§2.2.2.1. Economy and technology*).
- PFU *asëra* 'lord, leader' < PIIr. *asura- 'god; leader, lord', cf. OInd. *Ásura-*, Av. *Ahura-* 'lord'.
- PFU *ćata* 'one hundred' < PIIr. *ćatá- (<*km̥tóm), cf. Skt. *śatám.*
- PFU *i̯ama* < PIIr. *i̯ama- 'twin'.
- PFU *kurë* 'dig' < PIIr. *kar-, enlarged *karš- 'pull; plough', cf. PIIr. *kr̥ší- 'ploughing, furrow', PIr. *kārai̯a 'to sow, plant, plough', etc.
- PFU *mëkšë* 'bee' < PIIr. *makš- 'fly, bee'(Lubotsky 2001).
- PFU *ora* 'awl' ~ OInd. *ā́rā- (<*ēlā), after the merging of liquids, probably PIIr. and not Pre-Indo-Aryan as proposed by Koivulehto (1991), since it is found in other LPIE dialects with the same meaning. Also, Gmc. *ala(n)- <*HoH-ló-? remains unsuccessfully explained, and a borrowing from a Pre-PIIr. cognate is thus possible, although not warranted with the current data.
- PFU *ori̯a* 'slave' < Pre-PIIr. *ari̯a-, the self-denomination of Indo-Iranians, hence 'Aryan taken as a war-captive, prisoner', with a semantic shift mirroring Medieval Latin *sclāvus* 'slave', from Late Latin *Sclāvus* 'Slav', because Slavs were often forced into slavery in the Middle Ages.

- PFU *šistV* (*šikštV*) ~ OInd. *sikᵗʰa-* 'beeswax'.
- PFU *sosra* 'one thousand' < PIIr. *sa-ĵʰasra-* / Pre-PIIr. *sm̥-gʲʰesro-* (<*sm̥-gʰéslo-*), cf. OInd. *sahásram*, Av. *hazanram*.
- PFP *śuka* 'awn, chaff' < PIIr. / Pre-PIAr. *śuka-* 'needle', cf. OInd. *śuka-* 'insect's sting, ear of corn', Av. *śuka-* 'needle, pin'.
- PP *sur* 'beer' < PIIr. *surā-* 'alcohol', PFU borrowing due to the *s-* (Lubotsky 2001).
- PFP *taštä* 'star' < PIIr. (or PIr.) *tištriịa-* 'Sirius'.

It is difficult to distinguish any Pre-Proto-Indo-Aryan or Proto-Indo-Aryan loans from those usually proposed:

- PFU *anta* 'grass' < PIAr. *ándʰas-* 'sprout of the soma plant'. The Old Indian word has been connected to Gk. *ántʰos* 'flower', less likely to Alb. *endë* 'flour' and Arm. *and* 'field'; if so, then any cognate from DIE *andʰo-* 'sprout' to Proto-Indo-Iranian would be as good a candidate for the loanword as the Pre-Indo-Aryan stage.
- PFU *ịuχë-* 'drink' ~ OInd. *źuhŏ́ti* 'pour in fire, sacrifice'; the initial *ị* points to an earlier stage, cf. PIIr. *ĵʰu-ĵʰeu-* <*gu-gʰeu-* 'pour'.
- PFU *kuŋe* 'moon; month' ~ OInd. *Guṅgū́* 'lunar Goddess'.
- PFU *reśmä* 'rope' < PIAr. *raśmi* 'rein', is probably from a previous PIIr. *raćmí-* < Pre-PIIr. *rećmí-* given its vocalism, from IE *rek-* 'bind' (Lubotsky 2001).

Loans closer to Proto-Iranian, identified by their meaning or phonology, include the following (Lubotsky 2001):

- Ob-Ugric *kụoras* 'god; heavens' < Middle Iranian *xụar-* 'bright sun'.
- PP *maịäk/maịäg* 'stake' ~ PIIr. *maịūkʰa-*.
- PP *ńań* 'bread' ~ PIIr. *nagna-*.
- FV *oraśe* '(castrated) boar' ~ PIIr. *ụarájʰa* 'wild boar', a non-IE word (see *§3.4.3. Asian agricultural substratum*).
- PFP *śaka* 'goat' ~ PIIr. *sćāga-/sćaga*.

- PFU **šorńi* or **šar(a)ńa* 'gold' ~ PIIr. *jʰaranya* (<**gʰolʕʷ-*) 'gold', cf. Av. *zaranya-*.
- FP **śuka* 'chaff, awn', only found in Iranian, cf. YAv. *śuka-* 'needle'.
- Vog. *tas* 'stranger' < Pre-PIr. **dasu̯-* 'foreigner' (meaning shift from PIIr. 'people', see *§2.2.2.3. Society and laws*); an early borrowing due to the **s-* (Lubotsky 2001).
- PP **vork* 'kidney' ~ PIIr. **vr̥tka-*.

For more on Indo-Iranian loans in Uralic, see Kümmel (2019).

3.5.4. Schleicher's fable in Disintegrating Uralic

<div align="center">

uči – šepät

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uči, ńarana u̯olima,	*šepäi̯ näki;*
će küsä u̯iχim u̯iχitä,	*će enäm kantam,*
će koi̯im suχim kantata.	*uči šepäi̯ moni:*
"śüðʲämä ćärkë	*uräm šepäi̯ ai̯atam u̯äntitä."*
šepät monit: "kuntal, uči!	*śüðʲämät ćärkë u̯äntitä:*
urä, asëra, učin śäχrätä	*eči päu̯im u̯erčam teki,*
učin aptë epä u̯olik."	*e kulimä uči ńurmik kulkiśa.*

Notes:

- For 'not having wool', the more specific PFU word **ńarV* 'hairless skin' is found in the first sentence in the essive case (in **-na*), with the use of a copulative verb, and both terms in the nominative, with the dependent construction in the past perfect (or participle?).
- For the negative verb, a system similar to Proto-Finno-Samic is used, conjugating it with the third person singular marked by dialectal LPU present **-pa/-pä*.

4. Fourth stage

4.1. Greek

4.1.1. Greek evolution

Evolution of Disintegrating Indo-European to Proto-Greek, probably through a Graeco-Armenian stage, include the following phonetic changes (Bubenik 2017):

- Final laryngeal evolution (see *§II.2. Laryngeal evolution*).
- Devoicing of voiced aspirates: $*b^h \rightarrow *p^h$; $*d^h \rightarrow *t^h$; $*d^h \rightarrow *t^h$. Plain voiced and voiceless stops do not change.
- Dissimilation of labiovelars to plain velars adjacent to $*u$, e.g. Gk. *ouk*.
- LPIE $*s \rightarrow$ PGk. $*h$ except adjacent to itself, a voiceless stop, or when final.
- Vocalisation of syllabic resonants with epenthetic vowels, unstable still in the common period, e.g. Gk. *karterós/kraterós*.
- Preservation of $*\mu$; $*\underset{\sim}{i}$- is lost, although in initial position it is found weakened to $*h$- or strengthened to $*d\underset{\sim}{i}$-.
- Palatalisation, affrication, and depalatalisation and merging with cluster $*ts$: $*t\underline{i} \rightarrow *t'\underline{i} \rightarrow *t'^s\underline{i} \rightarrow *t^s$; $*k\underline{i}- \rightarrow *k'\underline{i}- \rightarrow *t'^s\underline{i}- \rightarrow *t^s$. The voiced counterparts were further simplified $*d\underline{i}$, $*g\underline{i} \rightarrow *d^z \rightarrow *z$.

Morphological features include (García Ramón 2017):

- The eight LPIE cases can be reconstructed for Proto-Greek before the syncretism of later dialects.
- A postposition added to the accusative ending, *-de*, can also be reconstructed as a "directive" found in ancient dialects.
- Thematic nominative plural in *-i*.
- Preservation of pronouns and demonstratives, with certain innovations.
- Fairly conservative verbal system, including dual, opposition active/middle and passive (in aorist and future stems), three aspectual stems, threefold opposition of tense, four moods (plus the inherited injunctive, still alive in Mycenaean).

4.1.2. Contacts with Pre-Greek sources

Proto-Greek is supposed to have entered the Greek peninsula after ca. mid–3rd millennium BC. The cultural and genetic steppe-related impact is relatively small compared to that of Bell Beakers (see *§3.2.1. North-West Indo-European community*), and this is reflected in the heavy inheritance of pre-Greek forms. Place names of Archaic Greece show a mixture of Greek and non-Greek forms.

The following are examples of non-Greek names (many of which show Pre-Greek morpheme *-ān-*), many found already in Mycenaean texts: *Kórintʰo-*, *Tíruntʰ-*, *Erúmantʰo-*; *Mukḗnā-*, *Athā́nā-*, *Halikarnāssó-*, *Knōssó-*; *Tʰẽbai* (Myc. *te-qa-de* = *Tʰēgʷans-de* 'to Thebes'), *Krēt-*, etc. and names of mountains such as *Ólumpo-*, *Parnassó-*, *Díktā-*, etc. The combination of Greek and non-Greek place names is proof that Greeks found central places such as *Athā́nā-* and *Kórintʰo-* already inhabited and named, but smaller places could still be given names in their own language, such as those found in Mycenaean texts: *Pleurṓn-* 'side of an area', from *pleura* 'rib, side'; *Marathṓn-* 'rich in fennel', from *máratʰ(u̯)o-* 'fennel'; *Selinóu̯ont-* 'rich in celery'; *Hríi̯o-* (<*sri-o-*) 'peak'; *Hél-es-* (<*sél-es-*) 'swamp'; *Leŭk-tr-o-* 'lookout', from *léusse* (<*leuk-i̯e-*); and *Plataii̯ái* 'plain'.

To the same substratum belong culture words such as *asámintho-* 'bath-tub', and *kupárisso-* 'cypress', both found in Mycenaean and Homeric Greek.

Dubious is the origin of words that are analysable as Indo-European, but which may have a non-Indo-European origin, such as Mycenaean terms with obscure etymologies *u̯anakt-* 'king', and its later replacement *gʷasileu-* (originally a local clerk); or forms with difficult morphological interpretations, such as *atástʰa-lo-* 'overconfident, carefree', *kʰróno-* 'time', *tʰálassa* 'sea'.

The replacement of the most common noun for wealth and livestock, **pekū*, into Gk. *próbaton* (close to *próbasis*) shows that it continues the Graeco-Aryan tradition of cattle and sheep-goat herding economy, but replaces the old root with an innovative economic term for moveable property (Benveniste 1969).

4.1.3. Anatolian and Semitic contacts

It has been argued in the past that an Anatolian language may be behind the Pre-Greek substrate, at least of place names in *-sso-*, *-tto-*, and *-ntʰo-*, believed to correspond to Anatolian place names in *-ssa* and *-anda*[xvii]. While the nature of the substrate language is difficult to ascertain, it is clear that Mycenaeans had contact with contemporaneous Anatolians (Hajnal 2018):

- Mycenaean had presence in Milet ca. 1450-1100 BC, and this is identified with *Millau̯a(n)da* in Hittite texts (identical with Greek

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[xvii] On the hypothetic 'offshore Luwic': "(...) there are scholars who maintain that Luwian or a closely related language was spread throughout the Aegean area, as it represents a key component of pre-Greek substrate. The main role in this argument is normally allotted to the toponyms in -(ι)νθο- and -(α)σσο-, such as λαβύρινθος "palace of the Cretan kings, Labyrinth" (da-pu2-ri-to- in the Mycenaean syllabic orthography) or Παρνασ(σ)ός 'Mount Parnassus'. The first of these proper nouns was compared with the Carian toponym Λάβραυνδα (also Λάβρυανδα), while the second one finds a direct parallel in the Anatolian town name Parnassa, which is attested in cuneiform sources. Furthermore, the root of the first pair of toponyms is reminiscent of Hittite-Luwian labar-/dabar- 'to rule', while the root of the second one evokes the Hittite-Luwian stem parna- 'house'. The suffixes -anda and -assa are productive with toponyms in Asia Minor, and the associated roots have a recognizable Hittite or Luwian character in many cases. If one accepts that they have the same origin as Greek -(ι)νθο- and -(α)σσο-, this can be used as an argument for the Luwian origin of such toponyms as Κόρινθος 'Corinth', Τίρυνθ- 'Tiryns', or Κνωσσός 'Knossos'." (Mouton, Rutherford, and Yakubovich 2013).

Milet). Therefore, the western *Aḫḫiịa(ụa)* described by Hittites must be identified with a mainland Greek empire, and in Mycenaean with the state name *Akʰaiụia, associated with the ethnic name Ἀχαιοί (*Akʰaiụoi*) the leading class in the palaces of Knossos, Khania, Pylos, Mycenae, Tiryns, and Thebes, and the name by which Homeric Greeks designated themselves in the Trojan war.

- In Mycenaean, women from Milet, *Milātiai*, or Halicarnassus, prisoners of war, are referred to as from *Asụia*, identical to the Hittite toponym *Aššuụa*.

- Names from Knossos contain *pi-ịa-*, which seem to correspond to frequent Luwian names with a first verbal component *pi-ịoᵒ-* 'give'.

The Late Bronze Age contacts between Greek and Anatolian dialects can also be seen in borrowings on lexical, as well as on phonological, morphological, and syntactic levels. However, unlike the heavy influence of the Pre-Greek substrate, these close contacts did not leave substantial traces in Mycenaean or in Anatolian languages.

Semitic loanwords may be found behind Mycenaean *kʰrūsó-* 'gold' (noun and adjective), *kúmīno-* 'caraway', *sā́sama* 'sesame' (Attic-Ionic *sḗsamo-*), *kʰitṓn-* 'undergarment worn on the body', etc.

4.1.4. Schleicher's fable in Proto-Greek

<center>*óụis híkʷoi-kʷe*</center>

óụis ịās ụlā́nos ne es	*híkʷons dédorke;*
ton gʷarún ụókʰon ụókʰentã,	*ton makrón pʰóron,*
ton mrətón ōkã pʰérontã.	*óụis híkʷoihi ụeikʷe:*
"kərdịā ákʰnutoi moi,	*anérā ụidóntei híkʷons agóntã."*
híkʷoi ụeikʷont: "klútʰi óụi!	*kərdịā ákʰnutoi ãsmí ụidóntei,*
anḗr, denspótʰis, óụịon ụlā́non	*sụoi kʷʰermón ụéstrãn kʷoịéịei,*
óụịon-kʷe ụlā́nos ne ésti."	*toi kluụṓs óụis agróm pʰégʷoto.*

Notes:

- Post-Mycenaean **hippos* < ***ékʷos* < LPIE **hékṷos* is striking because of the aspiration, the double -*pp*-, and the -*i*-. Raising of -*e*- to -*i*- in labial contexts is normal. Archaic and Classical -*pp*- most likely are due to Proto-Archaic gemination ***-kʷkʷ-*, to maintain the original prosodic structure of the etymo[xviii] (for both developments see *§4.10. Lusitanian*). The aspiration remains unexplained, because initial laryngeals had been lost already before the Proto-Greek period. It may be of expressive origin, or it was contaminated by another word.
- For the pronoun Gk. *ammí*<**ṇsmí*, an intermediate stage with -*s*- can be seen in the oldest stage (Bičanová and Blažek 2014).

4.2. Macedonian

Known features of Macedonian point to an ancestral origin close to Proto-Greek (Brixhe 2018):

- Previously, it was though that the presence of β instead of φ for initial **bʰ* set it apart from Greek (and parent Graeco-Phrygian, even Graeco-Armenian) evolution. It has recently been proposed, based on the φ found in the Pella tablet, that the evolution in Macedonian likely represents a conditioning voicing of all voiceless obstruents and spirantisation of aspirates, i.e. **pʰ* → **bʰ* → *v*, and spirantisation of voiced stops, **b* → *v*. As a consequence of this merge, both share the same graphic realisation.
- The Koine of Macedonia is similar to that seen in areas where the Koine has replaced a Doric dialect: <A> instead of the expected <H> in anthroponyms, orthographic representation <OY> for inherited **ū*.

[xviii] A less compelling explanation is given by Kroonen (2013), by which geminated *p* may continue **hepṷos*, i.e. a contamination form of the original paradigm found in Anatolian, expected nom. **hékus* <**hekus*, and the gen. **hépos* <**hkṷós*.

- The overwhelming majority of anthroponyms and most toponyms, divine epithets, and names of months can be interpreted through Greek.
- Some dialectal features appear to be in common with Thessalian and North-West Greek, such as apocope of *ā* + *ō* to *ā*, treatment of group -*sm*-, and particle -*ka*.

Since Phrygian and Thracian are quite close to Greek, and there are heavy borrowings (or shared cognates) of Phrygian and Thracian words in Macedonian, it is impossible to say to which Palaeo-Balkan group Macedonian belonged.

4.3. Phrygian

4.3.1. Phrygian evolution

Phrygian is most closely related to Greek. Both share the following features:

- Initial vocalisation of laryngeals (more consistent between each other than with Armenian).
- Use of the thematic pronoun *auto*- 'self'.
- Imperative middle 3sg. ending.
- Word-final $*m \rightarrow *n$.
- Common lexicon, such as *u̯ánakt*- 'ruler', and *lāu̯āg(etā)*- 'leader of a *lāu̯ó*-'.

Known Old Phrygian features include (Ligorio and Lubotsky 2018):

- Fate of stops unclear[xix]:
  - Aspirated stops become plain stops: $*b^h/d^h/g^h/g^{wh} \rightarrow *b/d/g/g^w$;
  - Plain stops become tenues (dubious): $*b/d/g \rightarrow *p/t/k$;
  - Labiovelars become plain velars: $*k^w/g^w \rightarrow *k/g$.

[xix] Because of the devoicing trend found in Proto-Greek and Proto-Armenian (arguably the first language to split from the common family), it is tempting to place Phrygian consonantal development as an innovation departing from this. For example, in aspirated stops, not $*b^h \rightarrow$ Phryg. b, but rather $*b^h \rightarrow **p^h \rightarrow **b^h \rightarrow *b$. See above for a similar evolution in Macedonian.

- Limited palatalisation trends: cf. *(d)zemelos* 'men (dat. pl.)' < *dʰg⁽ʰ⁾emelo-*, cf. Gk. *kʰtʰamalós*, Lat. *humilis*, 'low, humble'; demonstrative **se-/si-* and **sa-* probably from **ki-*.

- Merge **ē, *ā → a*. No certain examples of **ī, *ū*. Eventually, short and long vowels merged, and the New Phrygian period shows a vowel system without length opposition.

- No clear example of diphthong **ou*. There were at least two long diphthongs, *ōi* and *āi*.

- Declension affected by vocalism: **tēr → tar*; **ēn → an*; **-on* is raised to *-un*; **-eu̯-n̥-ts →*-evans → -evais*, **-eu̯-n̥-tos → -evanos*.

- Reduction of word-final clusters: cf. *bas <*bats, batan*; *ᵒvanak*, dat. *vanaktei*; *dakaren* (<*dakarent*); 3.sg. ending *-es <*-est*.

- **s* continues Graeco-Armenian trend to loss; it appears in word-final position and in clusters with a stop.
  - Development of geminates from **sK → **hK → kK*.

- Syllabic nasals develop as **aN*.

- Old Phrygian nominal declension had at least four cases.

- Preservation of relative and demonstrative pronoun (as anaphoric).

- Verbal system marked for tense (present, perfect, aorist), voices (active, middle), and moods (indicative, imperative, optative, subjunctive).

- Imperative ending 3sg. m. *-do* parallels Greek *-stʰō*.

- Unmarked word order seems to be SOV.

Based on the known Old Phrygian inscriptions (ca. 8th–4th c. BC), it may be assumed that Proto-Phrygian was spoken some time around the turn of the 2nd to 1st millennium BC. Its close relatedness to Greek puts their split from a common Graeco-Phrygian trunk necessarily earlier than the estimated Proto-Greek period.

4.3.2. Schleicher's fable in Proto-Phrygian

The following is a tentative version of the fable in Proto-Phrygian, based on the scarce data available, assuming a close similarity with Proto-Greek.

<center><i>oṷis ekoi-ke</i></center>

oṷis i̯as ṷlanos ne es	*ekois dedorke;*
son garun ṷogun ṷogenan,	*son meka borun,*
son dzemelun ōku beronan.	*oṷis ekoihi eṷeuke:*
"kard̦i̯ā agnutoi moi,	*anaran ṷidonei ekois akonan."*
ekoi eṷeukan: "kludi oṷi!	*kard̦i̯ā agnutoi anmi ṷidonei,*
anar, dampotis, oṷi̯un ṷlanun	*autoi germun ṷestran daket,*
aini oṷi̯un ṷlanos ne esti."	*soi kluṷos oṷis akrom buke.*

4.4. Thracian

Information on the Thracian language is limited (Brixhe 2018):

- Most likely the language underwent *Lautverschiebung*: $*b^h/d^h/g^h \rightarrow *b/d/g$; $*b/d/g \rightarrow *p/t/k$; $*p/t/k \rightarrow *p^h/t^h/k^h$.
- Loss of final consonants.
- Possible palatalisation of $*d/g$ before front vowels (no generalised palatalisation trend).
- Toponymic lexemes: *-para*, *-diza*, *-bria*.

Newly interpreted material from Zone has rendered old interpretations of a Thracian and a Daco-Moesian or Daco-Getian groups obsolete. Today, the most likely interpretation of the language spoken in the Zone-Samothrace region is of one split from an older Graeco-Thraco-Phrygian community in the Balkans.

4.5. Supradialectal communities

4.5.1. West Indo-European

Close contacts within a West Indo-European group (formed by Italic, Celtic, and Germanic), supposed to derive from a dialect *continuum* spanning Pan-European trade contacts during the Bronze Age, may be found in certain common traits. Most likely, because there were no closer contacts between Germanic and Celtic, or between Germanic and Italic, these common traits are in fact North-West Indo-European features that did not survive in Balto-Slavic, the most divergent dialect of the group, probably partly isolated early in close contact with Palaeo-Balkan and Uralic languages (see *§4.13. Balto-Slavic*).

One common feature of the three dialects is the merge of $*k\underline{u} \rightarrow k^w$, usually considered a parallel development in 'centum' languages, because it is also found e.g. in Gk. *hippos*. Nevertheless, since it is not found in Lusitanian, it may be posited as a common development, or one due to areal influence.

Shared folk tales among the three dialects (da Silva and Tehrani 2016) include "The Treasures of the Giant" (MFTD 328), whereby a boy or hero sets out to steal from a giant (a variant is Jack and the Beanstalk); and "The Animal Bride" (MTFD 402), where the youngest of three brothers succeeds best in the quests set by his father, bringing the best cloth, the most beautiful bride, etc., and the mouse (cat) who has helped him changes herself into a beautiful maiden.

4.5.1.1. Substrate words

Non-IE substrate words shared only by West Indo-European include e.g. *$*ereg^w$-o-*, *$*gnid$-*, or *$*knu\text{ʔ}$-* (see above *§3.2.5.1. Substratum common to NWIE and Palaeo-Balkan*), and also:

- WIE *$*ak^w\bar{a}$* 'water', found in Gmc. *$*ax^w\bar{o}$-* and Ita. *akwā-*, may be a loan from a non-IE language (de Vaan 2008). Traditionally claimed to be a variant from PIE *$*ap$-* 'water'.

- WIE **aru-* 'ore' as basis for Lat. *raud-*, Pre-Gmc. **arud* (cf. ODu. *arut*, OHG *aruz*, *ariz*), comparable to Sumerian *urud(u)* 'copper'.

- WIE **bʰolik-* 'coot', cf. Lat. *fulica*, Gmc. **balika/ōn-*.

- WIE **gʰazt-o-*, **gʰazdʰ-o-* 'spear', cf. Lat. *hasta*, OIr. *gat*, *gas*, Gmc. **gazda-* (de Vaan 2008)

- WIE **kagʰ-* 'enclosure' as basis for Lat. *caulae* < **kagʰ-el-ā-*, W *cae*, OBret. *cai* 'pen, enclosure' < **kagʰ-io-*, ON *hagi*, OE *haga*, OHG *hag* < **kagʰo(n)-* 'enclosure, pasture'.

- WIE **kapro-* 'goat', cf. Ita. **kap-ro-*, Cel. **gabro-*, Gmc. **kapro-*. The consonantal vacillation and a-vocalism support its non-IE origin.

- WIE **kar-(gu-)* 'sacrificial mound', cf. OIr. *carrac*, *carn*, OW *carrac*, *creic*, *carn*, ON *hǫrgr*, also in Finn. *karkko*, *karkku* 'pile, stone wall, cliff'.

- WIE **kragr-* 'heron', cf. MW crehyr < **krəxar-*, Gmc. **xraigran*.

- WIE **kʷe-kʷer-* 'gourd', cf. Lat. *cucurbita* 'gourd', OE *hwerhwette* 'cucumber'.

- WIE **-msl-* 'blackbird', in Ita-Cel. **mesal-* (cf. Lat. *merula*, W *mwyalch*, Bret. *moualc'h*), Gmc. **a-msl-* (cf. E *ousle*, OHG *amsala*); the reduction to **-msl-* and the addition of a non-IE prefix **a-* points to a non-IE origin (Kroonen 2013).

- WIE **marko-* 'horse, stead', found in Gaul. acc. *markan*, MIr. *marc*, MW *march*, ON *marr*, OE *mearh*, OHG *marh*, *marah*, has been connected to OInd. *mári̯a-*, but a-vocalism probably points to a non-IE origin, possibly a Eurasiatic wanderword through steppe nomads (Matasović 2009).

- WIE **sem/b-* 'rush', cf. OIr. *simin*, *sibin(n), sibhean(d)* 'rush, reed; corn-stalk', OS *semith*, MLG *sem(e)de*, OHG *semida*, MHG *semede*, *sebede*.

- WIE ***smmér-/*sémmr-* 'clover', possibly behind OIr. *seamar*, Gmc. **smēri̯ōn-* (restricted to Scandinavian).

- WIE **taks-*, cf. Cel. **tazg-*, Gmc. **ϑaxs-*, also in Lat. *taxo* (beside *taxus*), probably a loanword (Kroonen 2013).
- NWIE **u̯-l̥-t-* 'dyer's rocket' cf. Pre-Ita. **ulout-o-*, Pre-Gmc. **u̯olt-ā-*.

4.5.1.2. West Indo-European lexicon

Common West Indo-European lexicon likely of North-West Indo-European origin includes:

- WIE **al-e-* 'to feed', in Lat. *alere*, OIr. *alid*, W *alu*, Goth. *alan*, ON *ala*. Strong verb to PIE root **ħel-*.
- WIE **bʰlē-u̯o-* adj. 'blond', cf. Lat. *flāvus* 'blond', OIr. *blá* 'yellow', W *blaw* 'grey', Gmc. **blēu̯a-* 'blue'.
- WIE **bʰlō-* 'flower', cf. Lat. *blō-os*, Cel. *blo-tu-*, Gmc. **blōan*, *blōman-*.
- WIE **gus-tus* m. 'taste', cf. identical cognates Lat. *gustus*, Gmc. **kustuz* 'trial', OIr. *guss* 'excellence, force' < **gus-tu-*. Derived from root **geus*.
- WIE **kaput-* 'head', cf. Lat. *caput*, Gmc **xa(u)buda-*; further (in **-k-*) OIr. *cúach*, W *cawg*.
- WIE **kent-no-* 'skin', cf. Lat. *centō* 'blanket, patched cloth', OIr. *ceinn* 'head', W *cen* 'skin', ON *hinna* 'thin skin, membrane', OE *hion* 'meninx?'.
- WIE **ker-u-* 'deer', cf. Lat. *cervus*, OW *caru*, MW *carw-*, Gmc. **xeruta-* (with animal suffix *-ut-a-*), from PIE root **ker-* 'horn'.
- WIE **koldo-* 'destruction', cf. OIr. *coll*, Gmc. **xalta-*, and probably here irregular Lat. *clādēs* 'destruction' (reconstructed as from **kl̥-dʰ-*, but with no cognates outside Italic).
- WIE **krispo-* 'curl', cf. Lat. *crispus*, Gmc. f. **xrispō-*, W *crych* < **kripso-*.
- WIE **kr̥s-e-* 'run' cf. Lat. *currō* 'run', OIr. *carr*, W *car* 'vehicle', Gmc. **xurzōn* 'to rush'.

- WIE **lut-* 'mud', cf. Lat. *lutum*, OIr. *loth*, Ger. *Lotz* 'deep spot in a creek (to scoop water)'.

- WIE **mn̥to-* 'mouth', cf. Lat. *mentum*, MW *mant*, Gmc. **munθa*.

- WIE **nad-* 'bind', as basis for **nad-to-* in Lat. *nassa* 'wicker-work basket', OIr. *nassae* 'bound'; as o-grade **nōd-o-* in Lat. *nōdus* 'node', ON *nót*, pl. *nœtr* 'net'; as **nad-i-* in Gmc. **natja* 'net', OIr. *nenaid-* 'nettle'; as verb **nad-ske-* in OIr. *nascaid*, MBret. *naska* 'bind'; etc. Compare Skr. niṣká- 'golden necklace, golden ornament' and Thrac. acc. pl. neu. NHSKOA 'adornaments'.

- WIE **na-tr-* 'snake', cf. Lat. *natrix*, OIr. *nathir*, gen. *natrach*, Goth. *nadrs*, ON *naðr*.

- WIE **preus-* 'freeze', cf. Ita. *pruīna* 'frost', W *rhew* 'frost, rime', Gmc. **φreusan-* 'to freeze'.

- WIE **psei-so-* onomatopoetic verb 'blow; hiss; whisper; fart', cf. Lat. *spirāre*, W *ffûn*, Gmc. **φīsan-*.

- WIE **rēgs* 'king, ruler', cf. Ita. **rēks*, Cel. **rīgs*, Gmc. **rekaz* (cf. ON *-rekr, -reki)*, also in derivative fem. **rēgnjā* 'queen', cf. Ita. **rēginā*, Cel. **rīganī*, and **rēg(i)jo-*, 'royal, mighty, cf. Cel. **rīgjo* (and as a loan in Gmc. **rīks, *rīkija-)*. They continue a Late PIE concept, being evident in PIIr. f. **rā́jniā*; PIIr. m. **rā́jān* (<**rēgon-*, also found in Bret. *rīgon*) is usually explained as a back-formation from the feminine form in **-n*, because the West IE form is a root noun and thus believed to be ancient. However, this form is not found outside West Indo-European.

- WIE **u̯āti-* 'prophet', cf. Lat. *vātēs*, Cel. **u̯āti-*, Gmc. **u̯ātí-, *u̯āt-ó-*; contrasting with **kou̯i-* / **kou̯hēi-* of Palaeo-Balkan and Indo-Iranian groups.

- WIE **u̯āstu-* 'desert, waste, empty', cf. Lat. *vāstus*, OIr. *fás* < **u̯āsto-*, Gmc. **u̯ōstu-*.

- WIE *$\underset{\circ}{u}$iros* 'man, cf. Lat. *vĭr*, OIr. *fer*, Goth. *wair*; against long vowel in all other languages (Matasović 2009). Possibly related originally to Dybo's law (Kroonen 2013).
- WIE *$\underset{\circ}{u}l$-tu-* 'seen', cf. Lat. *vultus*, OIr. *fili*, *filed* 'seer', Goth. *wulþus*.

4.5.1.3. Celtic-Germanic isoglosses

Common Celto-Germanic vocabulary (before their respective sound shifts) includes a reflection of an ancient shared cultural sphere:

- WIE *aku̯o-lo-* 'awl', in Weslh *ebill*, ON *-all*, OE *awul*.
- WIE *baiso-* or *basi̯o-* 'boar', cf. Proto-Brit. *basio*, Gmc. *baiza-*.
- WIE *bʰodʰ-u̯a* 'war; battle', in MIr. *bodb, badb* m./f. 'war-god(dess); scald-crow', ON *boð*, OE *beado*, OHG *batu-*.
- WIE *bʰors-o-* 'bass', cf. Gael. *barsch*, Gmc. *barsa*, possibly from an original meaning 'pine needle'; cf. here Lat. *fastīgium* 'roof', Skr. *bhr̥stí-* y OCS *borshchŭ*.
- WIE *bʰrozdʰ-o-* 'edge', cf. OIr. *brot*, Ice. *bradd*, OE *breard*, OHG *brart*.
- WIE *dʰreibʰ-e-* 'hurry', cf. Cel. *drippi-* (<*dʰribʰ-ni*?) 'hurry', Gmc. *drīban-* 'to drive'.
- WIE adj. *drou-sd-o-* 'trustworthy', cf. OIr. *druit*, Gmc. *trausta-*. Probably from IE roots *dreu-* 'trust' + *sed-* 'sit'.
- WIE *dʰrūto-* 'joker', cf. identical MIr. *drúth* 'professional jester, fool', MW *drut* 'dear, foolish, foolhardy', ON *trúðr* 'juggler, fool', OE *trūð* 'trumpeter, actor, buffoon'.
- WIE *elki̯o-* 'evil, mean', cf OIr. *elc*, ON *illr*, borrowed into Finn. *elkiä*.
- WIE *gʰeislo-* 'hostage', cf. Cel. *gēs(t)lo-*, Gmc. *gīslaz* 'hostage', from *gʰeidʰ-* 'desire, wait for', possibly through 'one who is waiting (to be released)' (de Vaan 2008).

- WIE * g̑u̯el-o-* 'charcoal', cf. OIr. *gúal* < *goulo-*, Gmc. *kula-* < *gul-o-*. An innovation from a root meaning 'burn, shine'; cf. Toch. B *śoli̯e* 'oven' Skr. *jvālā* 'light, torch', Russ. *zolá* 'ash'.

- WIE *keng-e-* 'to limp', cf. OIr. *cingid*, MW *ry-gyng*, OE *hincian*, OHG *hinkan*; here probably also Gmc. *skank-*, O.Ind. *khañjati*, Gk. *skázdō*.

- WIE *koito-* 'forest', cf. OW *coit*, Bret *koat* 'wood', OCo. *cuit* 'silva', Goth. *haiþi* 'open field', ON *heiðr* 'heath, moor', OE *hǣð*, OHG *heida*.

- WIE *kork-* 'oats', cf. OIr. *corca*, *coirce*, W *ceirch*, Bret *kerc'h*, ON *hargr*, Ice. *-hagra*, NW *hagre*, OSwe. *hagri*.

- WIE *lok-* 'fault, offence', cf. OIr. *locht* 'fault, shortcoming, vice; offence; (physical) blemish', Gmc. *laxan-* 'to blame, reproach'.

- WIE *lugʰ-* 'to bind by oath', cf. OIr. *luige* 'oath', Goth. *liuga* 'marriage'.

- WIE *magʰus* 'young boy(?)', cf. OIr. *mug* 'servant', Corn. *maw*, Goth. *magus* 'boy', ON *mǫgr*, OE *magu*, etc.

- WIE *mon-go-* 'mane', cf. OIr. *mong*, Gmc. *mankan*.

- WIE *nent-e-* 'fight', cf. OIr. *néit* 'battle, combat, fighting', OHG *gi-nindan* 'to dare'.

- WIE *oitos* m. 'oath', cf. Cel. *oito-* behind OIr. *oeth*, and Gmc. *aiθa*. Given the close formal and semantic agreement, it is unlikely that the formation goes back to PIE only to surface in these two neighbouring branches independently, so it is likely to have arisen in a shared cultural zone with similar legal traditions (Kroonen 2013).

- WIE *orbʰi̯om* n. 'inheritance', cf. OIr. *orbe*, ON *arfr*, OE *ierfe*, OHG *arbi*, *erbi*. Maybe developed in a shared European cultural zone from a root meaning 'pass over', cf. Hitt. *ḫarp-* 'to associate (someone) with, to combine, to join together'.

- WIE *pleid-e-* 'to strive', cf. MW *llwydaw* 'to succeed', Gmc. *φlītan-* 'to strive, fight'.

- WIE *roi-no-* 'hill, border', cf. Bret *rūn* 'hill', ON *rein* 'marge, strip of land', MHG *rein* 'marge, elevation'.
- WIE *slak-* 'hit', probably onomatopoetic; cf. MIr. *slachta* 'hit', also MIr. *slacc* 'sword', Gmc. **slaxan* 'to beat, strike, slay'.
- WIE *sret-* 'swirl', cf. MCo. *streyth* 'river', MIr. *srithit* 'stream of milk or blood', OHG *stredan* 'to seethe, swirl'.
- WIE *streib-o-* 'stripe', cf. OIr. *sríab* 'stripe, line', Gmc. **strīpan-* 'stripe'.
- WIE *t(o)nʔros* 'thunder; god of thunder', in Cel. **toranos-* (metathesised **torʔnos*), Gmc. **ϑunraz*. Compare Lat. *tonitrus*, O.Ind. *tanā*.
- WIE *tegu-* adj. 'fat', cf. Cel. **tegu-*, Gmc. **ϑeku*.
- WIE *ueɡʰ-no-* / *uoɡʰ-no-* 'wagon', cf. Cel. **uegnos*, Gmc. **uagnaz*, probably reveals an ancient trend to replace the common noun **uoɡʰos* (cf. Sla. **vôzъ*) with one formed in **-no*.
- WIE *uelt-i-* 'wild', cf. Cel. **uelt-i-* in MIr. *geilt* 'lunatic, panic-striken fugitive' Gmc. **uelϑia-*. Maybe from **ɡʷʰel-ti-* (Matasović 2009).

More Celtic–Germanic isoglosses can be found in Lane (1933) and Hyllested (2010).

4.5.1.4. Italic-Germanic isoglosses

The shared Italo-Germanic lexicon before their characteristic sound shifts includes words related to nature and to the divine, among others:

- WIE *ankr-o-* 'lowland', in Lat. *ancrae* f.pl. 'valley', Gmc. **angra-* 'lowland, meadow', cf. Gk. *ankos* 'valley'.
- WIE *ark-u-* 'arrow; bow', cf. Lat. m. *arcus* < **arkus* 'bow, arch', Gmc. **arxuō- < *arkuā* f. 'arrow'.
- WIE *at-no-* 'year', cf. Ita **atno-*, Gmc. **aϑna-*.
- WIE *aus-e-* 'to scoop', cf. Lat. *haurīre*, Gmc. **ausan-*.
- WIE *bʰlē-* 'blow', cf. Lat. *flāre*, Gmc. **blēan-*.

- WIE *b^hr̥g-ne-* 'break', cf. Lat. *frangō*, Gmc. *$bruk(k)ōn$-*.

- WIE *b^hrā-ie-* 'to bore', cf. Lat. *forāre* 'to bore through, pierce', Gmc.
  burōi̯an- 'to bore'.

- WIE *b^hrod-n-* 'to bud', cf. Lat. *frondis* 'foliage, leaves', Gmc.
  $brut(t)ōn$- 'to bud'.

- WIE *b^hrug-i̯e-*, in Lat. *fruor*, Goth. *brukjan*, etc.

- WIE *gentis, *gn̥ʔti-* 'clan, kin, race', cf. Ita. *gentis*, *gnā-ti-*, Gmc.
  kindiz, *kundiz*, evolved from 'people of the same descent'. Compare
  for the basic meaning 'child, birth, offspring' Sla. *zętь* 'son-in-law' (<
  BSl. **źéntis*), Gk. *génetis* 'origin, source', PIIr. *ĵā́tiš* 'birth,
  production'.

- WIE *kar-n-* 'flesh', cf. Lat. *carō*, Gmc. *xarund-*; probably here also
  Lith. *karnà* 'Lindenblast'.

- WIE *kat-* 'goat', in Lat. *catulus* 'young animal' (cf. MHG *hatele*
  'young goat'), Gmc. *xattu* 'hat', ON *haðna* f. 'young goat'.

- WIE *$kneig^{wh}$-e-* 'bow (down)', cf. Lat. *cōnīveō* 'to be tightly closed,
  close (of the eye), Goth. *hneiwan*, ON *hníga*, OE *hnīgan*, OHG *hnīgan*.

- WIE *kolso-* 'neck', cf. Lat. *collum* 'neck; hill', Gmc. *xalsa-*, with
  common delabialisation; cf. Gk. *polos* < *k^wolos*, Lith. *kaklas*, Ltv.
  kakls < *k^wok^wlos*.

- WIE *spar-* 'spear' cf. Lat. *sparus*, Gmc. *spar(r)an*, *speru-*. Compare
  maybe from the same root Alb. *spardh(ë)* 'kind of oak', potentially with
  a meaning closer to the original.

- WIE *takē-* 'to be silent', cf. Lat. *tacēre*, Gmc. *ϑagēn-*, also in *taknā-*
  'to silence' (Kroonen 2013).

- WIE *tong-éie-* 'think, know', cf. Gmc. *ϑanki̯an-*, Lat. *tongēre* (the
  root is also found in Tocharian, see above *§2.2.3.2. Northern Indo-
  European*).

- WIE *u̯ā̆de-* 'to wade', cf. Ita. *u̯āde*, Gmc. *u̯adan*. Possibly from
  older *$g^weħd^h$-/$g^wħed^h$-* (Witczak 2012).

- WIE *$ṷéik$-* 'holy', cf. Ita. *$ṷik$-tm-$ā$-*, Gmc. *$ṷīxa$*, *$ṷīx$-nā*.

4.5.2. Italo-Celtic

The main reason for a proposed Italo-Celtic subgroup is the shared innovations of Proto-Celtic and Proto-Italic, which are unusual enough not to have been parallel developments, but rather reflect an early linguistic unity.

Common morphological developments include, from more to less likely to be dated to a common period of genetic relationship (Zair 2018):

- Morphological innovation:
  - Superlative in *-is-ṃmo-*, apart from the inherited *-t-ṃmo*.
  - Reinterpretation of *-ī̆* as an o-stem genitive, even though it alternates with other gen. sg. ending (viz. *-osị̯o*), is supported to stem from a common trunk by its presence in Venetic and Messapic.
  - Passive ending 1pl. *-mor*, 3.pl. *-ntro*.
  - The so-called "-ā- subjunctives", which have been reinterpreted (and thus their origin obscured) later in the different dialects.
  - i-stemisation of the suffix *-stħo-* (Weiss 2017).
- Shared lexemes, of which those unique to both are few. The most significant are:
  - The prepositions with ablatival rather than directive function (Lat. *dē*, OIr. *di-* 'from', Lat. *in-de* 'thence', OIr. *de* 'from him').
  - *trāns* (cf. Lat. *trans* 'across', MW. *tra* 'beyond').
  - Shared lexicon with cultural concepts, for example:
    - *tersā* 'earth' (etymologically 'dry land', from *ters-* 'dry'), cf. Lat. *terra*, Osc. *teerúm*, OIr. *tír*, W *tir*;
    - *sodị̯om* 'seat, throne' (from *sed-* 'sit'), in Lat. *solium* 'throne', OIr. *suide* 'seat'.
  - Substrate words unique to both, for example:
    - *bodị̯o-* 'yellow', cf. Lat. *badius*, OIr. *buide*;
    - *krbʰ-* 'basket', cf. Lat. *corbis* 'basket', OIr. *corb* < Cel. *karbanto* 'chariot', with a semantic evolution similar to non-IE

> **kistā-* 'basket' in Gk. *kístē* → Lat. *cista*, 'basket', and also
> *cissium* 'a kind of car with two wheels', probably from Gaulish,
> in turn from Cel. **kistā*.

- Shared phonological features (although parallel developments cannot
  be discarded):
  - NWIE **CR̥ʔC* → Ita.-Cel. **CRāC*.
  - Distant assimilation **p...kʷ-* → **kʷ...kʷ-*.

The dozens of shared words between Latin and Celtic come usually from
late loans—similar to the shared vocabulary between Germanic and Baltic, and
Germanic and Slavic (see below)—dating to the time of the Roman expansion.
The best description of the group is thus probably still that of a "drowned"
subgroup, sharing "a rather short period of common development followed by
a long period of divergence" (Cowgill 1970). The early estimates for Proto-
Italic or Proto-Italo-Venetic and Proto-Celtic languages (see below) put this
community most likely in the centuries around the turn of the 3rd–2nd
millennium BC.

4.5.3. Northern European

Based on shared vocabulary of Indo-European and non-Indo-European
origin (and on the lack of closer genetic relationship within the NWIE group),
it has been proposed that Germanic and Balto-Slavic may have shared a
common Indo-European substratum with strong non-Indo-European influence
(Kortlandt 2016).

This hypothetic Indo-European language without known descendants,
based on the phonetic and morphological similarities, may be identified with a
North-West Indo-European branch influencing both Pre-Germanic and Pre-
Balto-Slavic rather early, before the early satemisation trend in Balto-Slavic,
because no traces of the long proposed *Centum IE substrate*[xx] of Balto-Slavic

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[xx] The proposal of a hypothetic Tememalic substratum language (Holzer 1989) as a
North-West Indo-European (i.e. centum) dialect absorbed by Balto-Slavic on its
expansion to the west (a dialect of Indo-Slavonic, then), in spite of its defence by

can be found (Hyllested 2007). A Northern European language could thus be tentatively identified with the language of early vangard Yamna migrants from Hungary who settled into the Saxony-Anhalt region, by then dominated by the Corded Ware culture.

These pioneer settlers of the Northern European Lowlands were later replaced by East Bell Beakers migrating northwards, as the most likely source of both, a Pre-Germanic (in Scandinavia) and a Pre-Balto-Slavic community (in central-east Europe). Given the close contacts through the Northern Plains during the Neolithic, and the Pan-European influence of Únětice in the north during its classic period—apart from close contacts of cultures around the Baltic during the Bronze Age—it could be proposed that it was a third, neighbouring language from Únětice which influenced both.

Whichever the actual nature of the Northern European substratum, it could have been the source of:

- Common lexica of Indo-European origin found in Germanic and Baltic, and to some extent in Slavic, limited to social phenomena, and especially to technical terms for wooden tools and utensils, as described by Stang (1972). His 68 compiled isoglosses were reduced to 25 by Nepokupnij (2000) [xxi]. Well-known examples of Germanic–Balto-Slavic correspondances include (Dini 2018):
  - Lith. *alùs* 'beer', Ltv. *alus* ~ OCS *olŭ*, ~ OIce. *ol* 'beer', Engl. *ale*.
  - Lith. *draũgas* 'friend', Ltv. *draugs* ~ OCS *drugŭ* ~ Goth. *ga-draúhts* 'soldier', OIce. *drótt* 'army'.

Kortlandt (Kortlandt 2018), is not tenable in light of the thorough review and dismissal by Matasović (2013) of all the proposed Temem{atic} etymologies.

[xxi] More recently Kroonen (2013) listed ca. 220 broadly described 'Northern European isoglosses' (see above *§3.2.7. Statistics of lexical isoglosses*). Because of the lack of genetic relationship between Germanic and Balto-Slavic, the approximately 60 true shared stems between them—close to the number shared between Germanic and Celtic, and between Germanic and Italic—must be interpreted then generally (like the West Indo-European isoglosses) as ancient, North-West Indo-European stems which have only survived in these two specific branches.

- o Lith. *kliẽpas* 'loaf of bread', Ltv. *klaips* ~ OCS *chlěbŭ* ~ Goth. *hlaifs*, OIce. *hleifr*,

- o Lith. *rugys* 'rye' ~ Sl.: Russ. *rožĭ* ~ OHG *roggo*. Compare here also Iranian Pamir (e.g. Shughni *royz* 'ear of rye') and dubious Thracian *bríza* 'emmer-wheat, rye'.

- o Lith. *valdýti*, Ltv. *valdīt* ~ OCS *vladǫ / vlasti* ~ Goth. *waldan* 'rule a household'; particular is the extension of root **uel-*, cf. Lat. *valeō* and other IE cognates.

- Northern European subsitution of **-bʰ-* endings for **-m-*. Due to their consistent vocalism, it is likely that the original NWIE endings in **-bʰ-* (see above *§3.2.2. North-West Indo-European evolution*) underwent a reinterpretation to **-m-* in Germanic and Balto-Slavic.

  - o It is usually interpreted[xxii] as a substitution based on the adverbial suffix in **-m-* (cf. Lat. *ill-im* 'from there'; HLuw. abl-instr. pron *zin* 'from/with this'), therefore replacing an old adverbial ending (in **-bʰi-*) for another (Lundquist 2018); compare also Lith. *raĩbas/ raĩmas*, 'varied'.

[xxii] Kortlandt (2016) argued that an old PIA dative plural **-mus* must have been replaced by the ablative ending **-bʰos* in Italic, Celtic, and Indo-Iranian (where **-bʰios* may reflect the attachment of **-os* to the instrumental forms in **-bʰi-*). Nevertheless, on one hand there is a general consensus that the original form behind Sla. **-mŭ* and OLith. *-mus* (maybe influenced by Old Prussian) must have come from a dative-ablative plural **-mos* (Olander 2005), cf. PGmc **-maz*, and not from **-mus* as suggested by Georgiev (1966) and Kortlandt (Halla-aho 2006). Similarly, the common instrumental in **-mi-* behind Germanic and Balto-Slavic forms contrasts with the rest of the Late Indo-European domain, which shows **-bʰi-*.

An ending **-mos* (and thus a **-m-/*-bʰ-* variation) has also been argued to be quite old, based on enclitic pronouns Hitt. Dat. Pl. *-š-maš*, Kizzuwatna Luw. *-mmaš < *s-mos*, and Toch. 1ˢᵗ-3ʳᵈ pl. A *-m*, B *-me < *-mos* (Bonmann 2017). However, this is highly controversial, based on the alternative interpretation of the enclitic pronoun origin as **-sm-os* (Melchert 2018). On the other hand, we can reconstruct with a great degree of certainty an Indo-Anatolian adverbial ending **-bʰi-* (most likely at the origin of the common LPIE ending), as found e.g. in Hitt. *kuwāpi* 'where, when', *kuwāpi-kki*, 'somewhere, sometime' (*<*kʷo-bʰi-*), as well as in **χn̥tbʰí*, 'on both sides, around', from **χent-*, 'face, front' (Jasanoff 1976), found widespread in all Late PIE dialects.

- o However, it seems likely that this change of an already grammaticalised case ending in two different dialects would have been helped by certain regional features. Northern European, as the source of this common trait, could have undergone the change *-b^h- → *-m- due to a simple sporadic phonetic change, similar to the commonly assumed for Mongolian or Tungusic *b- → *m (Street 1983). This change may be also supported by:
  - ▪ a phonetic substrate (assuming e.g. an underlying nonobstruent stop that alternated with other nasal nonobstruents);
  - ▪ the influence of a substrate language with similar oblique cases;
  - ▪ or both.
- o Uralic languages (from Early Proto-Uralic to West Uralic dialects) are known for their lack of voiced and aspirated bilabial and velar stops, which would compel their speakers to adopt *-b^h- as a different but similar (i.e. bilabial) phoneme; and Uralic oblique cases and most dialectally innovated paradigms were usually made in nasals (cf. LPU acc. *-m, gen. *-n, loc. *-nV, dat.-lat. in *-n or *-$ń$). All this could suggest that Northern European was heavily influenced initially by Uralic or a closely related language. Interesting in this respect may also be the example of Livonian dative in *-n*, only partially stemming from the Uralic genitive in *-n, and which has strong links to the Latvian dative in *-m- (Seržant 2015).

- Generalisation of mediopassive endings in *-i and specialisation of the mediopassive system, in contrast with the the original alternation of endings in *-i (middle voice) and *-r (impersonal–passive), the latter surviving in frozen remains possibly up to Proto-Slavic, e.g. in the suffix *-žĭdo* 'each, every, everyone' (cf. Russ. *káždyj*, Pol. *kazdy*), which seems to reflect an archaic impersonal / middle-passive ending from PBSl. *-$g^h ido$-r (Majer 2012). Supporting this adoption of a

substrate *proto-middle*, later diverging in both branches, it has been suggested that *n*-infix athematic intransitive change-of-state verbs shared by Germanic and Balto-Slavic developed from the proto-middle through the 3sg. ending **-e* (Watkins 1969; Jasanoff 1978; Darden 1996, 2018).

- Witness to this intermediate substrate may also be other typological features common to Germanic, Balto-Slavic, Uralic, and Northern Eurasian languages (Klesment et al. 2003), although many are constrained to Balto-Slavic and Uralic, which developed in neighbouring territories.

- The bear taboo seems to affect Indo-European languages with a close relationship with Uralic peoples and culture, making them replace the inherited **ŕ̥tkos* 'bear' with epithets: so e.g. Germanic **beran-* 'the brown one' (cf. Lith. *bė́ras*, Ltv. *bērs* 'brown'); Slavic *medv-ĕdĭ* 'honey-eater', which has a parallel in OInd. *madʰv-ád* (but cf. common PIIr. *ŕ̥ĉšas* 'bear', absent in Slavic); and OPru. *clokis*, Lith. *lokỹs*, Ltv. *lākis*, from Proto-Baltic **talk-*, **tlkak-* hence 'trampler, stomper, pounder' (the IE root is conserved in Lith. *irštvà* 'bear-den'). This taboo has a parallell in Finno-Ugric languages: compare PF **karhu*, from **karheda* 'rough, coarse'; PFP from PU **oča* 'dam net, enclosure', possibly by association to the asterism—and mythical origin from—Big Dipper (cf. PF **otava*, Saami *oahci*, *oahtse*, Permian *oš*); in Ob-Ugric languages the bear is the most sacred and the most feared animal, and is called 'the old one of the forest', 'the little idol', 'the holy beast', etc. (Cushing 1977).

- Shared folk tales among Eastern Baltic cultures across the Baltic Sea, and also through East European cultures in the Forest Zone, also point to strong interaction between Germanic, Balto-Slavic, and Finno-Permic populations (Bortolini et al. 2017).

All these innovative traits and cultural similarities could have also been aquired through intense Bronze Age contacts between Palaeo-Germanic peoples from Scandinavia and Pre-Balto-Slavic peoples from Central-East Europe through the Northern European Lowlands and the Baltic Sea, without a need to propose a third, intermediate language. This is also supported by the closer lexical and morphological influence between Germanic and Baltic languages, product of later contacts in the same regions. Interesting in this regard are a certain number of borrowings from late Palaeo-Germanic into Proto-Balto-Finnic and Proto-Slavic (see below *§4.13.2.1. Proto-Germanic loanwords in Slavic and Finnic*).

4.6. Celtic

4.6.1. Celtic evolution

Certain common phonological features from Celtic include:

- Newly arisen sequences of velar + labial glide merged with labiovelars: cf. *$ek\u{u}o$-* → Cel. *ek^wo-* behind Gaul. *epo*-, OIr. *ech* 'horse'.
- Labiovelars:
  - Delabialise in various contexts *K^w* → *K*: before *$i̯$*, before *n*, before *u*.
  - In the other cases, *g^w* → *b*.
  - Shortly after this change, *g^{wh}* becomes *g^w* (see following point).
- No opposition *T* – *T^h*. Probably:
  - Voiced aspirates lost their aspiration: *D^h* → *D*.
  - Later intervocalic voiced obstruents were "lenited", becoming the corresponding voiced fricatives: *D^h* → *$Ḍ$*.
- Important changes are seen with *p* weakened to a voiceless bilabial fricative *$φ$*:
  - *$φ$* → *x* before *s* and *t*; *$φ$* → *$β$* before liquids.
  - After *s*, it survives as an allophone (maybe *b*).

- o In all other contexts $*\varphi \rightarrow **h \rightarrow *\emptyset$. At this stage, preceding liquids geminated: $*RH \rightarrow *RR$.
- Merge of $*k\underset{\circ}{u} \rightarrow *k^w$.
- Dental + velar sequences are metathesised: e.g. $*d^hg^hom- \rightarrow *gdon-$.
- Complex developments of clusters of three or more consonants with a sibilant in the middle.
- Resonants resolved into sequences of resonant + vowel, or vowel + resonants, usually $*C\underset{\circ}{R}C \rightarrow *CaRC$, but e.g. $*Ri$ before non-continuants.
- Clusters of labial segment + $*n$ showed complex developments.
- Few changes to vocalism, including reduction of long vowels to three, $*\bar{a}$, $*\bar{\imath}$, $*\bar{u}$ (e.g. $*o \rightarrow *\bar{u}$). Similar to Italic or Greek, Celtic keeps the distinction between short $*a$ and $*o$.

Important morphological developments include:

- Generalisation of stem $*so-$ for the demonstrative pronoun.
- Aorist and perfect merge into a single preterite category.
- Passive of preterite formed from a separate stem, based on verbal adjctive in $*-to-$ (used originally in the copula as a periphrastic passive similar to Lat. *factus est* 'was made').
- Present participle and infinitives lost.
- Different augments, widespread in $*ro- < *pro-$, and $*no-$.
- Rise of present stem classes through the loss of various intervocalic consonants belonging to either the root or the suffix.

The first references to Celtic peoples are found in connection with the Greek settlement in Massalia by Hekataios of Milet (indirectly attested in the *Ora maritima* of Festus Rufus Avienus in the 4th century). Celts are also described later in the works of Herodotus (5th c. BC), Aristotle (4th c. BC), Polybios (2nd c. BC), Poseidonius (1st c. BC) and Caesar's *De bello Gallico* (1st c. BC).

The first Celtic inscriptions are ca. 6th–1st c. BC in Lugano alphabet in Lepontic, a *p*-Celtic dialect (either early Gaulish or an independent Celtic branch); Gaulish, written in the Greek alphabet in Southern France from the 3rd c. BC, but also Cisalpine Gaulish in the Piedmont, in a variant of the North Etruscan alphabet, dated to ca. 1st c. BC; and Celtiberian in the Celtiberian variant of the north-eastern Iberian script in the 2nd-1st c. BC (Vath 2017).

The three broadly described Celtic groups with different SVO syntax allow us to infer an older emergence of a Common Celtic language probably in the centuries around the turn of the 2nd–1st millennium BC. The expansion of Hallstatt and La Tène have been traditionally associated with the expansion of Celtic peoples.

4.6.2. Proto-Celtic–Early Balto-Finnic contacts

Proof of Early Balto-Finnic (EBF) adstrate in Proto-Celtic include certain terms concentrated in the field of hyonyms, i.e. words designating pigs and boars (Hyllested 2016):

- Cel. **brokko* 'badger', also in Gmc. **brakka-* '(scent) hound, dog used for hunting', could be traced to EBF **mäkrä* 'badger', with Cel. ***br-** coming from an older **mr-* and stress shift with vowel loss in the first sillable. The word may be ultimately of Altaic origin (and thus connected to the contacts of the Seima-Turbino network), given the more recent similar loans into Russian or Hungarian.

- Cel. **lub-ia-* (cf. OIr. f. *luib* 'herb, plant'), also Gmc. **lubi̯a-* n. 'herb, potion' (cf. Goth. *lubja-leisei* 'witchcraft', ON *lyf* 'medicine, healing herb', OE *lyb* 'medicine, drug, potion'). A concept associated with magic, their similarity is often interpreted as a loan from one language to the other. However, they may have been adopted from Uralic **luppo*, cf. Fi. *luppo* 'lichen'.

- Cel. **mokku-* 'swine' (cf. OIr. *mucc*, W *moch*, Bret *moc'h*, Gaul. *Mocccus*, the name of a pig divinity) < EBF **emä* 'womb; mother (also of animal) + suffix **-kko*, cf. Finn. *emokki*, Est. *emak*, Votic *emakko*,

etc. Instead of being a NWIE loan or later wanderword, Kroonen proposes that MLG *mocke* f. 'breeding sow' and MLG MDu. *mocke* f. 'sow' are later loanwords directly from Gaulish, since they are confined to the Franconian part of the Germanic area (Kroonen 2013).

- Cel. **sukko-* 'sow' (cf. W *hwch*, OBret. *hoch*, Corn. *hoch*, OIr. *socc-*) looks similar to the common Late PIE hyonym **suH-s*, but the reconstruction of a laryngeal for Proto-Celtic is not possible, and the West Germanic forms in *-g-* come not from an older **k*, but from a regular velar development (*Verschärfung*) of hiatus or *-u̯-* between two high vowels if at least one of them is *u* (Kroonen 2013). Lat. *sūcula* comes from diminutive ending *-cula*. Therefore, NWIE **seuk-* did not exist. On the other hand, Ltv. *cūka*, Lith. dial. *čiūkà* 'pig' may point to a common origin in EBF **či/uka*, cf. Kar. *čugu*, Finn. *sika* (compare with N. Saami dial. *sohki*, Inari Saami *šahe*). Supporting this, Latvian compound *mežacūka* 'wild boar' (lit. 'forest pig') has the same etymological source as Finn. *metsäsika* 'badger' (*metsä* 'forest' is in turn a borrowing from Baltic **medi̯a-*).

- Cel. **turko* 'wild boar' (W. *twrch*, OBret. *torch*, OIr. *torc*) < EBF **tora* 'tusk of a wild boar' + denominal suffix **-kko*, cf. Kar. *torakko*, *torikko* 'tusk of a wild boar'. The root is also found e.g. in Finn. *tora-* 'struggle, fight, battle', N. Saami *doarro-*.

These direct contacts between Early Balto-Finnic with Proto-Celtic must come then most likely from direct contacts with the Tumulus culture (ca. 1600-1200 BC) and the succeeding Urnfield culture (ca. 1300-750 BC) with cultures from east Europe. The importance of pigs in the Baltic during the Iron Age is attested by Tacitus in his ethnographic work *Germania*, from around AD 98, in a commentary on the *Aestii*, a Northeast European tribe:

They worship the mother of the gods: as an emblem of that superstition they wear the figures of wild boars: this boar takes the place of arms or of any

human protection, and guarantees to the votary of the goddess a mind at rest even in the midst of foes. (Transl. Hutton 1914).

4.6.3. Schleicher's fable in Proto-Celtic

ou̯is ek^{w}ūs-k^{w}e

ou̯is i̯āi ulanā ne est	*ek^{w}ūns dorke;*
som trummom u̯egnom duk̯ontam,	*som magi̯os baskim,*
som gdoni̯om rinnom berantam.	*ou̯is ek^{w}obos sek^{w}et:*
"kridi̯os agetor mu,	*u̯ēdontei u̯irom ek^{w}ūns rēdontam."*
ek^{w}ūs sek^{w}ont: "roklinu, ou̯i!	*kridi̯os agetor nos u̯ēdontbos:*
u̯iros, tigernos, ou̯i̯om ulanām	*su̯ebei tepesmim linnām k^{w}rinouti.*
ou̯i̯om-k^{w}e u̯lānom ne esti."	*i̯om sosim klust ou̯is magosam tek^{w}t.*

4.7. Italic

4.7.1. Italic evolution

Important sound changes from North-West Indo-European to Proto-Italic (PI) include (Meiser 2017):

- Spirantisation of voiced aspirates (with voiced fricatives as allophones medially): $*b^h \to *\varphi$ ($*\beta$); $*d^h \to *\vartheta$ ($*\eth$); $*g^h \to *x$ ($*\gamma$); $*g^{wh} \to *x^w$ ($*\gamma^w$).
- Merger of the outcome of word-initial $*g^{wh}$, $*b^h$, $*d^h \to *f$.
- Labiovelars lose their labialisation before consonants.
- Merge of $*ku̯ \to *k^w$.
- Vocalisation of syllabic liquids $*r̥$, $*l̥$, to $*or(/ur)$, $*ol(/ur)$ before consonant, and $*ar$, $*al$ before vowel. No single vowel can be reconstructed for the vocalisation of nasals, hence a schwa is hypothesised: $*m̥$, $*n̥ \to *əm$, $*ən$.
- Lengthening of vowels preceding former spirants.
- Fronting of $*ūi̯$ to $*īi̯$ ("pius-law").

- Lowering of **oṷ* to **aṷ* before vowels ("Thurneyesen-Havet's law; preceding the PIE rounding of **eṷ* to **oṷ*).

- Assimilation of word-internal **gi̯* (and also **di̯?*) to **i̯i̯*.

- Voicing of **-t* in word-final position.

- Evolution of the "intrusive" **s* compounds with assibilation: **tˢt → *-ss-*.

Proto-Italic also had fixed stress on the first syllable of the word.

Morphological changes include (Vine 2017):

- Reduced declension system: the instrumental is lost.

- Archaisms and innovations reshape the pronominal systems.

- Development of suffix "conglomerates" with a prominent concentration of new abstract and adjective formations.

- Reorganisation of the present, aorist, and perfect tense/aspect categories (as well as secondary categories like iterative-causative, stative, and desiderative) into a two-part (mainly) tense-based system, opposing for each verb:
  - an *infectum* or "present system" (with four "conjugation classes" and all forms based on a present stem), including common past indicative suffix **-β-*, future suffix from desiderative **-s-/-so-*, and subjunctive from it with lengthened vowel;
  - to a *perfectum* or "perfect system" (with all forms based on a "perfect stem") reflecting a merger of perfect and aorist.

In Common Italic (post-Proto-Italic period) changes include e.g. the debuccalisation of **x* to **h* (and **γ* to **ɦ*); the loss of certain short vowels in word internal syllables, etc.

Archaic documentation of Latin and Faliscan start in the mid–7th c. BC in common with Etruscan, after the reception and diffusion of Greek alphabets, while Sabellic languages (traditionally labelled Oscan and Umbrian) start around a century later. A regional stabilisation of alphabets occurred only from the 6th c. BC. The existence of two quite distinct sub-branches in the early 1st

millennium BC, Latino-Faliscan and Palaeo-Sabellic, puts a common estimate for Proto-Italic around the mid– to late–2nd millennium BC. If related to Venetic in an ancestral Italo-Venetic trunk, the proto-language would be slightly older, and would place the proto-language *Urheimat* more clearly in Northern Italy.

The Siculian or Sicel language, documented from the end of the 6th c. to the 4th c. BC in central and easern Sicily, is believed to have arrived either around the 13th c. or in the middle of the 11th c. BC (or in both waves) from their ancient settlements in the mainland, driving prior inhabitants (Sicanians and Elymians) to the west of Sicily. While the interpretation of the script is difficult, it seems that it might have been closely related to the Latino-Faliscan, Sabellian, or Ausonian branches, which would place the language into the Italic trunk (Hartmann 2017).

4.7.2. Schleicher's fable in Proto-Italic

<div align="center">

oṷis ekʷoi-kʷe

</div>

oṷis kʷoi̯os ṷlānā ne fuβad	*ekʷons ṷoided;*
istom gʷraṷum ṷektim ṷexentəm,	*istom magnom pondom,*
istom xemonəm fristim ferentəm.	*oṷis ekʷoβos deikst:*
"kord meɣei dolēt,	*ṷirom ekʷons agentəm ṷidéi̯ontei."*
ekʷoi deiksontⁱ: "aṷizdi̯e, oṷis!	*kord nōβei dolēt ṷidéi̯ontfos:*
ṷiros, potis, oṷi̯om ṷlānād	*seβei xʷormām ṷestim fēked.*
oṷi̯om-kʷe ṷlānā ne est."	*estōd aṷizdītos, oṷis agrom fouged.*

4.8. Venetic

Venetic is sometimes classified as closely related to Proto-Italic in a Proto-Italo-Venetic group (Meiser 2017), although documentation (ca. 6th–1st c. BC) is scarce and poorly attested, due to the limitations in the script used. It has also been classified as an Italic (Prósper 2018) or Celtic dialect (Gvozdanovic 2012). Features include (Wallace 2018):

- Deaspiration of voiced aspirated stops: $*b^h \rightarrow *b$, $*d^h \rightarrow *d$, $*g^h \rightarrow *g$.
- Merger of the outcome of word-initial $*b^h$, $*d^h \rightarrow *f$, as in Proto-Italic, and $*g^h \rightarrow *h$.
- In word-initial position, $*g^w \rightarrow *u̯$.
- Bilabial nasal $*m$ merged with $*n$ in word-final position.
- Merge of $*ku̯ \rightarrow *k^w$.
- Syncretism of ablative/instrumental and dative/locative.
- Probably o-stem genitive singular in $*\text{-}i$.
- Ending $*\text{-}n̥t \rightarrow *\text{-}and \rightarrow *\text{-}ann \rightarrow *\text{-}an$.
- Passive forms in $*\text{-}r$.

Given certain common North-West Indo-European lexica (cf. Ven. *teu.ta* 'community, people', Ven. *ho.s.i-* <$*g^hosti$-, 'guest, host'), its common development with Proto-Italic, and pronouns similar to Germanic forms, it is likely a West Indo-European dialect.

4.9. Messapic

4.9.1. Messapic evolution

Messapic has been traditionally classified as connected to "Illyrian", although the very concept of a language behind Illyrian tribe names is not tenable today. The "Messapic language" is better confined to the inscriptions of the Salento peninsula, south of a hypothetical line connecting Brindisi-Taranto, which is where the name of Messapians (*Messāpii*, Μεσσάπιοι) is found in ancient sources. Indigenous inscriptions are attested here since ca. mid–6th c. BC, with a homogeneous linguistic community designated by the traditional name "Iapygian" (Simone 2018).

The prolific use in Messapic documents of European common appellative *teutā* 'people, community', as well as deities connecting the language to Italic, makes it quite likely that it belonged to the North-West Indo-European language expanding with Bell Beakers into the Apennine Peninsula.

Common features include (Simone 2018):

- NWIE *o → Messapic *a*.

- Diphthong *ou, *eu → *ou → Messapic *ao*.

- Multiple palatalisations, such as *Bla(t)ϑes =Blatses/Blatšes < *Blatos*, *Zis < *dēs*.

- Vocalisation of syllabic nasal, cf. *anda < *ṇdo* 'and, as well'.

- Probable deaspiration of voiced aspirates: *b^h → *b, *d^h → *d.

- NWIE *s → Messapic *h*.

- Genitive in *–(i)hi* probably comparable to Italo-Celtic *-ī*-genitive.

4.9.2. Schleicher's fable in Proto-Messapic

The following is a tentative version of the fable in Proto-Messapic, based on the scarce data available, assuming a close similarity with the Italo-Celtic group.

avih ekōh-ke.

avih ̯āi vlanā ne eht	*ekōn vaiðet;*
tam graum vegam vegantəm,	*tam maɣam baram,*
tam gəmanəm ōku berantəm.	*avih ekabah vaoket:*
"kēr agetar moi,	*viram ekōn aɣantəm viðəntei."*
ekōh vaokant^{s}i: "klaodi, avih!	*kēr agetar noh vidəntbah:*
virah, patih, avi̯am vlanām	*sebei garmām vehtim dedōti.*
avi̯am-ke vlānā ne eht^{s}i."	*tad kekluvah, avih aɣram buɣet.*

4.10. Lusitanian

4.10.1. Lusitanian evolution

Lusitanian (Lus.) is the fragmentary language attested (ca. 1st c. BC – AD 2nd c.) from five short inscriptions and "quasi-Lusitanian" texts (short Latin inscriptions with isolated Lusitanian forms) of the Lusitani, which, together with onomastic material and divine names and epithets, place-names, and lexical material, have made scholars proposed a Lusitano-Galician group extended over Central-West and North-West Iberia in Pre-Roman times.

Some common traits include (Prósper 1999; Prósper and Villar 2009; Stifter 2018):

- **e* raised to mid-high *ı* before tautosyllabic nasals.

- At least in final syllables **-ei* → Lus. *ē*.

- Lowering of **o* to **u* in contact with occlusives or labial nasals; **ō* to **ū*, at least in final syllable.

- There is an example of *ou < *eu*, but there are others in *eu*, which separates the language from Italic.

- **u̯* is lost in **-ou̯í/e-*.

- Reduction of long diphthong after *-i̯-*, cf. **-i̯ōi* → *-i̯ē* or maybe **-i̯āi* → *-i̯ē*.

- Voiceless stops become voiced ("lenited") between vowels and after resonants (**t → d*, **k → g*) but this did not attain phonemic status: dialectally restricted to the north, and temporarily to later stages; cf. NWIE **gʷ(e)m-tu-* 'causeway' into the Galaico-Lusitanian divinity **bandu-* (Prósper 2000).

- Probably Lus. *f* (possibly also *b, p*) *< *bʰ*, but *b < *b*; Lus. *Ø < *h < *gʰ*, but *g/Ø < *g*; Lus. *r < *d*, but *d < *dʰ*.

- Reduction of group **ns* (e.g. in accusative plural) → **s*.

- Probable (at least dialectal) trend to the loss of **s* in final position, maybe only when preceded by long vowel or when preconsonantal. Supported by possible aspiration initially and medially.

- Palatalisation of group **-ki̯-* → *š* represented as <S>.

- General output of syllabic **n̥* → *an-*. Loss of nasals before fricatives.

- No merge of **ku̯* and **kʷ*, which sets it apart from West Indo-European languages: **kʷ* → Lus. *p*, **ku̯* → Lus. *qu*; cf. *Iccona <*Ekkʷona*, comparable to Gaul. equine goddess *Epona*. It is unclear how the evolution **eku̯o- → *ekku̯o- → *ekko- → ikko-* (similar to Proto-Greek) affected the whole territory, but it seems that the absortion of *-u̯-* did not reach the northern regions of Callaecia and the Conventus Asturum.

- Assimilatory result of labial + labiovelar $*p...k^w > *k^w...k^w$, cf. *<PVMPI>*.
- Accent not word final (based on vowel reductions).

Morphological features include:

- Maybe thematic gen. sg. in *-o*, as in Celtiberian, although possibly an instrumental.
- Vacillating dative singular:
  o dat. masc. in *-<VI>* (=*-ūi* < *-ōi*);
  o dat. sg. masc. thematic in *-<E>* from stems in *-ịo-* (maybe feminine, see above);
  o dat. sg. fem. in *-<A>*.
  o dat. sg. athematic in *-<I>* or *-<E>*.
- Ablative in *-d* spread outside thematic stems.
- In several instances o-stem adjectives agree with ā-stem nouns.
- Superlative in *-tamo-*.
- Subordinating *iom* or correlative with demonstrative *etom*; *isaiccid* and *puppid* (if < *$*k^w odk^w id$) could be correlatives.
- No loss of final *-i*, at least in endings 3sg. *-ti* and 3pl. *-nti*.
- Conjunctive *indi*.
- Possibly SVO order. Adjectives follow head noun, and potential cases of postpositions.
- Lexicon *porcom* (with initial *p*, different from Proto-Celtic), *taurom*, *oilam* (<*ou̯i-lā*, different from Celtic and Italic).
- Productive adjectival formations in *-k* (as in neighbouring Celtiberian) and *-ịo/ā-*.

The earliest expansion of a Lusitano-Galician group, based on the known distribution of onomastic and toponymic materials, may be related to the expansion of statue-menhirs in the north-east (around the Minho and Douro, up to the Tagus River) and anthropomorphic stelae in the south-west (around the Tagus, Guadiana, and Guadalquivir rivers) from the mid–2nd millennium

BC. The lack of typical changes in common with West Indo-European dialects, and its clear origin in the North-West Indo-European community, puts its expansion in parallel with that of Italo-Celtic, hence probably in the late 3rd millennium BC.

4.10.2. Schleicher's fable in Proto-Lusitanian

The following is a tentative version of the fable in Proto-Lusitanian, based on the scarce data available, assuming a close similarity with the Italo-Celtic group.

<div align="center">

oʰilā indi ekku̯ūs

</div>

oʰilā i̯āi ne est flānā	*feiðet ekku̯os;*
som fehontəm gurum fehom,	*som maɣom φorom,*
som φerontəm oku xəmonim.	*oʰilā feupet ekku̯oβos:*
"kərdi ahetor mehē,	*fiðintē firom aɣontim ekku̯os."*
feupont ekku̯ūs: "kluði, oʰilā!	*kərdi ahetor nosβē fiðintφos:*
firos, potis, oʰilāis flānād	*pirneuti seβē xʷormom festim.*
indi oʰilāis ne esti flānā."	*klufos estūd, oʰilā φuɣet aɣrom.*

4.11. Pre-Pritenic

Pritenic is the name given to the language of the Picts, which is described as part of a P-Celtic *continuum*, either a dialect or (maybe more likely) a language diverging from the attested Brittonic. Features of Pritenic include:

- Preservation of -*st*-.
- Absence of final i-affection.
- Preservation of Common Celtic *$\bar{a}$, where Brittonic shows $\bar{ǫ}$ (c. 6th century).
- Absence of spirantisation in clusters *-*rd*-, *-*rc*- and *-*rt*-. Maybe *-*ks*- → Cel. *xs → Pri. -*ss*-/-*k*-.
- Absence of nasal assimilation, along with the irregular development of -*t*- in *$caito$-.

- Different evolution of **oi*, **ou*.

- Preservation of **u̯* where Brittonic evolves to *gu̯*.

- Preservation of **mb* (Britt. *mm*) and **nd* (Britt. *nn*).

- (Dubious) preservation of initial **sV-* (which became **hV-* in Brittonic) and possibly **sn-*.

- (Dubious) suffix **-i̯os* → Pri. *-ei*; it disappears in Brittonic.

- Merge of **kʷ* and **ku̯* in Pri. **kon- < *kʷon-*.

Beyond this settled question of its Celtic nature lie the unsolved etymologies of certain place names in the northernmost part of Great Britain, arguably one of the most likely to host some proof of the North-West Indo-European dialect spoken before the expansion of Celtic into the British Isles with La Tène culture.

The following are potential non-Celtic words, taken from the multiple lectures of Guto Rhys, see e.g. Rhys (2015):

- Non-Celtic: *Éboudai*, *Íla*, *Kelniou* (<**kai-lo-*? 'bright'), *Tína*, *Toúaisis*, *Taum*, *Nabárou* (in Ptolemy, probably from **nebʰ-*, and suffix *-ar*), *Bodería*. *Spey* (proposed from ***sku̯ii̯at-*, without hiatus-filling *ð* proper of neo-Brittonic, either), and *Spean* may be the strongest data in favour of a non-Celtic nature of Pre-Pritenic, depending on the interpretation of the names' origin.

- Likely Celtic: *Lossio Veda* (previous *Lóksa* in Ptolemy, with *-xs-* as *-ss-*, where NWIE **-ks-* → Gk. **xs-*), **abor (o-grade of aber)*, *Dekántai* (with preservation of *-nt-*), *Banatía* (in *-a-* as in Goidelic), *Calgacus* (<**kol/kl̥-* + suffix **āk-*, cf. Goidelic *colg-*, Britt. *col(y)-*);

- Likely Brittonic: *U̯epogenos* (in Rome, from **u̯ekʷ-* and **geno-*), *Argentocoxos* (with *-e-*, with *-nt*, with *-xs-*), *Ar(t)cois* (from *art-*, bear, and **koxs-*, and in final *-s-*).

4.12. Germanic

4.12.1. Germanic evolution

Sound changes from an Early Pre-Germanic stage, close to North-West Indo-European, to the Iron Age Proto-Germanic include (Schrijver 2014; Stiles 2017):

- Verner's law[xxiii]: if preceded by an unstressed syllable, $*p \rightarrow *b^h$, $*t \rightarrow *d^h$, $*k \rightarrow *g^h$, $*s \rightarrow *z$; as, $*\underset{.}{u}urt\text{-}ónos \rightarrow *\underset{.}{u}urd^h\text{-}ónoz \rightarrow$ (by following Grimm's law, and $*o \rightarrow *a$) $\rightarrow *\underset{.}{u}urdanaz \rightarrow$ OE *worden* (past participle 'become').

- Accent shift (later than Verner's law): fixation of stress accent on the initial syllable of the word weakened following syllables, with different sound developments and inventories in accented and unaccented syllables.

- Kluge's law: voiced plosives followed by $*n$ turn into double plosives, as $*stub^h\text{-}n\text{-} > *stubb\text{-} \rightarrow$ (by Grimm's law) $*stupp\text{-} \rightarrow$ OE *stoppian* 'to stop'.

- Svarabhakti: $*\underset{.}{r}$, $*\underset{.}{l}$, $*\underset{.}{m}$, $*\underset{.}{n} \rightarrow *ur$, $*ul$, $*um$, $*un$.

- Merge of $*k\underset{.}{u} \rightarrow *k^w$.

- Development of $*t+t$ (*via* $**\text{-}t^st\text{-}$) to $*ss$.

- Germanic consonant shift (Grimm's law) which affected all plosives:
  - Voiceless stops not preceded by an obstruent or *s* become voiceless fricatives (probably via an intermediate stage with aspiration): $*p \rightarrow **p^h \rightarrow *\varphi$, $*t \rightarrow **t^h \rightarrow *\vartheta$, $*k \rightarrow **k^h \rightarrow *x$, $*k^w \rightarrow **k^{wh} \rightarrow *x^w$. Later $*x$ and $*x^w$ were weakened word-initially to $*h$, $*h^w$.

[xxiii] Verner's law and Grimm's law are usually considered together as the paradigmatic consonantal shift of Germanic, with some authors putting one before the other and *vice versa*. In this case, Verner's law has been selected as the first one, due to its potential parallel development with Finno-Samic evolution (see below).

- o Voiced aspirated stops become voiced fricatives (although the reflexes become voiced stops in several positions at the end of Gmc.): *bʰ → *b/*β, *dʰ → *d/*ð, *gʰ → *g/*ɣ, *gʷʰ → *β ~ *ɣʷ.
- o Voiced plain stops become voiceless stops: *b → *p, *d → *t, *g → *k, *gʷ → *kʷ.
    - Also, *bb → *pp, *dd → *tt, *gg → *kk.
- Various developments that produced *nn, *rr, *ll, *u̯u̯, and *i̯i̯.
- Vowel merger: Pre-Gmc. *a, *o → Gmc. *a, and Pre-Gmc. *ā, *ō → Gmc. *ō.

labials	dentals	alveolars	palatals	velars
p	t	k		k
pp	tt	kk		kk
b/v	d/ð	g/ɣ		
(bb	dd	gg)		
φ	ϑ	x		xʷ
	s, z			
	ss			
m (mm)	n, nn			
	l, ll			
	r, rr			
u̯u̯			i̯i̯	

This table represents the Proto-Germanic stage. The third row consists of pairs of sounds representing a single phoneme, where the second member of each pair occurs mainly after vowels, the first member in all other positions. All Germanic languages possessed long voiced plosives, but it is unclear to what extent they were widespread in Proto-Germanic (they are between parenthesis).

- Vowel system reduced and long vowel system extended:

short				long		
i		u		ī		ū
e		a		ē		ō
				ǣ	ā	

Important morphological features include (Harðarson 2017):

- Conservation of ablaut system of the strong verb: the present tense continues the thematic (non-reduplicated) present stem; the past tense or preterite of the Germanic strong verb preserves basic structures of the perfect.

- Generalisation of stem *to- for the demonstrative pronoun.

- Weakening and partial loss of non-initial and especially final syllables.

- Incipient convergence of nominal classes (Thöny 2013), some even disappearing before the transmission of Gothic.

- Heavy reduction of the categories of verbal inflection.

- Emergence of a weak preterite with dental suffixes.

- Widespread augment in *ga- < *ko-.

The usual estimate of the *Ausgliederung* of Common Germanic is ca. 500 BC, and it is traditionally linked to the expansion of Jastorf, although this culture was probably not the only vector of expansion of Germanic languages, which have to put in relation to the evolution of the Nordic Bronze Age and related cultures. The oldest epigraphic mention of Germanic peoples come probably from the so-called Protogenes inscription from Olbia in the late 3rd c. BC, on the northern coast of the Black Sea, which refers to the East Germanic tribe of the Σκίροι ('the pure ones, purebreds'; cf. Goth. *skeirs* 'clear' etc.).

Pre-Christian records include the helmet B of Ženjak-Negau (Slovenia), probably belonging to a Germanic soldier involved in combat in pre-Roman northern Italy, dated to ca. 3rd or 2nd c. BC. Its inscription in north Italic (Venetic) letters can be read as *Harigasti Teiwē* (cf. Gmc. *xari̯a-* 'army' < *kori̯o-, *gasti-* 'stranger, guest' < *gʰosti-, *teiwa-* 'god' < *dei̯u̯ó-). Other early anthroponyms can be read in a set of Boiian silver tetradrachms coined in the Bratislava region in the mid–1st millennium BC, such as *Fariarix* (Gmc. *φari̯an-* 'ferryman', *rīk-* 'ruler'), a Germanic name of a Celtic sovereign (Nedoma 2017).

The long-term development of Pre-Germanic in close contact with Finno-Samic (see below *§4.18.4.1. Palaeo-Germanic borrowings*) allows us to propose a southern Scandinavian homeland (centered on Jutland), probably since the European Early Bronze Age, around the late 3rd or early 2nd millennium BC.

4.12.2. Finno-Samic influence on Pre-Germanic

Finno-Samic and Pre-Germanic evolution are closely intertwined, in a relationship that has been simplistically described as the adoption of Germanic by Balto-Finnic speakers. Sound changes influenced by Finno-Samic contacts include (Koivulehto and Vennemann 1996; Wiik 1997; Kallio 2001; Schrijver 2014) [xxiv]:

- Development of extensive set of long (geminate) consonants, where Pre-Germanic had none, and Finno-Samic already had a few.

- Development of initial accent from an original mobile one, comparable to the Uralic system (seen also generally in IE loanwords in Uralic).

- Development of *x, later *h (Proto-Balto-Finnic developed *h).

- Fricatives *ɣ and *ð occur (as allophones) only after vowels.

- Verner's law + Grimm's law eventually turned all voiceless obstruents into voiced obstruents, i.e. Pre-Gmc. *p, *t, *k, *s, into Gmc. *b/*v, *d/*ð, *g/*ɣ, *z. Both, Verner's law and probably Grimm's law are paralleled by rhythmic gradation in Finno-Samic to Balto-Finnic (see below *§4.18. West Uralic*).

- Vowel system remains largely unchanged, similar to Proto-Baltic, and fully compatible with Proto-Balto-Finnic.

[xxiv] Kallio's (2001) proposal of a common, non-Indo-European, non-Uralic substrate to justify the phonetic convergence of both Germanic and Finno-Samic is correctly described by Schrijver (2014) as an *ad hoc* solution which needs more assumptions than one of them influencing the other. In chronological terms, based on the described dialectal evolution, this means necessarily Finno-Samic influencing Germanic.

According to Schrijver (2014), because of the rare occurrence of stress-related consonant changes in European languages, and geographical and chronological proximity to the Finno-Samic evolution into Proto-Balto-Finnic, it is difficult to argue that these changes were not related. The most reasonable explanation is that Verner's law is a copy of rhythmic gradation, hence Germanic is North-West Indo-European spoken with a Balto-Finnic accent, thus Proto-Balto-Finnic (or related Para-Balto-Finnic dialect) speakers shifted to Germanic in Scandinavia. The comparison of Grimm's law with Proto-Balto-Finnic influence may further indicate that the phonetic transition of North-West Indo-European to Proto-Germanic was almost entirely directed by Balto-Finnic.

The borrowing of lexical items from hunter-gatherers into Germanic refers to the potential adoption of Proto-Germanic **selxaz* 'seal' (cf. ON *selr*, OE *seolh*, OHG *selah*) as well as Early Balto-Finnic **šülkeš* 'seal' (Finnish *hylje*, Estonian *hüljes*) from the marine-oriented Sub-Neolithic Pitted Ware culture (Iversen and Kroonen 2017), whose people have been labelled "hard-core sealers" and "Inuit of the Baltic" due to the marked predominance of seal in their diet. This adoption happened probably via an early Uralic borrowing with Finno-Permic-like vocalism ***šëlkëš*, then into Pre-Germanic ***selkos*. This is yet another proof of the cohabitation of both groups close to Southern Scandinavia, probably represented first by the (Para-?)Balto-Finnic-speaking Battle-Axe culture, and later by the expansive Pre-Germanic-speaking Dagger Period of the Nordic Late Neolithic.

4.12.3. Samic influence on Common Germanic

Potential influences of common Proto-Samic developments on early Germanic dialects include the following (simplified) vocalic changes (Schrijver 2014):

- North Germanic:
    - Stressed **ǣ → *ā*; **ā, *ō → *ō*;
    - Unstressed **ǣ → *ē, *ǣ*; **ā → *ō, *ɔ*; **ō → *ō, *ɔ*.

- West Germanic:
  - Stressed *$\bar{æ}$ → *$\bar{a}$; *$\bar{a}$, *$\bar{o}$ → *$\bar{o}$;
  - Unstressed *$\bar{æ}$ → *$\bar{e}$, *$\bar{æ}$; *$\bar{a}$ → *$\bar{æ}$, *$\bar{o}$, *$\bar{ɔ}$; *$\bar{o}$ → *$\bar{o}$, *$\bar{ɔ}$.
- East Germanic:
  - Stressed *$\bar{æ}$ → *$\bar{e}$; *$\bar{a}$, *$\bar{o}$ → *$\bar{o}$;
  - Unstressed *$\bar{æ}$ → *$\bar{e}$, *$a/\_R\#$; *$\bar{a}$ → *$a/\_R\#$, *$\bar{o}$; *$\bar{o}$ → *$\bar{o}$, *$o/\_R\#$.

Because most of these developments of unstressed long vowels cannot have occurred in the parent language, they belong to the separate branches (see below *§4.18.4.1. Palaeo-Germanic borrowings* for a potential intermediate merging of Pre-Gmc. *$\bar{a}$, *$\bar{o}$ → **$\bar{a}$ → Gmc. *$\bar{o}$). Language contact could be behind North and West Germanic similarities, because their systems are more complex and asymmetrical than the Proto-Germanic ones, and they were pulled into the same, unexpected direction, but from sound laws that were rather different—hence compelled by independent (but similar) influences.

Because Germanic influence cannot account chronologically or typologically for some Proto-Samic changes (see below *§4.18.3. Samic*), close contacts with an intermediate, Proto-Samic-like substratum language in Scandinavia may be proposed, probably around the Baltic Sea, before the Balto-Finnic expansion (Schrijver 2014).

4.12.4. Contacts with Celtic and Iranian

Close Proto-Germanic contacts with Proto-Celtic and Common Celtic languages are obvious from reconstructed loanwords, which reveal the social and political influence of expanding Celts on Palaeo-Germanic speakers. Examples include (Kroonen 2013):

- Gmc. *$r\bar{\imath}ks$ 'ruler' < Cel. *$r\bar{\imath}gs$ 'king', from West IE *$r\bar{e}gs$ (see above *§4.5.1.2. West Indo-European lexicon*).
- Gmc. *$ambaxtaz$ 'servant' < Cel. *$ambaxtos$ 'servant', from *$amb^hi\text{-}agtos$, also borrowed into Lat. *ambactus*.
- Gmc. *$\underline{u}alxaz$ 'foreigner; Celt', from a Celtic tribal name *Volcae*.

- Gmc. *bruni̯ōn-* 'mailshirt', probably from a pre-form of OIr. *bruinne* 'breast'.

- Gmc. *gīslaz* 'hostage', from a pre-form of OIr. *gíall*, with *gell* n. 'pledge, surety'.

- Gmc. *īsarna* 'iron', from Proto-Celtic *isarno / īsarno* 'iron'.

- Gmc. *lēki̯a-* 'doctor, leech' < Cel. *lēgio*, cf. OIr. *liaig* 'doctor', before the great sound shifts.

- Gmc. *lauda-* 'lead' < Cel. *φloud-io*, cf. Mir. *lúaide* 'lead'.

- Gmc. *Rīnaz* 'Rhein' < Gaul. *Rēnos* < Cel. *Reinos*, from *rei-* 'move, flow, run'.

- Gmc. *tuna-* 'fenced area' < Cel. *dūno-*, cf. OIr. *dún* 'fort, rampart', hence a Pre-Germanic loan.

Here belong also the loanwords Gmc. *gaiza-* 'spear, tip' → Cel. *gaiso-*, cf. OIr. *gae*, MW *gwaew*, due to the a-vocalism (Matasović 2009); and Gmc. *xabanō-* ~ OIr. *cúan* 'port, harbour' < *kap-on-*, probably spread from one language to the other at a later stage (Kroonen 2013).

From East Iranian, probably through steppe-related contacts, words were adopted into late Proto-Germanic. Examples include:

- Gmc. *keppǭ, skēpą* 'sheep' ~ Pers. *čapiš* 'yearling kid',

- Gmc. *kurtilaz* 'tunic' ~ Ossetian *kwəræt* 'shirt'.

- Gmc. *kutą* 'cottage'~ Pers- *kad* 'house'

- Gmc. *paidō* 'cloak' ~ Thrac. *baítē* 'coat made of pelt'.

- Gmc. *paϑaz* 'path' ~ Av. *pantā*, gen. *pathō*.

- Gmc. *u̯urstu̯a* 'work' ~ Av. *vərəštuua*.

4.12.5. Schleicher's fable in Proto-Germanic

Pre-Proto-Germanic

oṷiz ekʷʰōz-kʷʰe

oṷiz tʰāzi̯āz ṷulnā ne ṷose   *ekʷʰonz torkʰe;*

tʰom kʷurum ṷognom ṷegondʰum,   *tʰom mekelom borom,*

tʰom gumonum kʰrotʰom berondʰum. *oṷis ekʷʰomoz sogʷʰe:*

"kʰērtōn angui̯edai mez,   *ṷirom ekʷʰonz akondʰum ṷitundʰei."*

ekʷʰōz sogʷʰedʰundʰ: "kʰlou, oṷi! *kʰērtōn angui̯edai unsez ṷitundʰmos:*

ṷiros, pʰotʰis, oṷi̯ōm ṷulnām   *sez γʷormom ṷostim toṷi̯edi.*

jo-kʷʰe oṷi̯ōm ṷulnā ne esti."   *tʰod kʰlutos oṷis akrom pʰloukʰe.*

Proto-Germanic

aṷiz exṷōz-uxṷ

aṷiz, ϑaizōz ṷullō ne ṷas   *exṷanz saxʷ;*

ϑanǭ kurṷ ṷagną ṷegandṷ,   *ϑanǭ mikilǭ burϑinjǭ,*

ϑanǭ gumanṷ xraϑą berandṷ.   *aṷiz exṷamaz sagdē:*

"hertô angui̯aðai miz   *sexṷandi ṷiran exṷanz akandṷ."*

exṷōz sagdēdun: "hauzī, aṷi!   *hertô angui̯aðai unsiz sexṷandumoz:*

ṷiraz, φraṷi̯ō, aṷi̯ô̜ ṷullǫ   *siz ṷarmą ṷastį taui̯ði.*

i̯axʷ awi̯ô̜ ṷullō ne isti."   *ϑat hauzidaz aṷiz akrą φlaux.*

The Proto-Germanic version is modified from Euler and Badenheuer (2009).

4.13. Balto-Slavic

4.13.1. Balto-Slavic evolution

The traditional Balto-Slavic binary subgrouping is often accepted, although there are fierce opponents even to a common Proto-Balto-Slavic trunk, who propose a more dynamic dialectological model for the languages assigned to this branch, involving internal divergences and requiring a more fine-grained description. A more accurate division of Balto-Slavic subgroups, with bilateral relationships among them, must probably include Proto-West Baltic (PWB), ancestor of Old Prussian; Proto-Slavic (Sla.); and Proto-East Baltic (PEB), ancestor of Lithuanian and Latvian.

Common sound changes to Balto-Slavic languages include (Kim 2018):

- Satemisation trend:
    - Velars become palatovelars, with many exceptions: $*k \rightarrow *k^j$, $*g \rightarrow *g^j$, $*g^h \rightarrow *g^{jh}$.
    - Voiced and voiced aspirated merged as voiced stops: $*k^w \rightarrow *k$, $*g^w \rightarrow *g$, $*g^{wh} \rightarrow *g^h$.
- Voiced and voiced aspirated merge: $*b^h \rightarrow *b$, $*d^h \rightarrow *d$, $*g^h \rightarrow *g$.
- Palatalisation trend (into palatal sibilants, distinct from the palatal affricates in Indo-Iranian): $*k^j \rightarrow *\acute{s}$, $*g^j \rightarrow *\acute{z}$.
- Loss of first *t* in the "intrusive" *s* compounds PIE *-tt- →*-tst- → BSl. *-st-*.
- Late ruKi-rule: Retraction of $*s \rightarrow *\check{s}$ (probably to a palatoalveolar sibilant) after after *r*, *u*, *K*, *i*, affecting Proto-Slavic, but neither PWB nor PEB.
- Word-final *-d* and *-r* are lost.
- Palatalisation and yodisation trends found in BSl. dialects began quite late or after the disintegration of the parent language.
- *o*, *a* → BSl. *a*; *oi*, *ai* → BSl. *ai*; *ou*, *au* → BSl. *au*.

- *ŗ, *ļ, *m̥, *n̥ → BSl. *ir, *il, *im, *in, in most cases. Examples of *uR may have had expressive and/or pejorative value.

Morphological features include (Darden 2018):

- Archaic inflectional system of stem variation in pronouns.
- Merger of relative *i̯o-/i̯a- and *-i-/-e-/-ei- anaphoric pronoun.
- Innovative changes shared with Germanic (see above *§4.5.3. Northern European*).
- Past active participles formed with suffix *-us-.
- Verbs with infinitive/past-tense stems with the suffix *-e-, present tense with suffix *-ī-.
- Present participle in *-(o)m-os/-ā.

Even though Balto-Slavic languages were attested quite late (Old Church Slavonic documents AD 865, and Prussian among Baltic languages AD 1400), their proto-languages are supposed to have been spoken ca. 500 BC – AD 1, which puts a common Balto-Slavic language probably in the centuries around the mid–2nd millennium BC (Kortlandt 2018).

4.13.2. Uralic influence on Balto-Slavic

The recent influence of Finno-Ugric languages on Lithuanian, Latvian, and Russian as a shift from Uralic is indisputable. Proto-Slavic shows a stronger influence than PWB or PEB, probably due to the continued migration of its speakers eastwards into Finno-Ugric territories, before the proto-historic Slavic expansions. However, an older Uralic substratum layer on Balto-Slavic has also been described with detail by Bednarczuk, Meerwein, Strade, Viitso, Wiik, etc., with interference features found in several grammatical subsystems, and on a basic phonological level (Künnap 1997), which suggests that, akin to Germanic—and even more so—a North-West Indo-European-like Pre-Balto-Slavic language was adopted by Finno-Permic speakers and transformed under their influence.

On a phonological level, the following features have been related to Uralic substrate influence, from earliest to latest (see above Indo-Iranian *§3.4.2. Influence from Uralic* for comparison):

- Early satemisation trend.

- Loss of aspiration of voiceless and voiced aspirates.

- Tendency towards palatalisation and yodisation in PEB, Proto-Slavic, and PWB. This trend shows a different output, probably constrained by the specific Uralic dialect and stage: cf. BSl. palatal sibilants *$\acute{S}$* relative to PIIr. palatal affricates *$\acute{C}$* (Kallio 2001).

- ruKi-rule.

- Change *$i \sim e$ attributed to vowel harmony (also *$\breve{\imath} \sim i$, *$\breve{u} \sim o$ in Slavic).

- Change of the vowel and consonant system in Proto-Slavic so that it became fully comparable to that of Finno-Ugric:
  - Trend to loss of opposition of short/long vowels.
  - Simplicity of vocalism (quality of vowels) and not complicated prosody as opposed to the developed consonantism.
  - Correlation of front/back vowels as well as palatal/nonpalatal consonants in Slavic, which led to the symmetry of the phonetic system.

Morphological features related to a Finno-Ugric substrate influence in Balto-Slavic include:

- The high level of maintenance of the inherited complex Indo-European case system. Balto-Slavic and Indo-Iranian share a special position among Indo-European languages regarding their rather conservative nominal case system. It has been argued that languages with more second language speakers lose nominal cases (Bentz et al. 2015). It has also been shown that forces driving grammatical change are different (stronger) than those driving lexical change (Greenhill et al. 2017). These natural human trends would explain the higher simplification of the declension system in other North-West Indo-European dialects and

in Palaeo-Balkan languages, expanded over areas with simpler case systems (Pre-Basque or Afroasiatic may be good examples of potential European substrate languages), compared to the maintenance of the original system by Balto-Slavic speakers into historic times. A case system with a similar number of cases—and a continuous trend to expand them—is found in Proto-Finno-Ugric dialects.

- In languages around the Baltic Sea (PEB, PWB, and dialectal Slavic), likely contact-induced changes through code-switching:
  o Lack of conventional perfect/imperfect opposition.
  o Inflectional preterite (independent of the opposition perfect/imperfect).
  o Trend to the use of present tense instead of inflectional future.
  o Use of 'genitive-partitive' in Baltic and Slavic languages, corresponding to Balto-Finnic.

- In Proto-Slavic:
  o Animate/inanimate gender distinction.
  o Tendency to agglutination resulting in abundance of formants and relational morphemes which caused the lengthening of the word.
  o Nominal conception of sentence: verbal and nominal predicate being little differentiated.
  o Use of locative possessive with the adessive possessor, likely a Late Proto-Slavic feature, in common with Balto-Finnic.
  o Development of declension as opposed to the simplicity of conjugations.
  o Considerable number of participial formations and respective constructions, as well as impersonal expressions, cf. Russ. *nado*, Ukr. *treba*, Pol. *trzeba* '(one) must, (it is) necessary', Lith. *reikia*, Ltv. *vajadzīgs*, etc.
  o Emergence of predicative instrumental construction (best developed in Russian and Polish).

Lexical borrowings are usually from Indo-European to Uralic, but the reverse is probably found in Proto-Slavic, as:

- Sla. *polu̯* 'half' ~ Pre-PF *pale* 'half' (before the lengthening of *-aRe > *-ōRe , cf. Finn. *puoli*, Est. *pool*).

- Sla. *dǫbu̯* 'oak' ~ PF *tammi* (cf. Finn. *tammi*, Est. *tamm*, Liv. *tä͞m*, Mord. *tumo*, Mari *tum*, Udmurt *ti̯-pi̯*, Komi *tu-pu*). The substitution of -*mb*- for -*mm*- is common in languages which lack geminates (Toporov and Trubachev 1962).

The presence of early Slavic loanwords in Middle Proto-Finnic, especially those that already reflect the First Palatalisation (e.g. Finnish *hauki* 'pike' and *hirsi* 'beam), suggests a potential contact dated to AD rather than BC, but probably predating the expansion of East Slavic to the region, which supports some direct contact (i.e. not mediated through Baltic or Germanic) during the Early Roman Iron Age trade routes along the Russian rivers connecting Finnic and Slavic homelands (Kallio 2006).

4.13.2.1. Proto-Germanic loanwords in Slavic and Finnic

Some wanderwords or loanwords, usually from Proto-Germanic into Proto-Balto-Finnic (probably from contacts through the Baltic Sea) and into Proto-Slavic (probably through the northern Lowlands) should probably be dated to the expansion of the Proto-Germanic community in Northern Europe, and bear witness to the closeness of the three communities at the time (Pronk-Tiethoff 2013):

- Gmc. *xansō-* 'band of warriors, cohort' → Sla. *xǫsa* 'robbery, trap' ~ PF *kansa* 'people, nation' (a quite early borrowing in Proto-Finno-Samic, see below).

- Gmc. *arkō-* 'box, chest, ark' → Sla. *orky* 'box' ~ PF *arkku* 'box, chest, coffin'.

- Gmc. *beuda-* 'plate, table' → Sla. *bli̯udo* 'plate, dish' ~ PF *peütä* 'table'.

- Gmc. *dōm(i̯)a- 'judgment, verdict' → Sla. *duma 'advice, thought, opinion' ~ PF *toomijo 'judgment, verdict'.
- Gmc. *katila- 'kettle' → Sla. *kotĭlŭ 'kettle' ~ PF *kattila 'kettle'.
- Gmc. *kaupi̯an- 'to buy, trade' → Sla. *kupiti 'to buy' ~ PF *kauppV-'to trade'.
- Gmc. *kuninga- 'king, ruler' → Sla. *kŭnędžĭ 'prince, ruler' ~ PF *kuningas 'king'.
- Gmc. *laugō- 'bath, lye' → Sla. *lugŭ 'lye, caustic soda' ~ PF *lau(k)ka 'brine, pickle', *lauko(vesi) 'washing (water)'.
- Gmc. *lauka- 'allium, onion' → Sla. *lukŭ 'chive, onion' ~ PF *laukka 'Allium, onion'.
- Gmc. *naba-gaiza- 'auger, drill' → Sla. *nebozězŭ/*nabozězŭ 'wood drill' ~ PF *napakaira 'large drill'.
- Gmc. *nauta- 'cattle' → Sla. *nuta 'cow, cattle' ~ PF *nauta 'cattle'.
- Gmc. *skauta- '(hem of a) skirt, coattail' → Sla. *skutŭ 'hem, clothing covering the legs' ~ PF *kauta 'footlet (of a sock)'.
- Gmc. *u̯īnan- 'wine' → Sla. *vino 'wine' ~ PF *viina 'spirits, liquor'.
- Gmc. *xlaiba- 'loaf, bread' → Sla. *xlěbŭ 'loaf, bread' ~ PF *laipa 'loaf, bread'.
- Gmc. *xleu̯a- 'cover (against the weather)' → Sla. *xlěvŭ 'cattle shed, stable' ~ PF *lëvo 'roof, loft'.

4.13.3. Contacts with Palaeo-Balkan languages

It is often argued that Balto-Slavic shares features with Palaeo-Balkan languages, sometimes even within a broader Graeco-Aryan group, or as an Indo-Slavonic dialect, due to its satemisation trends. Nevertheless, and although there is no statistical work done on shared isoglosses, the shared vocabulary with Balkan languages seem to be in fact lesser than that shared by Balkan languages with Germanic or Italic (or at least not so well researched).

These are some well-known isoglosses shared only between Balto-Slavic and Palaeo-Balkan, which could be dated to contacts between Mierzanowice/Nitra or Trzciniec and Balkan EBA and MBA cultures:

- *ag^{h}l-u-* 'darkness, fog, mist', cf. Arm. *alj* 'darkness, fog, twilight', Gk. *ak^{h}lū̃s*, 'mist, darkness', OPru. *aglo* 'rain'.
- *arti* 'now, near' (probably a locative from *ar-* 'to fit together, join', with the original meaning 'fittingly, suitable, at hand'), cf. Arm. *ard(i)* 'now', Gk. *arti* 'just now', Lith. *artì* 'near'.
- *d^{h}g^{h}ū -* 'fish', cf. BSl. * źu'̣s*, OArm. *jukn*, Gk. *ik^{h}t^{h}ū́s*.
- Gk. *faidrós* 'bright, beaming' ~ Lith. *gaidrùs* 'bright, brilliant'.
- Gk. *gélgis* 'garlic clove', Arm. *gełj-k'* 'gland' ~Russ. *železá* 'gland'.
- *(H)iHlu-* in Gk. *ilū́s* f. 'mud, slime', Gk. (Hes.) *eilú mélan* 'black', OCS *ilŭ* 'bog, mire', Ltv. *īls* 'very dark'.
- Arm. *nnjem* <*ninud^h-i̯e/o* 'sleep', Gk. *nustázō* ~ Lith. *snúdau,* s*nústi*.
- Gk. *phulḗ* 'tribe, people' ~ OCS *bylĭi̯e* 'grass'.
- Gk. *rṓks* <*u̯roħg-* 'grieta, breach' ~ Sla. *razǐ* 'golpe, vez'.

4.13.4. Contacts with Indo-Iranian

Many shared words between Indo-Iranian and Balto-Slavic should probably be dated back to a Late PIE community. Those terms which are clearly borrowed are more likely from Iranian-speaking peoples expanding westward from the steppe, which places Balto-Slavic and the eastern fringe of the NWIE territory.

Some common terms include (Derksen 2008):

- Skr. *áchā* 'towards' ~ OCS *ešte*, Russ. *ešče* 'still'.
- Skt. *ati-réka-* 'remnant' ~ BSl. *otloiko(s)*, cf. OCS *otŭlěkŭ*, Lith. *ãtlaikas*. From root *leik^w-* 'let, leave'.
- Skt. *dakṣiṇá-* 'right', Av. *dašina-* ~ Lith. *dẽšinas*, OCS *desnŭ*, besides different derivatives from the same root in other dialects, cf. Gk. *deksiterós* 'right', Lat. *dexter*, Osc. *destrst*.

- **kʲiē-uó-* into Skt. *śi̯āvá-* 'black-brown, bay, dark', Av. **si̯ava-* 'black (personal name *Siiāuuāspi-* 'black-horsed) ~ **kʲī-uó-* into Lith. *šývas* 'gray-white', OCS *sivŭ* 'gray' (horse colour).

- Skr. *kośa-* 'pail, bucket, vessel' ~ Lith. *kiause* 'saucepan'.

- PIE **kʷr̥snós* 'black', into Skt. *kr̥ṣṇá-* ~ BSl. **kirsnos* cf. OCS *črŭnŭ*, Lith. *kir̃snas*, OPru. *kirsnan*.

- Skr. *mantra-* 'thought, speech, formula', Ltv. *mîkla, mîkle* 'mystery'.

- PIE **moros* 'death', into Skt. *pramará* (RV) ~ BSl. **moros* cf. OCS *morŭ* 'plague', Lith. *mãras*.

- Skr. *níṣṭya-* 'foreign, strange' ~ OCS. *ništĭ* 'poor, miserable'.

- Skr. *paścā* 'afterwards', Lith. *pàskui* 'id' (cf. Lat. *postquam*)

- Skr. *r̥tí-* 'assault, attack' ~ Sla. *ertĭ* <**ertis* , OCS *retĭ* 'strife'.

- Skr. *tavīti* 'is strong, has power'; Russ. *tyjǫ, tyti* 'to get fat' (cf. Lat. *tōmentum*).

- Skr. *tóśate* 'push oneself along, hurry'; YAv. *-tusa-* 'name of a charioteer warrior' ~ Ltv. *taucêt* 'pound in a mortar', OCS *tŭknǫti* 'strike, wound'.

- PIE **tus-sk(t)i̯o-* into Skt. *tucchi̯á-* (RV) 'empty, vain' ~ OCS *tuštu* 'empty' < Sla. **tŭščŭ*, Lith. *tùščias* 'empty', Ltv. *tukšs* 'empty, poor'. Notice the palatalisation in spite of the commonly reconstructed 'non palatovelar' PIE **-sko-* ending.

- Skr. *vāpī-* f. 'pond, body of water'~ Sla. **vapa* f. 'lake'.

- Skr. *valká-* 'bark of tree', YAv. *varəka-*; ~ SCr *vlákno*, Russ. *voloknó* 'fibre'.

- Use of **kʷid* to introduce absolute interrogative sentences: Skr. *kiṃ=ápi* (*kiṃ tatra gacchati?* 'does he go there?') ~ Pol *czy*, Ukr. *chi*.

4.13.5. Schleicher's fable in Proto-Balto-Slavic

Balto-Slavic and PEB versions modified from Kortlandt (2013); Proto-Slavic version modified from Wikipedia (author unknown) [xxv]. Accents and their changes are not represented.

Proto-Balto-Slavic

oṵiš ā eśṵōs

oṵiš ịāi ṵilna ne est	*eśṵons ṵīdē;*
īnun tingun ṵoźun ṵelkontin,	*īnun ṵelīn kroṵun,*
īnun źmōnin burźu neśontin.	*tēr tu oṵiš eśṵomos:*
"bolei mini śēr,	*ṵīrun ṵīdenti eśṵons genontin."*
tren tu eśṵōs: "śludi oṵei!	*bolei īnmos śēr ṵīdenti,*
ṵīros, potiš, iž oṵịun ṵilnās	*subi teplān drōbin kurneuti,*
ā oṵimos ṵilna ne esti."	*to ślušuš oṵiš plānun bēgā.*

Proto-Slavic

ovĭca i konịi

ovĭca (ị)aka bez vĭlny estĭ	*konịę vidętu;*
edinŭ tęžĭkŭ vozŭ tęglŭ,	*edinŭ veliko bermę,*
edinŭ čolvěka nosilŭ bŭrzo.	*ovĭca konịemŭ reče:*
"sĭrdĭce moịe bolitĭ,	*viděti konịę že vozitĭ čolvekŭ."*
konịi rekošę: "slušaịi, ovĭče!	*sĭrdĭca naša bolętĭ kogda vidimŭ,*
mọžŭ, gospodĭ, ovĭčịeịọ vĭlnoịọ	*sebě teplŭ drabŭ tvoritĭ,*
a ovĭca bez vĭlny estĭ."	*to slyšavŭ, ovĭca na pole poběže.*

[xxv] From article on Proto-Slavic <https://en.wikipedia.org/wiki/Proto-Slavic>, author unknown.

Proto-East Baltic

avìs ā źìrgọs

avìs kurí netùri vìlnās	*règē źìrgọs;*
vẹ́ną smàgụs ràtọs vèlkantị,	*vẹ́ną dìdị kràvą,*
vẹ́ną źmṍnị grẹ́t ̣ ai nèsantị.	*avìs sàkē źirgàmus:*
"màni sápā śirdìs	*règinti vírą gènantị źìrgọs."*
źìrgai sàkē: "klàusi avẹ́!	*mùmus sápā śirdìs règinti,*
víras patìs iź avẹ́ṣ vìlnās	*sèvi dàrā śìltą drṍbị,*
ā àvies vìlnās netùri."	*gìrdusi tà avìs bégā ị lauką.*

4.14. Armenian

4.14.1. Armenian evolution

Proto-Armenians apparently formed as an amalgam of the Hurrians (and Urartians), Luvians, and the Mushki, after arriving in its historical territory during the Iron Age. Armenian phonology seems to have been greatly affected by Urartian, which may suggest a period of bilingualism.

The most prominent features of Proto-Armenian include (Fortson 2010; Kim 2018):

- Satemisation trends (different outcomes before front vowels):
  - Velars become palatovelars under certain circumstances: $*k{\rightarrow}*k^j$, $*g{\rightarrow}*g^j$, $*g^h{\rightarrow}*g^{jh}$.
  - Labiovelars become (and merge with) plain velars: $*k^w{\rightarrow}*k$, $*g^w{\rightarrow}*g$, $*g^{wh}{\rightarrow}*g^h$.
- Palatalisation:
  - Palatovelars became fricatives $*k^j{\rightarrow}*s$, $*g^j{\rightarrow}*c$, $*g^{hj}{\rightarrow}*ǰ$.
  - $*g^h{\rightarrow}*ǰ$ before $*e$ or $*i$, e.g. $*g^{wh}ermo{-} \rightarrow$ Arm. *ǰerm* 'heat'.
- Armenian consonant shift (akin to Germanic):
  - Word-internally, $*b^h$ and $*p$ had been weakened to $*u̯$.

- o Plain voiceless stops become voiceless aspirates: $*t \rightarrow *t^h$, $*k \rightarrow *k^h$.
- o Voiced stops become voiceless stops: $*b \rightarrow *p$, $*d \rightarrow *t$, $*g \rightarrow *k$.
- o Voiced aspirates become voiced stops: $*b^h \rightarrow *b$, $*d^h \rightarrow *d$, $*g^h \rightarrow *g$ (the outcome of $*g^h$ is obscured because of the palatalisation rule, see above).

- Syllabic liquids developed an *a* before them. Word-finally, syllabic nasals became *-n*.
- Glides change: $*i̯$ mostly disappeared; $*u̯$ became $*g$ word-initially, via an intermediate $*g^w$; in consonant clusters it shows $*su̯ \rightarrow *k^h$, $*ku̯ \rightarrow *sk$, $*du̯ \rightarrow *rk$, etc.
- $*s \rightarrow *h$, a Graeco-Armenian feature.
- Short vowels mostly remain intact, but *i* and *u* are deleted in non-word-initial unaccented syllables. Long vowels became short and changed.
- At some point in prehistoric Armenian accent is fixed on the penultimate syllable.

Morphological features include:

- Moderate simplification of inherited morphology: Seven cases are distinguished, although no single noun or pronoun distinguishes them all.
- Dual is lost everywhere.
- Grammatical gender is lost.
- The verbal system is similar to the inherited LPIE, but few forms are inherited:
  - o Perfect and imperfect disappeared. Imperfects were transferred over to the aorist category.
  - o Present and aorist stems survived, and they expressed an opposition not only in tense (non-past vs. past), but also in aspect (imperfective vs. perfective). The aorist is for the most part a continuation of the PIE imperfect.

- o A new imperfect was created, as well as present and aorist subjunctive.
- o Mediopassive inflection is distinguished by a stem change.
- o Only one participle is found.

The earliest inscriptions in Old Armenian date from the period of the creation of the Armenian alphabet by Mesrop Maštocʿ ca. AD 406. Even though only one dialect is documented, Armina was a Persian province ca. 500 BC, so other dialects may have existed by the time when Old Armenian was spoken. A Common Armenian language may be thus dated to the centuries around 500 BC.

4.14.2. Hurro-Urartian contacts

The following are examples of likely Hurro-Urartian loans (Greppin and Diakonoff 1991):

- Arm. *agarak* 'field' from Hurrian *awari* 'field'.
- Arm. *ałaxin* 'slave girl' from Hurrian *al(l)a(e)ḫḫenne*.
- Arm. *arciw* 'eagle' from Urartian *Arṣiba*, a proper name with a presumed meaning of 'eagle'.
- Arm. *astem* 'to reveal one's ancestry' from Hurrian *ašti* 'woman, wife'.
- Arm. *caṙ* 'tree' from Urartian *ṣârə* 'garden'.
- Arm. *cov* 'sea' from Urartian *ṣûə* '(inland) sea'.
- Arm. *kut* 'grain' from Hurrian *kade* 'barley' (rejected by *Diakonoff*; closer to Greek *kodomeús* 'barley-roaster').
- Arm. *maxr ~ marx* 'pine' from Hurrian *māḫri* 'fir, juniper'.
- Arm. *pełem* 'dig, excavate' from Urartian *pile* 'canal', Hurrian *pilli* (rejected by Diakonoff).
- Arm. *salor ~ šlor* 'plum' from Hurrian **šall-orə* or Urartian **šaluri* (cf. Akkadian *šallūru* 'plum').
- Arm. *san* 'kettle' from Urartian *sane* 'kettle, pot'.

- Arm. *sur* 'sword', from Urartian *šure* 'sword', Hurrian *šawri* 'weapon, spear' (considered doubtful by Diakonoff).
- Arm. *tarma-ǰur* 'spring water' from Hurrian *tarman(l)i* 'spring'.
- Arm. *ułt* 'camel' from Hurrian *uḷtu* 'camel'.
- Arm. *xarxarel* 'to destroy' from Urartian *harhar-š-* 'to destroy'.
- Arm. *xnjor* 'apple' from Hurrian *ḫinzuri* 'apple' (itself from Akkadian *hašūru*, *šahšūru*).

For a revision of potential Anatolian loanwords, see Martirosyan (2017). For a revision of potential Indo-Iranian cognates and Indo-Aryan or Iranian loanwords, see Martirosyan (2013).

4.14.3. Schleicher's fable in Proto-Armenian

$$aic_{ik^h} \, j\bar{e}_o k^h\text{-}ek^h_e$$

aic$_{ik^h}$ o$_h$ir gelman o$_{hu}$k^h$_i$ go$_{t^hi}$	*jē$_{on}$s haịec^{h}au;*
aid$_{on}$ erk^h$_{um}$ and$_{uran}$ acun$_{t^han}$,	*aid$_{on}$ ber$_{in_{an}}$ mec$_a$,*
aid$_{on}$ mard$_{on}$ šuti beran$_{t^hi}$.	*aic$_{ik^h}$ jēo_ic^h$_o$ asac^h:*
"im$_{on}$ kirt$_i$ kele$_{st^h}$,	*ai$_{n}$r$_{on}$ gitan$_{t^hei}$ jē$_{on}$s hecan$_{t^han}$."*
jē$_o$k^h asac^{h}in: "lú(sr) aic$_{ik^h}$!	*mer$_{on}$ kirt$_i$ kele$_{st}$ gitan$_{t^hei}$,*
ai$_{n}$r$_{ok^h}$, ti$_{ns}$ai$_{n}$r$_{ok^h}$, gelmamb$_i$ aicic^h	*arne$_{t^hi}$ heur zgest$_{un}$ ǰerm$_{on}$,*
aicic^h-ek^h$_e$ o$_{hu}$k^h$_i$ e$_{st^h}$ gelman."	*ais$_{oi}$ lụeal aic$_{ik^h}$ art$_{on}$ p^{h}axeau.*

Notes:

- This tentative version includes a language older than Old Armenian, before the regular loss of final syllables. However, these hypothetic lost syllables are represented as from an unstable period (in subscript), already disappearing—similar to how Modern French retains mute final syllables—because it is unclear how they were exactly before their loss, and how much their loss might have influenced the reconstructed morphology and vocabulary as used in the text. A risky assumption, for example, is that endings in *-*s* after

vowels were generalised in *-k^h, inferred from Arm. *otkʿ* 'feet' ~ Gk. *pódes*; in Arm. 1st pl. verbal *-mkʿ* ~ Lat. *-mus*, Ved. *-mas*; or Arm. *erekʿ* < *trēs < **trei̯es*- 'three'.

- A common word for 'horse' is OArm. *ji* <*g^h*itós*, originally an epithet cognate with Skr. *háya* <*g^h*éi̯os*, probably a poetic word belonging to the 'language of the gods'. Arm. *ēš* < **heki̯os* evolved to mean 'donkey, ass' most likely in Proto-Armenian, possibly due to the relevance of this animal in the Armenoid homeland near the Caucasus.

4.15. Illyrian

While it seems impossible to give Krahe's "Illyrian theory" a shaped linguistic form, if it refers to the indigenous Balkan languages, it could be as a whole connected with one of the early Palaeo-Balkan communities referred to in this text; i.e. Palaeo-Balkan including Albanian, or only Graeco-Armenian, or just Graeco-Thraco-Phrygian dialects.

Strictly speaking, only the 'southeastern Dalmatian onomastic area' offers some concrete chance of containing names that belong to the indigenous language of the actual Illyrian tribes that lived in the south-east Dalmatian region (today's Albania) at least since the 4th century BC in Graeco-Roman historiography. Indo-European etymologies exist for some of the stems repeated (Simone 2018):

- *Gent-* (< *gentis 'lineage, descent') in Lat. *Gentius*, *Gentilla*, Gk. *Genthios*, *Gentheas*, *Genthena*, etc.
- *Teut-* (< *teutā 'people, community') in Lat. *Teuticus*, *Teuta(na)*, Gk. *Teutios*, *Temi-teuta*, *Teutaia*, etc.
- *Trit-* (< *tri-tos 'third') in Lat. *Et-Tritus*, Gk. *Tritú-mallos*.

Traditionally linked with Albanian because of the distribution of its modern speakers, there is no clear data to support this connection, and there are in fact phonological incompatibilities of the few clear onomastic taxa with Pre-Proto-

Albanian. Although this does not rule out a previous, Pre-Albanian phonological stage compatible with the language ancestral to "Illyrian" in a quite early stage, the posited Albanian–Celtic (and potential Albanian–Celtic Germanic) isoglosses (Trumper 2018) and toponymic data (Orel 1998) support a central-east European Albanoid *Urheimat*, while the earliest potential Doric Greek loans of Albanian origin may point to a secondary homeland in the Balkans as early as the 7th century BC (Witczak 2016).

4.16. Albanian

4.16.1. Albanian evolution

Pre-Proto-Albanian (or Early Proto-Albanian) and Proto-Albanian are the oldest reconstructible stages of Albanian, informed by different layers of external loans as well as internal reconstruction.

Features of Pre-Proto-Albanian include (Fortson 2010; de Vaan 2018):

- Voiced aspirates lost their aspiration and fell together with the plain voiced stops: $*b^h \rightarrow *b$, $*d^h \rightarrow *d$, $*g^h \rightarrow *g$.
- Merger of $*k^w \rightarrow *k$; also $*g^w$, $*g^h$, $*g^{wh} \rightarrow *g$.
- $*sp$, $*p \mathbin{/} t\_V \rightarrow *f$.
- Palatalisation trend that must have begun before the merge of velars (i.e. during the initial satemising trend), because there seems to be up to three different outputs in some cases:
  - $*k$, $*s \rightarrow *ts$;
  - $*g$, $*\text{-}g^h\text{-}$, $*dg^h\text{-} \rightarrow *dz$;
  - $*t\underset{\;}{i} \rightarrow *t\check{s}$; the same evolution is seen in $**T^s t$ ($< *Tt$), and in some cases of $*k^w$ before front vowels.
  - $*d\underset{\;}{i}$, $*d^h\underset{\;}{i}$, $g^{(w)(h)}$(before front vowels), $g^h\underset{\;}{u} \rightarrow *d\check{z}$;
  - $*sk \rightarrow *x$.
- Sibilant $*s$ shows different outcomes (some not fully explained): $*\int$, $*z$, $*\underset{\;}{i}$, $*h$, and loss.

- Syllabic liquids developed into liquid plus **i* (**e* under some conditions); nasals become **a*.

- Clusters **Tm*, **sm*, **Pn* → **m*.

- Glides become Ø between vowels; **u̯*, **su̯* → **β*, word-initial **su̯* → **d* (cf. *diell* 'sun', *dirsë* 'sweat').

- Changes in the vowel system: **o* → **a*; **ou* → **au*; **oi* → **ai*.

- More unusual changes appear in the long vowels: **eu*, **ēu* → **ē* or **au*; **ē*, **-as-* / *l,n,r* → **ā*.

Morphological features of Old Albanian include (Matzinger 2018):

- Reduced nominal inflection with five cases; personal pronouns do not have genitive. Most recognisable case-endings disappeared.

- The verbal system, on the contrary, preserves a remarkable amount of inherited material: present and aorist remained (the latter including reduplicated perfects), as well as the subjunctive and optative, and the voice distinction. Innovations include imperfect with endings from imperfect and optative, and other tenses are formed periphrastically, with a complex system of mood.

- Articulated adjectives, bearing an inflected proclitic element going back to **so-*/*to-*.

4.16.2. Schleicher's fable in Early Proto-Albanian

<p align="center">daili̯ā kabalai-dže</p>

daili̯ā tši̯ō laiša ni̯o eset	*kabala pakset;*
tan raunta karra beri̯ana,	*tan madza barra,*
tan maʃkula ʃpei̯toi̯ enbarni̯ana.	*daili̯ā kabalō spolet:*
"zemerā mei̯i lendoi̯et,	*nera sākskanei kabala rinana."*
kabalai spolanti: "degi̯eoi̯ daili̯ā!	*zemerā nosōm lendoi̯et sākskanei,*
nera, u̯itšpata, daili̯āu̯ō laišei	*βetei zi̯arma patika bani̯et,*
daili̯āu̯ō-dže laiša nuka ensti."	*tei ndiéni̯eta daili̯ā arā eikanet.*

Note: Early Proto-Albanian vocabulary relies heavily on Latin loans, and there might be even borrowings from Slavic among the lexicon used. Therefore, the language reflected in the fable cannot predate the Roman Empire, and probably dates to its latest period.

4.17. Central Uralic

Phonetic changes of Finno-Permic to Permic include (Sammallahti 1988):

- Complex vowel evolution, deriving:
  - o At a Pre-Permic stage:
    - ▪ PFP *u, *ü, * ū, *e → Pre-Permic *ĭ.
    - ▪ PFP *o(-a), * e̋ → Pre-Permic *ŭ.
    - ▪ PFP *i, *ī → Pre-Permic *ĭ.
    - ▪ PFP *a → Pre-Permic *u.
    - ▪ PFP *o(-i), *ō → Pre-Permic *u̇.
    - ▪ PFP *e(-i) → Pre-Permic *ü.
    - ▪ PFP *i(-a) → Pre-Permic *i.
    - ▪ PFP *e(-ä) → Pre-Permic *o.
    - ▪ PFP *i(-ä) → Pre-Permic *e.
    - ▪ PFP *ä → Pre-Permic *a.
  - o At a Proto-Permic stage:
    - ▪ A reduced *ü and low round *å are added to the paradigm
    - ▪ *a split into *ĭ, *ȯ, and *a, so that *ĭ occured in monosyllabic nouns, *a in (new or PFP) monosyllabic vocalic stems, *ȯ elsewhere.
    - ▪ Subsequently the non-back, non-front vowels split into back non-round and non-back round vowels: *ȯ → *e̋, *ȯ; *u̇ → *i̇, *u̇.
- Minor changes in the consonant system, including:
- Retention of original qualities in internal positions, except a few irregular cases (cf. *bur 'good' < PFP *pĕra).

- o Word internally:
  - ▪ Single intervocalic plosives disappeared; cf. PFP *śata 'hundred' → PP *śu.
  - ▪ Geminate stops became single; cf. PFP *keččä 'sphere' → PP *kič.
  - ▪ *č changed into *š which was voiced in voiced contexts.
  - ▪ *ś changed to *ć postnasally.
  - ▪ Single intervocalic obstruents became voiced; cf. PFP *pečä(-) 'pine' → PP *požim, PFP *kasi(u̯) 'long' → PP *kuź.
  - ▪ The dental spirant *d was lost or exchanged to *l which was nasalized adjacent to *m; *ð changed into *lj; cf. PFP *kuda- 'weave' → PP *kĭ-; PFP *vuði- 'new' → PP *vĭlj;
  - ▪ Intervocalic *v and *x were lost or changed into *i̯; cf. PFP *kivi 'stone' →PP *kĭ.
  - ▪ Intervocalic *ŋ was lost or retained as a nasal; cf. PFP *i̯äŋi 'ice' → PP *i̯ừ.
  - ▪ Clusters consisting of a nasal and a plosive or an affricate were denasalised into single voiced stops or affricate; cf. PFP *lenti 'pasture' → PP *lud.
  - ▪ Nasals were lost before sibilants; cf. PFP *vanša 'old' > PP *våž.

4.18. West Uralic

Common Finnic and Samic developments include (Sammallahti 1998):

- It continues the development of the PFU copula.
- PFS inessive *-sna/-snä and elative *-sta/-stä continue the lative *-s.
- Local cases in *-na/-nä and *-ta/*-tä, from the PU locative *-na and ablative *-ti.
- PFS essive of the possessive adjective *i̯na/-i̯nä, *i̯ni/-i̯ni, from the PU plural oblique *-i̯, and *-ni as a variant of *-na/*-nä.
- PFS partitive *-ta/-tä.

- PFS illative *-sin.*

- Infinitive in *-tak/-täk*, consisting of PU deverbal suffix *-ta/-tä* + lative *-k.*

- PFS Present participle *-ja/-jä*, perfect participle *-mi-nśi*, from PU *-mi* and diminutive suffix *-nśi.*

- Abessive of deverbal noun formed with PFS suffix *-kka/-kkä.*

- New deverbal and denominal suffixes as combinations of common PFU forms.

- It is a phonetically a highly conservative language, though, with the following consonantal paradigm:

labials	dentals	alveolars	palatals	velars
p	*t*	*č*	*ć*	*k*
pp	*tt*	*čč*	*ćć*	*kk*
	s	*š*	*ś*	
			ðʲ	*χ*
m	*n*		*ń*	*ŋ*
	l		*l'*	
	r			
v			*i̯*	

4.18.1. Balto-Finnic

The changes of Proto-Balto-Finnic from the common West Uralic trunk include:

- Further development of the copula, with reinterpretations leading to the "negative past" (from the former copula-less perfect).

- Development of the partititve case, apparently in close areal contact with Baltic languages (or adopted later by Baltic languages): With intransitive verbs of existence (express the simple fact that something exists or not), indefinite plural and mass nouns appear in the partitive case.

- Adjectives agree in case and number with their head nouns, possibly due to Baltic or Germanic influence.

- Vowel system as follows (diphthongs not included):

	first syllable			non-first syllables		
i	*ü*		*u*	*i*	*ü*	*u*
e	*ö*		*o*	*e*		*o*
ä		*a*		*ä*		*a*
ī	*ǖ*		*ū*			
ē	*ȫ*		*ō*			
ǟ	*ā*					

- After **ti* → **si* and after the rise of **h*, there were probably thirteen consonants. The consonant system can be summarised as follows:

labials	dentals	alveolars	palatals	velars
p	*t*	–	–	*k*
pp	*tt*	–	–	*kk*
	s, ss	–	–	*h*
	–		*(ð)*	–
m, mm	*n, nn*		–	*(ŋ)*
	l, ll		–	
	r			
v			*i̯*	

4.18.2. Mordvinic

A number of innovations are shared between Balto-Finnic and Mordvinic (Häkkinen 2009, 2012), but not with Samic, likely indicating close areal contact of both dialects in north-eastern Europe, possibly from the East Baltic to the Volga-Kama area within Textile Ware communities (Häkkinen 2012; Parpola 2018):

- Noun paradigms and the form and function of individual cases.

- The geminate **mm* (foreign to Proto-Uralic before the development of Balto-Finnic under Germanic influence) and other non-Uralic consonant clusters.

- The change of Uralic numeral *luka 'ten' with (loanword?) *kümmin (pro *kümmen).
- The presence of loanwords showing irregular correspondences, hence of likely non-Uralic origin, related to farming ('cow', 'mortar', possibly 'wheat') and trees (such as 'oak', 'maple', 'hazelnut'), potentially Palaeo-European in nature, related to the Pit–Comb Ware culture.

On the other hand, certain Komi and Udmurt words in Balto-Finnic can be better explained as borrowings that spread from the west rather than reconstructing two different close forms, which suggest a period of contact likely during or after the eastward expansion of Balto-Finnic, corresponding to the Middle Ages (Saarikivi 2018).

4.18.3. Samic

Changes in Proto-Samic include (Sammallahti 1998):
- Grade alternation, contractions, and to some extent metaphony brought a shift towards a fusional instead of agglutinative morphology.
- Conservation of the dual (in contrast with other Finno-Permic languages).
- Genitive and accusative singular syncretise after the loss of final nasals.
- Locative singular continues the former inessive and elative.
- Comitative singular from PFS **i̯na*/-*i̯nä*.
- Essive from PU locative *na/-*nä*.
- Sami declension suggests a PFS system with no specific local cases in the plural.
- Possessive suffixes undergo a radical simplification.
- Phonetic evolution:
  - Extensive innovations in the vowel system: in the first, second and third syllables.
  - The consonant stock is fairly conservative, characterised by the extensive use of the opposition of voice; changes include PFS post-

   alveolars into PS dentals, PFS *k* → PS *v* before *i̯*, *l*, * *ń*; and in
   consonant clusters *ns* → PS *ss*, *si̯*, *ši̯* → PS *šš*.

- o The distribution of consonants is also highly skewed, with severe
  restrictions on their occurrence everywhere except in the consonant
  centre.

4.18.3.1. Samic substrate languages

Regarding contacts of Saami with neighbouring populations of Fennoscandia, (Aikio 2012):

*"The Saami substrate in the Finnish dialects thus reveals that also Lakeland Saami languages had a large number of vocabulary items of obscure origin. Most likely many of these words were substrate in Lakeland Saami, too, and ultimately derive from languages spoken in the region before Saami. In some cases the loan origin of these words is obvious due to their secondary Proto-Saami vowel combinations such as *ā–ë* in *kāvë* 'bend; small bay' and *šāpšë* 'whitefish'. This substrate can be called 'Palaeo-Lakelandic', in contrast to the 'Palaeo-Laplandic' substrate that is prominent in the lexicon of Lapland Saami. As the Lakeland Saami languages became extinct and only fragments of their lexicon can be reconstructed via elements preserved in Finnish place-names and dialectal vocabulary, we are not in a position to actually study the features of this Palaeo-Lakelandic substrate. Its existence, however, appears evident from the material above."*

Based on the estimated location of the Finno-Samic-speaking community around the Gulf of Finland during the Bronze Age (see below), it is likely that both (Palaeo-Lakelandic and Palaeo-Laplandic) communities were related to contemporary asbestos ceramic groups of north-eastern Fennoscandia.

4.18.4. Contacts with Germanic

4.18.4.1. Palaeo-Germanic borrowings

Lexical borrowings between Germanic and Finno-Samic languages have been stratified by Jorma Koivulehto in thorough studies of Germanic

loanwords into an old stratum, often shared between Balto-Finnic and Samic languages, and a later one, which is probably to be identified with a Proto-Scandinavian stage (Figure 9). Further classification into different stages has been done more recently (*Lexikon der älteren germanischen Lehnwörter in den ostseefinnischen Sprachen* 1991, 1996, 2012).

Regarding these continued contacts, and their relevance for the location of the Finno-Samic homeland with Textile Ware cultures around the Gulf of Finland, Kallio (2017) states:

"Even though Bronze-Age Finnic and Samic were still two dialects rather than two languages, it does not mean that they would still have been spoken in a geographically limited area. On the contrary, their Indo-European loanwords dating to this period indicate that their speech areas were already geographically separate. The fact that at that time both Baltic and Germanic influenced Finnic much more strongly than Samic must be considered a crucial piece of information when we are trying to locate the Finnic and Samic homelands.

(…) the fact that Palaeo-Germanic loanwords are much more numerous in Finnic than in Samic must lead to the same conclusion. As I noted above, the most likely Palaeo-Germanic speaking carriers of the Nordic Bronze culture (ca. 1700–500 BC) spread from Scandinavia to the Finnish and Estonian coastal areas. As they never spread any further to the east than as far as the bottom of the Finnish Gulf, the idea that the Finnic homeland included neither Finland nor Estonia completely fails to explain the very existence of Palaeo-Germanic loanwords, whose quantity and quality in Finnic presuppose a superstrate rather than an adstrate.

(…) as the Nordic Bronze culture influenced coastal Finland much more strongly than it did coastal Estonia, the idea that the Finnic homeland did not include Finland but Estonia alone similarly fails to explain the very strength of the Bronze-Age Palaeo-Germanic superstrate in Finnic, which can indeed be compared with the Medieval French superstrate in English, for instance

(Kallio 2000: 96–97). From a Germanicist point of view, therefore, Itkonen's
theory concerning the Finnic homeland does not only seem to be the best but
also the only alternative (Koivulehto 1984: 198–200).

I fail to see why the Indo-Iranian loanwords counted in dozens should be
more relevant in locating these two homelands than the Germanic loanwords
counted in hundreds. Besides, the Indo-Iranian loanwords mainly consist of
cultural borrowings which do not necessarily presuppose a superstrate but
only an adstrate. Moreover, they must be dated so much earlier than Vedic
Sanskrit (ca. 1500–1000 BC) and Gathic Avestan (ca. 1000–800 BC) anyway
that their spread can very well be connected with the abovementioned Netted
Ware wave about 1900 BC."
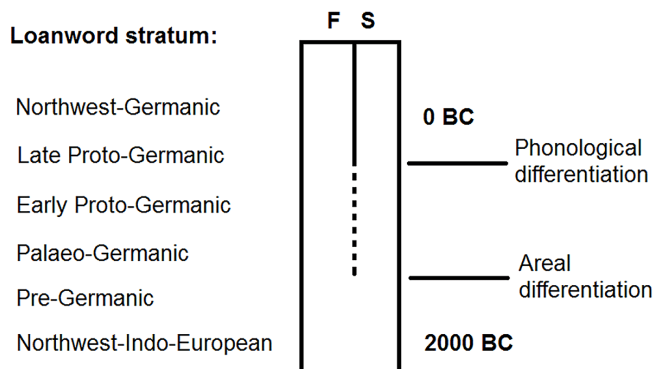
Figure 9. *The Finnic and Samic separation looks shallower than it actually is. Invisible convergence can be 'triangulated' with the help of Germanic layers of mutual loanwords (Häkkinen 2012).*

Palaeo-Germanic words in Proto-Finno-Samic, and later in Proto-Balto-Finnic and Proto-Samic, counted in hundreds to more than a thousand depending on the dialect, are described as of a *superstrate* influence, while the dozens of Indo-Iranian loanwords consist mainly of cultural borrowings, which may thus represent a simple *adstrate* through language contact (Kallio 2017).

The early stratum, called Palaeo-Germanic, is dated between Pre-Germanic and Proto-Germanic, and may today be divided in two periods.

4.18.4.1.1. Early Palaeo-Germanic borrowings

The early Palaeo-Germanic period is closer to Pre-Germanic, marked by loanwords which adopt Pre-Gmc. *k (although arguably also from an early fricative *x) → PFS *k, and which later underwent the Samic vowel shifts, e.g. PFS *a → PS *uo, or Proto-Balto-Finnic developments, e.g. PFS *š → PF *h. Similarly, the adoption of Pre-Gmc. *g as PF *g, or Pre-Gmc. *pʰ / *φ as PF *p[xxvi] must be quite old. The period of these borrowings must therefore be identified with the Nordic Bronze Age (ca. 1800–500 BC), before the spread of Proto-Germanic and the full separation of Proto-Samic and Proto-Balto-Finnic. Examples include (Aikio 2006; Kallio 2012):

- Gmc. *i̯eka(n) < Pre-Gmc. *i̯egon- 'ice' (<IE *ieg-en-) → PFS *i̯ägä- 'ice', cf. Finnish *jää*, South Estonian *jägä, jegä*, Saami *jiegnâ*; cf. also Mansi *jāŋk*, Khanty *jöŋk (Balodis and Pajusalu 2019)*. It has been proposed as an Indo-Uralic root *jæǥ (Kümmel 2012) with Altaic cognates.

    o Perhpas from the same period also Gmc. *rukk/ga(n) < Pre-Gmc. *rúgʰon 'rye' into PFS, compare South Estonian *rügä- 'rye'.

- Gmc. *φastu- < Pre-Gmc. *pʰasto- 'firm, solid' → PF *pasto ~ *paasto 'fast'.

- Gmc. *φelϑa- < Pre-Gmc. *pʰeltʰo- 'field' → PF *pëlto 'field'.

- Gmc. *xansō < Palaeo-Gmc. *kansā- (<Pre-Gmc. *kom-sā-) 'troop' (cf. OE *hos* 'crowd, host', OHG *hansa* 'id.') → PFS *kansa, cf. PS *kuossē, Finn. *kansa*, 'people, crowd'.

- Gmc. *xardi̯a- < Palaeo-Gmc. *karti̯a (<Pre-Gmc. *kort-i̯o-) 'to harden, to endure' → PFS *kärti, cf. PS *kiertë- 'endure', Finn. *kärsiä* 'to suffer; to endure'.

[xxvi] Examples by Juho Pystynen (2018).

- Gmc. **xargú-* < Palaeo-Gmc. **karkú-* (<pre-Gmc. **kark-ú-*) 'heap of rocks; sacrificial site' (cf. ON *hǫrgr*) → PFS **karko(i̯)*, cf. PS **kuorkō(i̯)*.

- Gmc. **xaɸa-* < Palaeo-Gmc. **kāpa-* (<Pre-Gmc. **kōp-o-*) 'hoof' (cf. ON *hófr*, OE *hōf*, OHG *huof*) → PFS **kāpa*, cf. Finn. *kavio*, + suffix **i̯a-u̯*.

- Gmc. **sōki̯a-* < Palaeo-Gmc. **sāgi̯a* (<Pre-Gmc. **sāg-i̯o-*) 'seek' (cf. Goth. *sōkjan*, ON *sœkja*, OE *sēcan*, OHG *suohhen*) → PFS **šaki-*, cf. Finn. *hakea* 'seek'.

- Gmc. **u̯arō* < Palaeo- and Pre-Gmc. **u̯osā* → PFS **u̯os-ta* (cf. Finn. *osta-* 'buy', Saami *oasti-*), **u̯osa* 'ware, commerce, purchase' in Finnic dialects (Koivulehto 2003).

- Gmc. **rexta-* < Pre-Gmc. *reg^{h}to-* 'straight' → Pre-PF **rehta* 'row, line, side, sight'. Its derivation from Pre-NWIE **rehd^{h}ā* (cf. Gmc. **rado*, 'row', ultimately from DIE **rehd^h-* 'achieve, accomplish') into Pre-PF **rešta-*, as proposed in Koivulehto (2003), seems much less likely.

Words from this stage are thus marked by the presence of Pre-Gmc. **ā* (→ PFS **a*) before it merged into Gmc. **ō*. In the case of **kōp-o-*, it has been argued (Kallio 2015) that it is a merge of Pre-Gmc. **ā, *ō* into Palaeo-Gmc. **ā*, before it becomes Gmc. **ō*, shortly after the Proto-Germanic expansion (Van Coetsem 1994).

4.18.4.1.2. Late Palaeo-Germanic borrowings

The late Palaeo-Germanic / Proto-Germanic period is composed of words which also participated in Proto-Saami complex vowel shifts, but which show Ø as substitute for Gmc. **x*. These borrowings are thus common only to Proto-Samic (since Proto-Balto-Finnic would have adopted them with **h*). Examples include (Aikio 2006):

- Gmc. **xamen* (cf. OHG *hamo* 'hunting net') → Pre-Samic **amin* 'a kind of hunting fence'.

- NW-Gmc. **hāba-z* (< Gmc. **xēba-z*, cf. ON *háfr* 'pocket net, hoop net') → Pre-Samic **api/as* 'depth of fishing net'.

- Gmc. **hasi̯a-* (cf. Ice. *hes* 'skin pouch') → Pre-Samic **asi̯o* 'bellows'.

In many borrowings, the vowel shift PFS **a* → PS **uo* had not yet happened, but no Gmc. **x* is found in the borrowed word, so no exact (early or late) Palaeo-Germanic stratum can be assigned. There are also cases in which the same Germanic word seems to have been borrowed independently by Proto-Samic and Proto-Balto-Finnic (Aikio 2006).

Later contacts between Proto-Germanic or Northwest Germanic and Middle Proto-Balto-Finnic, which must be dated to the Pre-Roman Iron Age (ca. 500–1 BC) or later, are reviewed in Kallio (2012) and Kallio (2015). Proto-Scandinavian loanwords in Samic, potentially of a slightly later date, are reviewed with detail by Aikio (2006).

4.18.4.2. Balto-Finnic evolution

The split of Proto-Balto-Finnic can be explained as being caused under the strong influence of the initially bilingual Pre-Germanic/Proto-Balto-Finnic community in Scandinavia (see above *§4.12.2. Finno-Samic influence on Pre-Germanic*), which suggests continued, long-lasting contacts between both early communities in contact through the Baltic Sea.

Developments affecting the evolution of Finno-Samic to Proto-Balto-Finnic related to Germanic include:

- Loss of the entire Finno-Samic palatal series (apart from **i̯*), with a later loss of fricative *ð* (later also found in Proto-Germanic), and disappearance of **ŋ*, all sounds which Pre-Germanic lacked.

- The only increase in consonants is in the number of long (geminate) consonants: **ss*, **mm*, **nn*, **ll*, which parallels their appearance and development in Germanic.

- The contrast between dentals and alveolars has disappeared: out of three different *s*-sounds only one remains.

- Development of **h* (Germanic developed **x*).

- Rhythmic gradation turns all voiceless obstruents after an unstressed syllable into weak-grade consonants, which means that PFS *p, *t, *k, *s, become PF *b/*v, *d/*ð, *g/*γ, *z. This is paralleled by the effect of Verner's law + Grimm's law in Proto-Germanic (see above *§4.12.1. Germanic evolution*).

4.18.4.3. Samic evolution

Proto-Samic developments with similar developments to Germanic include (Schrijver 2014):

- The loss of *i̯ could be motivated by the absence of that sound in Germanic.
- The loss of vowel harmony and its replacement by *Umlaut* introduces a Germanic feature into Samic.
- The lengthening of *æ, *a, and *ɔ to *ǣ, *ā, and *ɔ̄ brings the Samic vowel system closer to that of Proto-Germanic.
- The development of *ā and *ǣ in stressed syllables matches Germanic changes.
- The same can be said about the split of *ā and *ɔ̄ in unstressed syllables.

4.18.5. Contacts with Balto-Slavic

Many traditionally described Baltic loanwords in Finnic, around five hundred of six thousand commonly used words, can in fact be traced to a Proto-Balto-Slavic stage, and many (around 10%) of those loanwords are also found in Samic, which points to a moment of separation (but close contact) of the Proto-Finno-Samic community as the relative period of acquired loanwords. Some of these loanwords have also been proposed to derive from an (unattested) early Proto-Balto-Slavic dialect, 'North Baltic' (maybe closely related to West Baltic). This would support continuous, long-term contacts in at least two distinct periods in the Baltic region: Proto-Balto-Slavic–Proto-Finno-Samic, and Early Proto-Baltic–Proto-Balto-Finnic (Kallio 2008) and

Proto-Samic (Kallio 2009), which should be added to the described Early Proto-Slavic–Proto-Balto-Finnic contacts (Koivulehto 2006).

Proto-Balto-Slavic phonemes and corresponding Proto-Finno-Samic reflexes include (Kallio 2008; Koivulehto 2006):

- BSl. *p, *b → PFS *p; BSl. *t, *d → PFS *t; BSl. *k, *g → PFS *k; no palatalisation of velars had taken place before front vowels: Lith. *gẽltas* 'yellow' ~ Finn. *kelta*, Lith. *kirvis* 'axe' ~ Finn. *kirves*; Lith *mazgóįu* (<*BSl. *mozgēįe-*) ~ Est. *moske-*, Hung. *mos-*.

- Interesting is the lack of reflexes for a reconstructed laryngeal *ʔ* in Proto-Finno-Samic, which further supports its disappearance in the common NWIE stage, against Kortlandt (2016).

- BSl. *s → PFS *s, i.e. borrowed before its evolution into PF *h; BSl. *ś (also *ź), *š → PFS *š, which may point to a period before, during, or after their merge in PFS from a PFP stage.

- Resonants were kept, but for BSl. *u̯ → PFS *v (there was no bilabial in PFS).

- Similar vocalic outputs. Interesting is the reconstruction of BSl. *o, *a → PFS *o, *a in loanwords, which points to a period before their merging in Balto-Slavic, cf. Lith. *taũras* 'auroch, bull' ~ Finn. *tarvas* 'elk, roe deer', but Ltv. *tàure* 'horn' ~ Finn. *torvi* 'horn, pipe'.

- The adoption of diphthongs may have undergone different outputs.

Interesting (in relation with a parallel development in Proto-Ugric, see below) is the adoption of BSl. *źmōn* 'man' (<*gʰmōn*, see *§3.2.4.1. Remade Late PIE stems*) → PFS *sōme* → Finn. *Suomi*, Est. *Soome*, the self-denomination of all Finnish peoples, originally probably 'man', also behind the term *Sámi* for Samic peoples. It would else be reconstructed as PFU **śoma* or **ćoma* (Koivulehto 2003). Compare also Mordvin self-denomination *miŕd'e* 'man, husband', also *Mari* 'man, human being' (see *§3.5.3. Contacts with Indo-Iranian*).

For detailed reference of loanwords, one can consult the (out-of-date) standard handbooks Thomsen (1890) and Kalima (1936).

Still later contacts are represented by Latvian and Old Russian borrowings in Balto-Finnic languages.

4.18.5. Schleicher's fable in Proto-West Uralic

<div align="center">

lampa – šepät

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lampa min vilnaptak voliį	*šepäį näkiį;*
će lusam vaknam ųikiįä,	*će enäm kantam,*
* će mertäm përak kantaįa.*	*lampa šepäį moniį:*
"śüðʲämämi ćärki	*uräm šepäį aįattajam kaćëįako."*
šepät moniįit: "kūltilosa, lampa!	*śüðʲämämäk ćärki kaćëįako:*
urä, asëra, lampan vilnasta	*ečimsä lämpim päiväm tekipä,*
lampa vilnaptak volipä."	*tan kūltiliminśi lampa kentäsin korkëį.*

Notes:

- For the verb 'have', the possessor would have been probably in essive, and the object in possessive. In PFS, an abessive in *-*pta*/*ptä-k* can be reconstructed, hence it is used with the verb to be, instead of a negative construction.

- The elative in *-*sta*/*stä* is used to indicate that is made 'of wool'. The prolative in *-*ko* is used with present participles to indicate 'by (way of)'.

- PFS *lampa 'sheep', a loan from Palaeo-Gmc. *lamb^hes*- (<**lon-b^hes*, cf. Gmc. *lambiz-) 'lamb'. Because of its meaning as 'sheep' in Gothic and Balto-Finnic, it has been used to support the hypothesis that the Goths emigrated from Gotland (Kroonen 2013).

- PF *villa 'wool', a loan from BSl. *ųilnā (cf. Lith. *vìlna*) is here supposed to have been adopted first as PFS *vilna, and then borrowed again in PF. Saami languages show a loan from Proto-Scandinavian, **ul'lu*.

- PS *losē < PFS **lusa, described as dating to a common PFS period in Sammallahti (1998).

- Finn. *vaunu* < *vagnu* < PFS **vakna* < Gmc. **u̯agna* < PreGmc *u̯ogʰno-*. We assume an older Palaeo-Gmc. loan, and not Gmc. or Proto-Scandinavian (cf. Swedish *vagn*).

4.19. East Uralic

4.19.1. Ugric evolution

Some developments of Proto-Ugric include (Sammallahti 1988):

- Possessive suffix before case suffix.

- Future tense.

- Compound verb forms with auxiliary following the lexical verbs.

- Early development of SOV order, but with a trend to follow the innovative Proto-Finno-Permic SVO.

- Lack of genitive forces possession to be marked by placing the possessor in unmarked form before the possessed, attaching to the head noun a possessive pronoun agreeing with the possessor.

- Extremely frequent use of the passive, with logical subject (grammatical nonsubject) appearing in an oblique case, while logical object (grammatical subject) is in the nominative, triggering verb agreement.

- Generalised negative particle *-ne*.

- Intense systematic vocalic changes, in contrast with Proto-Finno-Permic (Sammallahti 1988). Among important changes: *ū → *u, *ō → *a, *ē → *ä, *ē̄ → *ë, *ī → *i, *ü → *ŭ; *o → *a (in most cases, except open syllables before *ï), *a → *o after *p and *u̯; *e → *i before second syllable *i.

- Consonant changes include *s, *š →*ϑ; *ś → *s in general, but *ś → *ć after nasals, *ŋ → *ć intervocalically (although in some cases it is preserved); *ɣ→ *g.

Interesting relative to the parallel development in Proto-Finno-Samic (see above *§4.18.5. Contacts with Balto-Slavic*) is PUg. **mańćim* 'man, person', possibly from a source akin to Indo-Iranian **manu-*, maybe through an intermediate Central Asian agricultural language using a common suffix **-ka* (found in Tocharian, Indo-Iranian and other Central Asian wanderwords, see *§3.4.3. Asian agricultural substratum*).

4.19.2. Samoyedic evolution

The Samoyedic branch is believed to have separated first from the Ugric-Samoyedic trunk, but—similar to the Tocharian case—the reconstructed Proto-Samoyedic (PSmy.) language may be dated much later than the parent one (Janhunen 1982).

Some traits of Proto-Samoyedic include:

- Copular constructions without any copular verb.
- Ancient ordinal **-mtV*.
- Predicative nominal inflection (conjugating of the nouns), which is also found in Mordvin.
- Dative in **-ŋ*, and coaffixes **-kθ -* and **-ntθ(-),* presumably from PU lative.
- Verbal suffix equivalents *-d* (frequentative and causative), *-t* (momentary, causative), *-pt* (causative). Suffix **-ntV* is found as an imperfective in Selkup.
- Reflexive created from a root meaning 'body' or 'head', **ona-*.
- Common phonetic changes from Proto-Uralic to Proto-Samoyedic are detailed by Janhunen (1982).
  - In Proto-Samoyedic, unlike in Proto-Finno-Permic (or in Proto-Uralic) it seems warranted to reconstruct **å* instead of **a*, and **ï* instead of **ë*.

o   The loss of final vowels and evolution of final consonants may have been influenced by the characteristic changes of Yukaghir relative to Uralic (within an Indo-Uralic trunk).

Likely early features, probably developed in contact with Ugric languages:

- Future tense.

- Compound verb forms with auxiliary following the lexical verbs.

- Verb clause-final, with the subject usually in initial position and other major constituents between them.

While the traditional view considered Samoyedic the first to split off from the Uralic tree, with a remaining Finno-Ugric trunk in north-eastern Europe, the revised phylogenetic tree holds that, in spite of its strong lexical divergence, Samoyedic phonology shows sufficient traits in common with Ugric dialects to be considered part of an Ugric-Samoyedic group (Häkkinen 2012). Recent archaeological and genetic research supports this possibility of an Eastern Uralic group stemming from Abashevo and expanding with the Seima-Turbino phenomenon into the Andronovo-like Horizon.

Palaeo-Samoyedic may be dated within a wide chronological framework, but a *terminus post quem* for the dissolution of the dialect continuum has to be necessarily set after its close contacts with Proto-Turkic, in turn dated to the centuries around the common era. Northern Samoyedic is believed to have arrived on the Arctic coast roughly from ca. AD 1000 on, including at least a Pre-Nganasan and a Pre-Nenets-Enets dialects already separated at that time, to allow for Nenets-Enets isoglosses with southern Samoyedic branches.

4.19.3. Samoyedic–Eastern Indo-European contacts

It is believed that different languages may have had contacts with Proto-Samoyedic near the Upper Ob and Upper Yenisei region, among them eastern Late Proto-Indo-European dialects like Proto-Indo-Iranian and Tocharian. This is supported by certain loanwords:

- PSmy. * i̯aə 'flour' (cf. Yurats *ja*) ~ PIIr. *i̯au̯a- 'grain'.

- PSmy. * u̯ë́n 'dog', most likely from PT *ku̯ënə 'dog (obl.)' → Pre-PSmy. *u̯ë́nø, which means that either the oblique was selected to avoid homonymy with PSmy. *ku 'rope, strap', or maybe Pre-Toch. *ku̯ën- was the basic nominative stem by the time of the loan (Kallio 2004). Also, Pre-Proto-Indo-Iranian obl. *ču̯en- could be suggested, but the necessary evolution of **ču̯- → (**hu̯-? →) *u̯- would need an *ad hoc* explanation (e.g. PSmy. **u̯u̯en-? cf. PSmy. *lë́ from PU *lu̯u̯e).

- PSmy. *me (~ PFU **mäχi) < PIIr. **maĵ-e- 'knead, plaster; build', found also in Hung. *művel* 'do, make'. LPIE verb *mag- is found in Gk., Arm., and BSl., which makes it possible that the verb was used in Pre-PIIr. times, although it has not survived.

- Less convincing is the proposal of the adoption of PSmy. *se̯it̯u̯ø < PT *şäpt-u- 'seven', although it seems less problematic than the explanation necessary from its comparison with Finno-Permic *śe(e)ś/ćimi (Kallio 2004).

- Controversial is the origin (and thus direction of borrowing) of PSmy. *u̯esä 'metal, iron' ~ Pre-Toch. *u̯esā (→ PT u̯i̯äsā). While the PSmy. word may go back to PU *u̯äśkä 'copper, bronze' (> Finn. *vaski* 'copper; bronze, brass'), also in *äsa- 'tin, lead', the PT word has been considered a 'thème II' to be compared to the 'thème I' found in Ita. *auso-, Bal. *auso-, *ausi- (Adams 2013). A spread from west to east with the Sejma-Turbino transcultural phenomenon, characterised by its metal weapons and other objects, could explain the borrowing in Tocharian (Kallio 2004). Much less likely, the reconstruction of PIA n. *χé-χu-so- 'glow' as a reduplicated stem from a hypothetic original **χe̯i̯es- 'metal' may favour a borrowing in the opposite direction (de Vaan 2008).

- LPIE or Pre-PIIr. *u̯oida 'saw; know', evolved in common to 'watch over, be alert, guard', may be behind PSmy. *u̯o̯irå, found in Nenets *jierā-, jera-* 'guard, save', *je-, we-* 'guard', Nganasan *bå̊rə́da* 'wait';

and alsobehind PUg. **u̯oi̯-d-*, cf. Khanti *wu-*, *wo-* 'see, know, can',
ojəɣtə-, *ǎjət-* 'find, notice, see', Mansi *waj-*, *woj*, etc. 'see', OHung. *ov*
'save, watch over'. The meaning evolution is similar to PU verbs **koke*
and **oča*, and PIA **ɣʷekʷ-*, from 'see' to 'look out, beware, watch,
guard, defend, etc.'

4.19.4. Schleicher's fable in Proto-Ugric and Proto-Samoyedic

Proto-Ugric

uči – lu̯u̯it

uči, ńurana u̯alis,	lu̯u̯i̯ näkis;
će enä u̯igim u̯igintä,	će läula kantam,
će koimim sarka kantanta	uči lu̯u̯i̯ i̯uktas:
"siðʲmäm ćärki	manćim lu̯u̯i̯ ai̯antam näkintä
lu̯u̯it i̯uktast: "kuli, uči!	siðʲmäk ćärki näkintä:
manći, aϑira, učin sägrätä	mälä u̯urɣam teki-u̯,
učin sägrä es-u̯alik."	a kulimä uči ńurmik puktas.

Proto-Samoyedic

uc – i̯untåt

ucөna u̯äi̯ä et-u̯åi̯så	i̯untåi̯ kok;
ce kitä kåntåm kåntåntå,	ce inä elөm,
ce kåi̯өm sum elөntå.	mån uc i̯untåi̯:
"sii̯ämä åŋkө	kåimåm åttөntå i̯untåi̯ åi̯ånntä."
månt i̯untå: "kuik, uc!	sii̯ämät åŋkө attөntä:
kåimå, ïńөpå, učөn u̯äi̯ätä	ona pei̯u̯ u̯ircåm me,
ucөn u̯äi̯ä et-u̯åi̯. "	e kuit uc sii̯tåŋ påkså.

Notes:

- For master, stem PS **ɨńө* 'tame' + action/actor suffix **-på*/*pä* is used.

4.20. Yukaghir

4.20.1. Yukaghir evolution

Long-term contacts between Late Proto-Uralic and Late Proto-Yukaghir dialects in Northern Eurasia are certain, and a closer affinity between Proto-Uralic and Proto-Yukaghir within an Indo-Uralic group is not supported by their divergent phonetic evolution with respect to Proto-Indo-Anatolian. Therefore, it is often difficult to posit a common ancestral Indo-Uralic root for Yukaghir, if only a Proto-Uralic cognate is found.

Known features of Proto-Yukaghir include (Nikolaeva 2006):

- Genitive in *-*n*.
- Accusative in *-*lə*.
- Dative in *-*ń, *-*ŋiń*.
- Locative in *-*ɣ- /*-*q-*.
- Plural in *-*ji* (old, non-productive in Proto-Yukaghir), proably related to plural marker for verbs in *-*j*.
- Participles in *-*n* (imperfect), *-*i̯*, perfect part. in *-*mə*.

4.20.2. Schleicher's fable in Proto-Yukaghir

<div align="center">

oɣə – i̯aqai̯i

</div>

oɣə qa au̯rən əi̯-l'ə	*i̯aqai̯i öɣe;*
ta niɣei̯ u̯elel u̯eŋken,	*ta könta poi̯lə,*
ta čērīl omt qontə.	*oɣə i̯aqai̯i an:*
"niŋ qamp	*ńan u̯aŋ i̯aqai̯i ymon."*
i̯aqai̯i ani̯: "qoli, oɣə!	*niŋ qamp u̯aŋ:*
ńan, leml'ə, oɣəi̯ au̯rəń	*mət puɣö suklə ui̯,*
oɣəi̯ au̯rən əi̯-l'ə."	*ei̯ qolem oɣə leu̯eń ölkə.*

For this fable, a non-ergative stage of the language is assumed. Likely cognates of words used in this version include (for Proto-Indo-Uralic cognates, see above *§1.1.3. Schleicher's fable in P*):

- For 'sheep', a PYuk. **oɣə (cf. PYuk. *monoɣə 'moufflon') was selected, because of its potential connection to Indo-Uralic **ɣeu̯e* (which would have given regular PPYuk **eu̯e* → **eɣe) and derivatives, although they are probably unrelated.

- PYuk **i̯aqa* 'horse' is probably a borrowing from a source akin to Proto-Tocharian **i̯äku̯ë*.

- PYuk. **əi̯-l'ə* 'no-is', from **l'ə* 'be, exist; have', which have cognates in Proto-Uralic.

- PYuk *qa 'which' from PIU interrogative/relative *kV.

- PYuk. *ta 'that, this' from PIU demonstrative *tV, and PYuk. **ei̯* from PIU **i-*. Different demonstratives in **e-*, **a-* (such as *a-n, *e-n, etc.) may be traced back to a common PIU *e, *i plus a PYuk pronominal suffix.

- For PYuk *öɣe 'see, watch', see above PIU **ɣoku̯e*.

- PYuk **u̯eŋke* 'carry' would be the usual reconstruction for modern derivatives, although the Proto-Uralic reconstruction informs a Pre-PYuk. ***u̯eɣe* according to Nikolaeva (2006).

- PYuk. **poi̯(o-)* 'lift, raise, carry (on the shoulders or back)' is potentially connected to PU **pali̯ë*.

- For the verb 'carry', a form *qontə is found in common with Proto-Uralic *kanta.

- For PYuk. *könta 'person, human being' cf. PIE **g(e)nh-ti-* 'child' (although it is not found in Anatolian).

- PYuk. **u̯aŋ/u̯oŋ-* is potentially related to PIU **u̯ainde*.

- For PYuk *puɣö, see above PIU **paχu̯ë*.

- PYuk. **qol-* means 'sound, noise; ear', but here it is used with their reconstructed original meaning 'ear; hear', see above PIU *χeule.

- PYuk. *mət is related by Nikolaeva to the 1sg. PIU **m-*.

APPENDICES

I. Schleicher's fable in other proto-languages

I.1. Eurasiatic

For this version, vocabulary from Dolgopolsky (2008) and Bomhard (2018) has been used. Discussions on grammatical details are found e.g. in (Kümmel 2009) or Kortlandt (2010), with summaries of previous comparisons such as the following nominal declension paradigm:

	PIU	Turk.	Mong.	Tung.	Korean.	Japonic
pl.	*-t	*-t	*-t	*-ta, *-te	*-tɪr	*-tati
acc.	*-m			*-ba, *-be		*-bo
gen.	*-n	*-ŋ	*-n	*-ngī	*-ń	*-n
dat.	*-ka	*-g *-ka *-ga	*-ga	*-ga *-kī *-gī		*-nka
loc.	*-ru	*-ru	*-ru		*-ro	
loc.	*-n	*-n				
loc.	*-i					*-ni
abl.	*-t	*-da *-ča	*-dur *-ča	*-du *-ji		*-tu *-to *-du

<div align="center">

Proto-Eurasiatic

poge moret

</div>

poge ʾne ʾəlet sahrinə,	*morei ʕʷuḳa;*
tu palamə buramə u̯eden,	*tu mage ṭolamə,*
tu manumə sali ṭolan.	*poge moret u̯aḳa:*
"kuŋem giles,	*meremə ʕʷuḳan morei u̯eden."*
moret u̯aḳat: "ḳiu̯le poge!	*kuŋen giles ʕʷuḳan,*
mere, ʾede, pogei sahranə	*ʾone ṭäpi ḳaṗimə u̯äres,*
u̯e pogei sahranə ʾne ʾəles."	*ʾi ḳiu̯lut poge u̯elanə boka.*

I.1. Altaic

This Micro-Altaic version of the fable relies heavily on vocabulary reconstructed for both Proto-Mongolic and Proto-Turkic. It uses mostly words reconstructed for both proto-languages[xxvii], if possible including those with Tungusic cognates. For morphosyntax, a simple system based on comparison of nominal and verbal endings and formants of Proto-Mongolic (Mong.), Proto-Turkic (Turk.) and—when possible—Tungusic (Tung.) has been used:

- Vowel harmony likely a late, independent development under areal influence.
- Ancient SOV order, as with other Eurasiatic languages.
- Noun system:
  - Nominative in *-Ø.
  - Accusative Mong, Tung. *-i̯(V)*. Turk. shows all obliques formed in *-n-*, with acc. *-nVG*, but the pronominal declension (arguably showing the oldest remains) has *-nI*.
  - Genitive in *-n*.
  - Oblique (dative, ablative, or locative) in *-T-* (often *-d-*).

- o Plural: Mong. *-s* and *-d* (with a more restricted *-n*); Turk. pl. *-lAr* (pronominal in *-z*), Tung. *-l* and *-sVl.*

- Personal pronouns 1p. in *-m-*, 3p. in *-Ø*; 2p. Turk. *-s-*, Mong. *-c-*.

- Interrogative in *kV-*, demonstrative in Mong. *e*, Turk. *i* (3p.).

- Verbal system:
  - o Imperative 2sg. formed with unmarked verbal stem in *-Ø*.
  - o Complex use of tense–aspect markers in the proto-languages, which probably developed independently, from an older system of participial endings similar to the nominal one in *-n, *-i̯(V),* and *m.*
  - o Common verbal endings in *-k* and *-g*, and also *-t, *-r* with different functions.
  - o Probably late development of personal markers for finite verbal forms.

- Negative particles *e-* (cf. Mong. *e-se*, Tung. *e-*) and *ən-* (cf. Turk. *en*, Tung. *ā(n)-*).

Micro-Altaic

bāku ătas

bāku ke Íepan e-biǰu	*ătas ébǰo;*
te ámba ki̯úŕui ileg,	*te pèki̯i ki̯unei,*
te áŕi̯ am ǰugig.	*dé bāku ătas:*
"siŕu ǰürekemi,	*áŕi gòreg ătas ki̯ăčug."*
ătat dét: "áĺi bāku!	*siŕu ǰürekema gòreg,*
áŕi, bǎŕa, bākus Íepan	*oŋned di̯ùlu i̯umi̯ ki,*
bākus Íepan e-biǰu."	*e ălik bāku keberd ti̯íŕge.*

Note: For 'horse', cf. PM *aduxu-* 'horse; cattle; drove, herd; to herd', PT *ăt* 'horse', Tungus-Manchu *abdu* or *adbu* 'cattle, herd'. Also interesting is derivative for 'stallion' **ati̯ir-ga-* from the same root, cf. Turk *adgɨr*, Mong *ai̯irga* (possibly of borrowed from Turkish), into different Eurasian languages, cf. Dag. *adirag*, *adirga*, S.-Yugh. *ai̯irga*, etc.

Proto-Mongolic

konï morid

konï ene nou̯urin ese büi̯ii̯ü	*morid üi̯ei̯ü;*
tere kündü tergei̯i texen,	*tere hike i̯axuni,*
tere ereni bisixü ačin.	*konï morid keleluxa:*
"simsim i̯irüke-mini	*ere üi̯en morid hunun."*
morid keleluxa:"duxulg konï!	*simsim i̯irüke-mani üi̯en,*
ere, ei̯en, konïs nou̯uri	*öxen dulaxani kunari kinam,*
da konïs nou̯urin ese büi̯ii̯i."	*exü duxulgsa konï talad tergei̯u.*

Note: Mong. **i̯axu-n* 'thing' is used instead of 'load' or 'burden'.

Proto-Turkic

sarïk atlar

sarïk ka i̯uŋan i̯ōkdi	*atlar gördï;*
bu iagïr kaŋag e̯ltügma,	*bu bedük i̯ünäg,*
bu ērag biāt ār̯tïgma.	*sarïk atlar dēdi:*
"emgei̯ur i̯ürekem,	*ērag görügma atlar būnügma."*
atlar dēlar: "diŋla sarïk!	*emgei̯ur i̯ürekemez görügma,*
ēr, bäg, sarïklar i̯uŋag	*ge̯ntü i̯ïlïg čēkag qïlïr,*
sarïklar i̯uŋan i̯ōkur."	*bu dïŋlamïš sarïk i̯alaŋka kač-.*

For Proto-Mongolic morphosyntax and vocabulary, the texts Janhunen (2003) and Nugteren (2011) have been used; for Proto-Turkic, Johanson and Csató (1998) and (Erdal 2004).

I.2. Afroasiatic

I.2.1. Afrasian

It is very difficult to reconstruct ancient Proto-Afroasiatic (PAA) vocabulary, and still more difficult to reconstruct a common morphosyntax. These are some known features common to more than one branch, though (Hodge 1971; Lecarme, Lowenstamm, and Shlonsky 2000; Frajzyngier and Shay 2012):

- Verb initial (Egyptian, Semitic, some Berber, Central Chadic). Clause-final position (Omotic, Cushitic, Akkadian) considered a product of contact with other languages.
- Case marking (Semitic, Berber, Cushitic, Omotic, maybe also Egyptian): subject and object less overtly marked. Probably similar to Proto-Semitic:
  o Nominative in *-*u*,
  o Genitive in *-*i*,
  o Focalised element (object, vocative) in *-*a*.
  o Construct state in *-Ø (in Semitic, Cushitic).
  o Plural in ablaut to *-*a*- (Semitic, Berber, Cushitic, Chadic), suffix *-*u̯*- (Semitic, Berber, Cushitic, Chadic), or ending *-*t* (the only one in Omotic).
  o Feminine in *-*(a)t*.
- Maybe adverbial (locative?) in *-*iš* as found in Semitic and Egyptian.
- Adjective forming suffix (from genitive) *-*(a/i)i̯*-.
- Apparently, verb stems ended in consonant; pronoun and indeclinable stems could end in vowel; and nouns and adjectives were distinguished by the so-called 'terminal vowel'.
- Verbal system:
  o Two tense/aspectual systems (Chadic, Egyptian, Semitic, Cushitic).
  o Vowel alternation or *Ablaut* codes a variety of functions.

o   Prefix-conjugation as the most ancient one (Pre-PAA), continued by suffix conjugation and subject agreement.

o   Extensions of the verb: causative in *s*, inchoative/denominative *i̯* (and *u̯*), non-finitive *n*, durative *t*, stative/intransitive *m*, middle voice *dl*, amplificative *h*, complementive *ɣʷ*, etc.

o   No initial vowels or consonant clusters.

o   One or more negative markers depending on the position of the verb in the clause.

o   Sequential clauses marked by markers, converbs (Cushitic, Omotic, Semitic, Chadic) or by tense forms (Berber, Egyptian).

<div align="center">

bagu ʕai̯ru̯-da

</div>

bagu ma hai̯i ĉaʕara,	*i̯araʔi̯ ʕai̯ar;*
i̯aḳul tu ĉai̯ʔa ḳ⁽ʷ⁾urī,	*i̯aʒub tu ḳama gadī,*
tu nasa pidiš.	*i̯akau̯ʔ bagu ʕai̯ar:*
"i̯adum ani libbu,	*raʔii̯ i̯ahim nasu ʕai̯ar."*
i̯akau̯ʔu̯ ʕai̯ru̯: "gur baga!	*i̯adum nu̯ libbu raʔii̯*
i̯apal nasu, ʔadu, kuru̯	*ĉaʕar-bagi kicu̯a sirfī,*
ma i̯ahai̯ bagu ĉaʕarī."	*ta kina i̯abuḳ bagu ʔaqa*

Notes:

- For 'and', the reconstructed 'comitative' case *-dV* / *-Vd* 'along with, together with, in addition to' is used (hypothesised to be an ancient postposition).

- For plural forms, the ending *-u̯* is used for nominative, ablaut in *-a-* for the accusative (although this was most likely not the case, and these forms alternated, since cases were probably not marked in the plural).

- There is no reconstructed word for 'hear, listen', hence *gur-* 'sound, voice' is used as a verbal stem for the 'imperative', and *kin-* 'know, learn' for 'having heard'.

I.2.2. Semitic

These are some general features reconstructed for Proto-Semitic (Weninger et al. 2011):

- General VSO order.

- Noun:

  - PSem. feminine is marked by *-at*.

  - Singular case paradigm nom. *-u*, gen *-i*, acc. *-a*.

  - Plural m. nom. *-ū*, gen/acc. *-ī*, pl. fem. nom. *-ātu*, gen-acc. *-āti*. Internal plurals (not occurring in Akkadian) are assumed to be a secondary feature spread by areal diffusion, hence not central to a PSem. reconstruction (although potentially quite old).

  - Less clearly reconstructible for PSem. (and probably specialised in East Semitic) are a locative *-u* (or *-ū*), and a terminative *-iš*.

- Simple syntax of preposition + genitive. Formation of prepositions from the construct state of the accusative, cf. Classical Arab *baina* 'between' < *bainun* 'separation; interval'. Reconstructible PSem. preposition include *ʾad* 'until, to'.

- Common prepositions include *ṷa* 'and', *aṷ* 'or', and *šimmā* 'if'.

- Adverbial ending Akk. *-iš*, Syr. *-(ʾ)īϑ*, or (indefinite) accusative in Akkadian (*-am*), Classical Arab (*-an*).

- Interrogatives generally in *ʾai-*, also *man* 'who', *matī/ai* 'when'; negations in *ʾal/ʾul*, *ʾiiV*, *lā*.

- Verbal system:

  - Finite forms show a great stability over millennia, with the usual paradigm being:

    - Singular: 3m. *ii-_-Ø*, 3f. *ta-_-Ø*; 2m. *ta-_-Ø*, 2f. *ta_-ī*; 1c. *ʾa-_-Ø*;

    - Plural: 3m. *ii_ ū*, 3f. *ii_-ā*, 2m. *ta-_-ū*, 2f. *ta_-ā*, 1c. *ni-_-Ø*.

o The 'perfect' is an innovation of West Semitic (WS), and seems to have evolved from the Akkadian stative, which did not have an ending for the 3sg.m. (although cf. *-a in WS, considered as from the absolute). In this fable, the 3sg. form is left without ending.

o Many afformatives in nominal derivation can be reconstructed for PSem. The most relevant ones are *ma-, *mi-, *mu-, *ta-, *ti-, *ʔa-, *ʔi-, *ʔu-, *-ān.

<div align="center">raḫilu u̯a muhrū</div>

raḫilu lā i̯ihu̯ui̯ šipāti,   i̯iʔumr muhrī;

i̯iṣau̯ar ða arkaba kabita,   i̯iϑakam ða aϑkama rabb,

ða ʔinša nidiš.   i̯iku̯ul raḫilu muhrī:

"i̯i̯agaʕ-nī libbu,   ḫizai̯i i̯irkaba ʔinšu parašī."

i̯iku̯lū muhrū: "šmuʕ raḫilu!   i̯i̯agaʕ-nā libbu ḫizai̯ī

i̯iʕabad ʔinšu, baʕlu, tāx̱   šipātu-ṣ̌aʔni kiṣu̯ta šaḫn,

u̯a lā i̯ihau̯ai̯ ṣ̌aʔnu šipāti."   hā šimaʕ i̯ibluṭ raḫilu ʔad šadau̯i.

Notes:

- For individual 'sheep' *raḫil is selected. For the plural (collective) forms, *ṣ̌a'n seems more appropriate.

- PSem. *muhr, 'foal', has been selected as the oldest reconstructible stem for 'horse'. The other widespread ancestral root is *su̯su̯-, which seems a borrowing from an Indo-European source, akin to Luw azzuwa, or PIAr. *áśvās (via Mitanni). Maybe the term for 'foal' was the original, although it is more likely that the donkey was the usual Middle Eastern/African animal before the introduction of the horse.

- For 'having', a head noun 'wool' in construct is used.

- For 'chariot', a form of the root *rkb 'ride, drive, mount' is used, as in Akkadian narkabtum 'carriage'.

- PSem. *ṣu̯r 'carry (on shoulders)', and *t̠km 'carry on shoulders/back'.

I.2.3. Northwest Semitic

Features of WS, some of them innovations of a previous Central Semitic (CS) stage include (Weninger et al. 2011):

- General VSO, possessor possessed, and noun-adjective order, as in PSem.
- PSem. initial *u̯- became *i̯- (except for conjunction *u̯a- where *-u̯- was probably interpreted as word-medial).
- PSem. *n- became assimialted to an immediately following consonant except for *h in several cases.
- NWS determinative-relative pronoun *ðū inflected in case, number, gender.
- Deixis in *h-, *n-, *ð-, *l-, *k-.
- 'Triptotic' declension in the singular, 'diptotic' in the dual and plural.
- Adjectives regularly agree with nouns, inflect in masc. /fem. gender and number.
- Prepositions can be reconstructed for WS: *bi- 'in', *la- 'to', *ʕalai̯ 'on', *min 'from', etc.
- Conjunction *pa- 'and, then' as Central Semitic innovation.
- Verbal system:
  - Imperfect or 'prefix conjugation' with an older and a younger type:
    - The "short imperfect" or "jussive", (cf. 3.m.sg. *i̯aktub-Ø), akin to Akkadian preterite, expresses deontic modality and punctual past.
    - The "long imperfect" (cf. 3.m.sg. *i̯aktub-u, with long vowels of the 2f.sg. and 3/2pl. expanded by *nV), is used in CS for present-future tense, durative or iterative past, circumstancial events etc.
  - "Perfect" or "suffix conjugation" (cf. 3m.sg. *kataba for active verbs) expresses different types of past tense or completed action,

from a previous stage denoting timeless qualities or mental stages (cf. **kabida* 'he is heavy')

o Subjunctive (CS) acts as volitive, and maybe indicates subordination, cf. 3m.sg. **i̯aktub-a*.

o "Energetic" mood forms in **-(a)nna* (also **-(u)nna?*), an innovation of Central Semitic.

o Imperative formed on the base of the 'short imperfect'.

o Active participle **kātib-* (for sound fientic roots) inflects initially like a noun.

o Passive participle forms **katīb* and **katūb*.

o Different levellings of the verbal system, e.g. drop of initial **i̯* in verbs Ii̯ (originally Iu̯); assmilation of **n* or **l* in "imperfect"; etc.

o Internal passives introduced before NWS (cf. **kutiba* vs. **kataba*)

o Levelling of vowels in verb prefixes: Proto-Semitic, informed by Akkadian, showed **ʔa-*, **ta-*, **ni-*, **i̯i-*.

<center>*raḫilu u̯a parašū*</center>

raḫilu lā i̯aḫuu̯i̯a šapāti,	*ʾamara parašī;*
ṣāu̯iru ðū markabta kabita,	*ϑākimu ðū ϑaʕina rabba,*
ðū ʾanāša nāi̯ida.	*qau̯ul raḫilu parašī:*
"i̯ai̯guʕu libbu-nī,	*ḫāzii̯i rākiba ʾanāšu parašī."*
qau̯ulū parašū: "ušmuʕ raḫilu!	*i̯ai̯guʕu libbu-nā ḫāzii̯ī*
i̯apʕulu ʾanāšu, baʕlu, tān̠	*šapātu-raḫili kisu̯ta šaḫana,*
u̯a lā i̯aḫuu̯i̯u raḫilu šapāti."	*hā šamīʕ i̯abruḫ raḫilu la-dabri.*

Notes:
- For 'horse', the West Semitic **paraš* has been used.
- Active participle **ϑaʕīn* 'loaded with' = carrying as in Syriac.

I.3. Dravidian

This Proto-Dravidian version of the fable has been reconstructed using mainly lexicon from Burrow and Emeneau (1984) and morphosyntax from Andronov (2003).

<p align="center">*kori-m ivuḷi-ku-m*</p>

kori boc-ku e-ā	*ivuḷi-k-an̠ kānṭ-ān̠;*
atu viṇ tēr-an̠ īẕipu,	*atu peru mōr-an̠,*
atu āḷ caṭṭ kuditu.	*kori ivuḷi-k-an̠ jant-ān̠:*
"guṇḍ en̠ nō-an̠,	*āḷ kāṇpu ivuḷi-k-an̠ lātu."*
ivuḷi-k jant-ār: "āl korī!	*guṇḍ em nō-an̠ kāṇpu,*
āḷ, jāḷ, kori-k-a boc-āl	*tān̠ veku cavaḷi-n̠ vān,*
kori-k-a boc-ku ān̠-ā."	*itu ālal kori vāj-kku ōḍ-ān̠.*

Note: Proto-Dravidian features are sometimes difficult to reconstruct for an old, common period. It is believed that, during the earliest reconstructible stage, there were no cases, just postpositions which only later became bound to the noun and lost their internal etymological source. For this version of the fable, the accusative in *-*(a)n̠* (probably a late Proto-Dravidian development) is also used, and reconstructed 'case' markers are thus also postponed to the general plural marker, and they are (like auxiliary verbs) marked in the text with a dash; but grammatical(ised) endings, like participial endings, are not.

I.4. Kartvelian

For this version of the fable, Common Kartvelian roots were selected mainly from Klimov (1998), and Common Kartvelian morphosyntax based on Tuite (1998).

<p style="text-align:center">ćxu̯ar da cxenen</p>

ćxu̯art mat maṭql mad q̇u̯a	*cxenen źina*
is maḳe borbor magu̯ar,	*is maquŕś,*
is ḳać adra maźn.	*tḳu̯a ćxu̯art cxenen:*
"çqn č̣u̯em mḳerdt	*ḳać mućq̇s cxenen mareq̇."*
tḳu̯es cxenent: "smen ćxu̯ar!	*çqn č̣u̯en mḳerdt mućq̇s,*
ḳaćt, upet, ćxu̯arebis maṭqlad	*tau̯ ṭpil arćxel kamn,*
da ćxu̯arent maṭql mad q̇au̯en."	*eg smil ćxu̯ar dabs u̯lṭa.*

I.5. Nostratic

For these versions, common words found in both Dolgopolsky (2008) and Bomhard (2018) are used, with Nostratic roots shared at least by Proto-Indo-European and Proto-Semitic, whenever possible.

Proto-Nostratic

paka helat

paka hnə ʔilat cara,	*helat ʕaḳa;*
ṭu pali para u̯aden,	*ṭu magi ṭula,*
ṭu cala mana ṭulan	*paku helat u̯aka:*
"kunuk galša,	*mara ʕaḳan helat ʔorgan."*
helat u̯akat: "ḳulu paka!	*kunun galšat ʕaḳan,*
maru, ʔadu, pakat cara	*ʔon tapa kapa ʔu̯araša*
u̯a pakat cara hnə ʔilaša."	*ṭa ḳulat paku paṭan puka.*

Notes:

- Reconstruction of precise dentals (*t vs. *d vs. *$ṭ/t^h$ etc.), occlusives (*g vs. *k vs. *k^w vs. *$ḳ/k^h$, etc.), etc. is often impossible, because there is no common phonology agreed upon. Still more difficult is to reconstruct a common vocalism.

- For 'horse', Nostratic *$hVlV$ 'deer' is used, found as Euras. *$ʔelV$, Afroas. *$ʔai̯Vl$-. Euras. *$more$ 'cattle, horse' is used as a more specific 'domesticated horse', cf. Dravidian *$mūr$- (also SDr. *mar-*ai* 'deer'), Mong. *$móru$-, Tung. *$murin$, Kor. *$mằr$; also found in Celtic and Germanic *$mark$-*o*.

- Instead of 'carrying', 'lifting', 'pulling', etc. a 'vehicle', 'load', or 'weight', here the horses 'lead' (*$u̯VtV$) 'many' (*$pVlV$) 'horned animals (calf, heifer)' (*$pVrV$).

The reconstructions of the Muscovite school, although heir of the oldest tradition in Nostratic reconstruction, may be deeply flawed in the sense that an

old, non-laryngeal, Brugmannian reconstruction of Proto-Indo-European is still used, so that little has changed since Illich-Svitych's pioneer work. Proto-Indo-European is without doubt the best reconstructed proto-language to date, and remains the main model for any older proto-language, thus any error in its reconstruction implies a false start for an ancestral stage.

Also, the exclusion of Afroasiatic from the Nostratic family, and its inclusion within a 'Borean' group along with other languages (viz. various Amerindian, African, etc.) to develop the common vocabulary makes the lexicon in The Tower of Babel Etymological Database Project at <http://starling.rinet.ru/> potentially still more speculative than a Nostratic etymology already is.

Allan Bomhard's own reconstructions of Proto-Afroasiatic roots (and phonology) seem to be biased toward Proto-Indo-European and Nostratic roots, hence risking circular reasoning. On the other hand, his bold take on precise Nostratic vocalism and consonantism and the inclusion of Proto-Afrasian as just another Nostratic branch at the same level as Eurasiatic, Dravidian, and Kartvelian, may give a more precise picture of what a Nostratic language could have been like thousands of years ago.

I.6. Northeast and Northwest Caucasian

These tentative Caucasian versions of the fable contain vocabulary and morphosyntax by Starostin and Nikolayev (1994). An early stage is represented in both fables, before the fixation of particles as case suffixes.

Proto-Northeast Caucasian

ʔīlχu hĭčwĭar-gi

ʔīlχu kwi ƛwāħnin hwe ina	*hĭčwĭar agwana;*
ʔi hĕq̇wa hwəlkwēm ʔīqar,	*ʔi hăχe rắχ:am,*
ʔi ćwĭjo ắχi ĭχ̱:er.	*ʔīlχu hĭčwĭar ʔiʔwina:*
"jĕrḳwĭ zā ʔắčĕ,	*hĭrḳwĕm ămçĕr hĭčwĭar ărḳĕwr."*
hĭčwĭar ʔiʔwina: "χĭq̇ē ʔīlχu!	*jĕrḳwĭ ža ʔắčĕ ămçĕr,*
hĭrḳwĕ, ʔāλi, ʔīlχuar ƛwāħnim	*ču āwʎwĕr ḳū̆čwĭm hŏq̇ē,*
ʔīlχuar-ra ƛwāħni hwe a."	*ma χĭq̇ēse ʔīlχu qwĭʔrūdi ilqwāna.*

Proto-Northwest Caucasian

χʷə č̓ʷara-gʲə

χʷə ja laś̌ʷam mə q̇́ˤ:an	*č̓ʷara pəʎ́an;*
mə χʷanəta k:ʷəm q:irə,	*mə č̓ʷəχʷa č̓ʷam,*
mə ćəm pasa məš̌ʷrə.	*χʷə č̓ʷara q̇́ˤan:*
"ź̌əʁʷə sā ǵʷə,	*q:aćam ćarə č̓ʷara ḱʷarə."*
č̓ʷara q̇́ˤan: "q:ˈˤʷa χʷə!	*ź̌əʁʷə ša ǵʷə ćarə,*
q:aća, ĺa, č̓ʷara laś̌ʷam	*ʎ́ʷa ḳaç̌ʷəm čə-wə,*
χʷiara-gʲə laś̌ʷam mə q̇́ˤ:a."	*nə q:ˈaˤʷasa χʷə rəq:ʷada q:ˤʷan.*

I.7. Basque

For a Pre-Basque situation, the following features are assumed (Martínez-Areta 2013):

- SVO order, which means a stage before ergativity.
- Noun system:
  - Plural marker *-*aga*.
  - Genitive in *-(e)n*.
  - Dative (assumed as general oblique) in *-i*.
  - Locative in *-ga*.
- Verbal system:
  - Finite forms unmarked.
  - Non-finite forms marked with *e-*.
  - Perfective participle in *-i*.
  - Relative clauses in -*n* attached to finite verb.

Vocabulary used is mainly from Trask (2008).

ardi zaldi-aga

ardi ez edun ilei	*ekus zaldi-agai*
hau ebil gurdi astun,	*hau ekarr handi zati,*
hau ekarr gizon laster.	*ardi enau zaldi-agai:*
"nien bihotz-min	*ekusen gizoni ehots zaldi-agai."*
zaldi-aga enau: "berarr ardi!	*guen bihotz-min ekusen,*
gizon, andots, ardi-agan ilega	*ber-egin belo antzi,*
zaldi-aga ez edu ilei."	*ardi eberarri honi eutz larrei.*

I.8. Tyrsenian

It is impossible to reconstruct a common Proto-Tyrsenian version uniting Etruscan, Rhaetian, and Lemnian, due to the fragmentary (and secondary) nature of the currently available documents. However, many works of Helmut Rix have helped us understand the close connection between these languages.

This is a potential text of some lost Common Tyrrhenian language, by the time of its expansion into Etruria (i.e. already contaminated by Proto-Greek, and partially by Proto-Italic), with the help of some more or less accepted meanings (especially of Etruscan words) and common morphosyntactical features (Wallace 2008):

<div align="center">

akne tʰemnar-c

</div>

akne an lanes ein amai	*tʰemnar tefai;*
ikani bam cukie afke,	*ikani vel tul,*
ikani turs keli tefrake.	*akne tʰemnar efai:*
"kʰur mini maf,	*lautn tfakesi tʰemnar menke."*
tʰemnar efai: "vot akne!	*kʰur kene maf tfakesi,*
lautn, laukʰ, aknearas laneale	*eisi tep plutin kinakʰe,*
aknearas-um lanes ein ame."	*itani votku akne pesale lanśai.*

II. Laryngeal loss and vocalism

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(First draft published in October 2017)

The loss of Proto-Indo-European laryngeals is often described as multiple independent processes within each branch and proto-language.

However, there are striking similarities in the merging, colouring, vocalisation, and deletion processes that suggest a common period of laryngeal evolution.

In this paper we examine the potential evolutionary stages of laryngeals in the Common Indo-European period – after the separation of Proto-Anatolian –, and in early branches, with special emphasis on North-West Indo-European phonetic reconstruction.

II.1. Laryngeals

Today, the reconstruction of consonantal sounds to explain what was reconstructed before as uncertain vocalic *schwa indogermanicum* or *schwa primum* is firmly accepted in Indo-European (IE) studies in general, and there is a general agreement on where laryngeals should be reconstructed (Keiler 1970).

Even the number and quality of those laryngeals is today a field of common agreement, although alternative number of laryngeals and proposals for their actual phonemic value do actually exist. Reconstructed laryngeals are valid only for the oldest reconstructible stage using comparative grammar, i.e. Middle Proto-Indo-European or Proto-Indo-Anatolian (Kloekhorst 2016; Schmidt 2011; Jasanoff 2003)[xxviii], and potentially also Indo-Uralic (Hyllested 2009; Kloekhorst 2008).

These laryngeals are in most cases notated as $*h_1$, $*h_2$, $*h_3$ but sometimes also with their assumed realisation $*h_e$, $*h_a$, $*h_o$, or phonetic inventory, $*ʔ/*h$, $*χ/*ħ$, $*ɣʷ/ʕʷ$. A more traditional representation is found in $*a_1$, $*a_2$, $*a_3$, or $*ə_1$, $*ə_2$, $*ə_3$. Sometimes, a vocalic quality is assumed, $*Ee$, $*Ae$, $*Oe$.

Their evolution during Late Proto-Indo-European (LPIE), after the separation of Anatolian, is often assumed as a *loss* or *deletion* with certain common outputs in the daughter branches or proto-languages (Adrados 1998; Bomhard 2018; Koch 2013). However, it has also been stated that the three laryngeals might have survived until the final phase of LPIE (Rasmussen 1999). A certain support is found for the survival of laryngeals until after the separation (Cogwill 1960), but the general view is that they disappeared completely, leaving only indirect traces in historical languages (Sanker 2015).

As Clackson (2007) sums up: "Particularly puzzling is the paradox that laryngeals are lost nearly everywhere, in ways that are strikingly similar, yet

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[xxviii] Proposed first by Sturtevant (1942) the condition of Anatolian as an archaic language "sister" to Indo-European from an Indo-Hittite parent language, this is still rejected by some scholars (Joseph 2000; Kazaryan 2017).

apparently unique to each language branch. We can of course assume some common developments already within PIE, such as the effect of the laryngeals *h_2* and *h_3* to change a neighbouring *e* to *a* or *o*, but the actual loss of laryngeals must be assumed to have taken place separately after the break-up of the parent language (…) it would have seemed a plausible assumption that the retention of *h_2*, and possibly also *h_1* and *h_3*, is an archaism of Anatolian, and the loss of the laryngeals was made in common by the other languages."

Chronologically, there is no commonly agreed scheme as to the maintenance of laryngeals in daughter languages. Whereas there is some common ground whereby laryngeals were lost by the time when Late Indo-European languages were written down (Rasmussen 1999; Sukač 2014), its survival has been supported for certain late proto-languages, *e.g.* for Slavic as late as Charlemagne's times (Kortlandt 1975).

II.2. Laryngeal evolution

II.2.1. Late Proto-Indo-European

In the vocalic inventory of the current Proto-Indo-European reconstruction, the following simplified evolution paradigm is widespread (Beekes 2011; Meier-Brügger 2003; Ringe 2006; Adrados, Bernabé, and Mendoza 2010):

CIE	DIE	NWIE	PGk	PIIr
*iHC	*ihC	*$īC$	*$īC$	*$īC$
*uHC	*uhC	*$ūC$	*$ūC$	*$ūC$
*oH	*oh	*$ō$	*$ō$	*$ā$
*eh_1	*eh	*$ē$	*$ē$	*$ā$
*eh_2	*ah	*$ā$	*$ā$	*$ā$
*eh_3	*oh	*$ō$	*$ō$	*$ā$
*Hi	*i	*i	*i	*i
*Hu	*u	*u	*u	*u

Ho[xxix]	*o	*o	*o	*a
h₁e	*e	*e	*e	*a
h₂e	*a	*a	*a	*a
h₃e	*o	*o	*o	*a

CIE	*Ch₁C*	*Ch₂C*	*Ch₃C*	*VHV*	*CRHC*
DIE	*Ch°C*	*Ch°C*	*Ch°C*	*VhV*	*CR°hC*
NWIE	*CaC*	*CaC*	*CaC*	*V̄*	*CRᵃhC*
PGk	*CeC*	*CaC*	*CiC*	*V̄*	*CRĒC*
PIIr	*CiC*	*CiC*	*CiC*	*V̄*	*CRVhC*

II.2.2. Common Indo-European

A differentiation of Late Indo-European in an early, Common Indo-European (CIE), and a late, Disintegrating Indo-European (DIE) stage is necessary.

After the separation of Proto-Anatolian ca. 4500 BC, Common Indo-European developed probably in the eastern Volga-Don region of the Pontic-Caspian steppes, in the late Khvalynsk and late Repin groups, ca. 4000-3500/3300 BC (Anthony 2007; Quiles 2017).

In this Common Indo-European phase, trends observed in the last stage of Proto-Indo-Anatolian as shown by Proto-Anatolian might have included the following:

- Potential uvular-to-pharyngeal shift of *h₂*, *h₃* (Weiss 2016).
- Early merging and deletion processes (Kloekhorst 2006; Bomhard 2004):
  - PIA *h₁R-* and *h₃R* → CIE *hR*
  - PIA *VHC* → CIE *V̄C*

[xxix] On the *h₂o* problem, see De Decker (2014).

o PIA *Ho-* → CIE *ho-*

An auxiliary vowel was probably inserted often in certain positions, which can be reconstructed for all branches alike: *Ch₁C → *Ch₁°C, *Ch₂C → *Ch₂°C, *Ch₃C → *Ch₃°C.

II.2.3. Disintegrating Indo-European

With the Disintegrating Indo-European stage we assume a period of a Northern-Southern dialectal division and internal Southern dialectal split (between Palaeo-Balkan and Pre-Indo-Iranian groups), in which the whole community remained still in contact, allowing for the spread of innovations such as a generalised vocalisation of the auxiliary vowel and the merging of laryngeals (Adrados 1998; Bomhard 2018; Koch 2013).

This linguistic scheme is compatible with the spread of the late Repin/early Yamna culture from ca. 3500/3300 BC westward into the north Pontic steppe, and eastward as a group that would develop the language ancestral to Tocharian (Anthony 2007; Quiles 2017). The time to most recent ancestor of eastern Yamna lineages show that Palaeo-Balkan and Pre-Indo-Iranian groups were already developed in this common early Yamna stage, while the common western European lineages had yet to split.

A generally agreed absence of a common Proto-Indo-European *-a* (Lubotsky 1989) contrasts with the unstable vocalic system of this period.

The evolution CIE → DIE can therefore be represented as follows:

- Colouring of *-e-* by laryngeals (but long *ē* more stable → uncoloured, "Eichner's law"), although it has been proposed as a subphonemic feature (Kortlandt 2003-2004).
- Loss of laryngeals after and before low vowels.
- Merge of laryngeals *h₁, *h₂, *h₃ → *h (with vocalic allophone *h̥), i.e. probably the voiceless laryngeal fricative /h/ (Szemerényi 1967; Collinge 1970; Bomhard 2004).
- *HC- → *C- in all dialects but for Palaeo-Balkan languages (Greek, Phrygian, and probably Armenian). In this old branch, they are retained

as colourised vowels (Bernabé 1975), but there are exceptions (Hinge 2007).

- **CH°C → *CHəC → *ChVC → *CVC*, with the first phase more common in PIA, and the last one common in the dialectal split phase (see below).

- Metathesis of **CHIC-* to **CIHC-*.

- Eichner's law.

- Pinault's law **-VCHi̯ → *VCi̯ -* (Pinault 1982).

- **-ERH → *-ĒR*. The Saussure effect (Nussbaum 1997; Yamazaki 2009; van Beek 2011) accounts for some irregularities in the outcome of laryngeals (especially with **-h₂*, but not limited to it) whereby CIE dialects do not show a usual reflection of the inherited sequence. It "reflects something that happened, or failed to happen, already in the proto-language" (Lubotsky 1997):
  - **HRo- → *Rŏ̄-*.
  - **-oRH-C- → *-oRC-*.

- **CIHV- → *CIJV-*.

- **-CR̥/IHV- → *-CR/IV-* in compounds.
  - In the group **CR̥HV*, a vowel can appear before the resonant, as the laryngeal disappears. That vowel is usually coincident with the vocalic output that a resonant alone would usually give in the different dialects, so it can be assumed that generally **CR̥HV→ *C(V)RV*, although exceptions can indeed be found (Woodhouse 2011). A common example of parallel treatment within the same dialect is Greek *pros/paros < *pros/p°ros* (Adrados, Bernabé, and Mendoza 2010).

- **(-)CHV- → *(-)CV-* in all branches, but with some showing innovations such as aspiration before **h₂*, sonorants, gemmination, etc.

- **CEHI- → *CEI-*.

- **CEHE- → *CEE-*.

- *-EH → *-Ē*, with special cases for the group *HEH* in Palaeo-Balkan languages (Bernabé 1975).

- *RHC-* → *RVC-*, or "Beekes' law", with laryngeal in anlaut vocalised in most languages, and the resonant becoming consonantal.

- *-Hs-* probably evolved into geminated *-ss-* in Anatolian and Greek—and thus potentially Palaeo-Balkan (Ledo 2002).

II.2.4. Late Indo-European dialects

Some laryngeal reflexes reached DIE dialects differently, but still with some apparent contacts. They must have happened after the westward expansion of the Yamna culture, during the existence of a strong network of exchange between Yamna settlers:

- Loss of word-initial laryngeals *H* → Ø, but for Palaeo-Balkan languages, which appear to show a general output *H°→ *Hə→ **e**, **a**, **o** (an evolution which had already begun in CIE, see above).

- *CHC* → *CHəC* → Western DIE *ChaC* → NWIE *CaC*, as found in Italo-Celtic (Schrijver 1991; Zair 2012), Germanic (Ringe 2006), and Tocharian, as well as in Armenian (Mondon 2008) and Albanian. Alternative fate was laryngeal loss in certain environments *CC* (Byrd 2010).
  - In Proto-Greek, CIE *CHəC* evolved into *CaC*, *CeC*, *CoC* depending on the nature of *H*.
  - Eastern DIE *ChiC* evolved into PIIr. *CiC*.

- DIE *CR̥HiV-* → NWIE *CR̥iV-*, as found in Italo-Celtic *CaR̥iV*, cf. Lat. *cariē*s < *kr̥h₂-i̯ē-* (Schrijver 1991), also found in Greek and perhaps Sanskrit.

- DIE *HJV-* → NWIE *JV-* as found in Italo-Celtic (Schrijver 1991; Zair 2012), Germanic (Ringe 2006), Tocharian, and also in Indo-Iranian, Armenian, and Albanian (Zair 2012).

- DIE *$R̥HC$- → NWIE *$RăC$-, as found in Italo-Celtic (Zair 2012), cf. Lat. *lăbāre* (Schrijver 1991), and Germanic (Beekes 1988).

- DIE *HIC- → NWIE *IC-, as found in Italo-Celtic (Schrijver 1991; Zair 2012), Germanic (Ringe 2006), and Tocharian, as well as Albanian, Indo-Iranian.

- DIE *$CEHR̥$- → NWIE *CER-, with an unclear intermediate development, but necessarily parallel in Italo-Celtic, Germanic, and Indo-Iranian (Zair 2012).

- DIE *$CIHR̥$- → NWIE *$CIJR̥$- in Italo-Celtic, Indo-Iranian (Schrijver 1991; Zair 2012).

- DIE *-IH → NWIE *-$Ī$ as found in Italo-Celtic and Germanic, as well as Albanian and Indo-Iranian. Vocalisation in Greek-Armenian and Tocharian.
  - CIE *-ih_2 ending in auslaut had an alternative form *-$i̯°h_2$, DIE *-ih/-$i̯əh$, which could produce *-$ī$, *-$i̯ă̆$, alternating forms that are found even within the same dialect.

- Dybo's rule in North-West Indo-European: short vowels as output of *$CHIC$-, or *$CIHC$-, with long vowels remaining when stressed, but shortened in pretonic syllables, as found in Proto-Italic, Proto-Celtic and Proto-Germanic (Zair 2012; Garnier 2015).

The contentious Osthoff's law, which affected all DIE branches but for the eastern territories (languages ancestral to Tocharian and Indo-Iranian), must have been a general trend after the start of the Yamna expansion to the west, i.e. after ca. 3100/3000 BC.

When *H is in a post-plosive, prevocalic position, the consonantal nature of the laryngeal values is further shown *$CHVC$ → *C^hVC. This is more frequent in PIIr, cf. *$pl̥th_2ú$- → Ved. *$pr̥t^hú$-*, but it appears also in the perfect endings, cf. Gk. *$oist^ha$*. This development might have happened in North-West Indo-European, and later devoiced to *CVC.

The proposed glottal stop *$ʔ$ reconstructed for the merged laryngeal in scattered early proto-language remains (Mayrhofer 2005; Lubotsky 2018) is the most likely phonetic evolution of DIE *h before fully disappearing.

II.2.5. Laryngeal remnants in early Indo-European proto-languages?

II.2.5.1. Glottal stops

Apparently a reflect of consonantal laryngeals is found between non-high vowels as *hiatuses* (or *glottal stops*) in the oldest Indo-Iranian languages, in Homeric Greek (Lindeman 1987), and potentially in Germanic (Connolly 1980). However, there is not enough evidence to explain such irregularities by laryngeal remains instead of by the more obvious licence in metric (Kümmel 2014).

-iH/-i̯•H

In old compositions, some final short vowels are found as heavy syllables, cf. Skt. *devī́ etu*, or vocat. *vŕki, tanu* (Lindeman 1987; Beekes 1982): "The Vedic phrase *devyètu*, i.e. *devì etu* is best understandable if we suppose that *devī́* 'goddess' still contained the laryngeal form *$dewíh$ (with *-ih<*-ih₂) at the time of the formulation of the verse in question. In the phase *-íh it was possible for the laryngeal simply to disappear before a vowel" (Meier-Brügger 2003). Other common example used is *$u̯ŕ̥kih$.

The laryngeal survival in Proto-Indo-Iranian finds limited support for a preservation in intervocalic position in the Gāθās and in the Vedas (Gippert 1996), which is also controversial (Kümmel 2014; Beguš 2015).

It is not justified, then, why these examples must represent a sort of unwritten laryngeal, and not an effect of it, i.e. a laryngeal hiatus or glottal stop, from older two-word sandhis that behave as a single compound word.

Interesting is also that they are in fact from words already alternating in CIE *-ih₂/*-i̯°h₂, or DIE *-ih/-i̯əh, which reflect different syllabification in Indo-Iranian vs. Greek and Tocharian, whilst "[t]he source of the difference is not fully understood"(Fortson 2010).

It has long been recognised that the treatment of word-final laryngeals shows a strong tendency to disappear (so *e.g.* in Hittite), and most of the time it appears associated with morphological elements (Adrados, Bernabé, and Mendoza 2010).

In line with this problem is that the expected case of *-*aH* stems is missing, which makes it less likely that Indo-Iranian examples come from a common hypothetic PIIr. stage in which a word-final *-*H* had not still disappeared, and more likely that these—as well as the Homeric Greek and Germanic examples—were particular cases with certain phonetic rules in action. If they could be traced back to an ancestral stage of each language, they would be frozen remains (probably of a glottal stop) in certain formal expressions.

*-*aH*

The sandhi variant in *-*aH* is found in Greek and Old Church Slavonic (Meier-Brügger 2003; Ringe 2006): In both "clear traces are missing that would confirm a PIE ablaut with full grade *-*eh₂*- and zero grade *-*h₂*- (…)

That is why it appears as if the differentiation between the nominative and vocative singular in this case could be traced to sandhi-influenced double forms that were common at a time when the stems were still composed of *-*ah₂*, and the contraction *-*ah₂*- →*-*ā*- had not yet occurred." For an original zero grade alternation in Greek, Latin, Slavic, and Tocharian, see (Kortlandt 2017)

This was rejected by Szemerényi (1999): "The shortening of the original IE ending -*ā* to -*ă* is regular, as the voc., if used at the beginning of a sentence or alone, was accented on the first syllable but was otherwise enclitic and unaccented; a derivation from -*ah* with the assumption of a prevocalic sandhi variant in -*a* fails therefore to explain the shortening."

Laryngeal hiatus

The Rig Veda preserves many words that could be interpreted as though some remnant of a laryngeal, probably a glottal stop, was still present between vowels, a phenomenon called laryngeal hiatus. For example, Skt. *vā́tas* 'wind'

must sometimes scan trisyllabically as *va'atas*, cf. OAv. *va.ata-*, possibly from PIIr. *$u\acute{a}^{\jmath}ata$- < Pre-PIIr. *$\underset{\circ}{u}eh\underset{\circ}{n}tos$ < CIE *h_2ueh_1-$\underset{\circ}{n}t$-o- → DIE *$\underset{\circ}{u}eh\underset{\circ}{n}tos$ → NWIE *$\underset{\circ}{u}entos$; cf. Lat. *ventus*, W *gwynt*, Gmc. *$\underset{\circ}{u}indaz$; but PT *$\underset{\circ}{u}\underset{\circ}{i}ent\ddot{e}$ < *$\underset{\circ}{u}\bar{e}ntos$.

Compare also potential examples Ved. *ca-kar-$^{\jmath}a$* (the *$^{\jmath}$* still preserved in the period of the activity of Brugmann's law), or Ved. *náus* < *na$^{\jmath}$us*. Such finds would support a vocalisation of CIE *$\underset{\circ}{n}$, *$\underset{\circ}{m}$ → PIIr. *a earlier than the loss of laryngeal (or glottal stop) in that environment.

II.2.5.2. *$C\underset{\circ}{R}HC$

The group *$C\underset{\circ}{R}HC$ is explained differently for the individual dialects without a general paradigm, with dialectal outputs explained as (Beekes 2011; Meier-Brügger 2003):

- *$CR°hC$ into Proto-Tocharian *$CRaC$, Italic and Celtic *$CR\bar{a}C$, Ligurian *$CRaC/CR\bar{a}C$ (Prósper 2018), Proto-Armenian *$CRaC$, i.e. an output similar to *CHC in these dialects, which points either to an ancient trend to a-vocalism (i.e. NWIE *CR^ahC), or to an assimilation of the group to the output of *CHC.
  - PIE *$C^w\underset{\circ}{l}HC$ into NWIE *$C^{w°}lhC > *C^ulC > *CulC$, as found in Italic and Celtic, in common with the general Germanic output (Prósper 2017).
  - Germanic *$C\underset{\circ}{R}C$. There is difficulty reconstructing the potentially old Northern variant *-HC- *-aC- (Müller 2007), among them the scarcity of surviving traces of laryngeals (Fortson 2010).
  - Balto-Slavic *$CVRC/C\bar{V}RC$, with the same vocalic output as *$C\underset{\circ}{R}C$, and distinction by accentuation (Darden 1990), which would mean a merging of the laryngeal posterior to the vocalisation of sonorants.
- In Proto-Greek, the original laryngeal determined the vocalic output: e.g. *$\underset{\circ}{r}h_1$→*$\underset{\circ}{r}°h_1$→*reh. *RH gives $R\bar{a}^x$ when the accent follows and a^xRa^x when the accent is on the resonant.

A common example of the different dialectal outputs of the *CRHC* model in PIE *gn̥h₁-tó-* 'created, born':

- Vedic *źātá-* < PIIr. **jātó-* < **jahtó-* < **gⁱn̥ʔtó-*, which means that the laryngeal merged after the evolution DIE **n̥* → PIIr. **a*.

- DIE **gnᵊʔtó-*; cf. for the same intermediate grade PGk. **gnētó-* < **gnᵊh₁tó-*, but Armenian *cnaw* < **gnᵃhtó-*.

- Pre-NWIE **gn̥ʔtó-* into PT **gnató-* < ***gnᵃʔtó-*, Ita.-Cel. **gnātó-* < ***gnaʔtó-*, Gmc. **kunda-* < ***gn̥tó-*, Bal.-Sla. **gìnta-?* < ***gìnʔta-?* per Hirt's law, following the **pl̥h₁nó-* example (Darden 1990).

The palma rule in Latin, which in turn seemed to have distinct developments depending on whether CIE **CR̥ḤC-* sequences were accented or not (Höfler 2017), points more strongly to the unstable nature of compounds including sonorants.

A common explanation of certain alternating forms found even in the same dialect is based on late dialectal morphological and analogical changes (Adrados, Bernabé, and Mendoza 2010): "The different solutions in this case depend solely on two factors: a) if there are one or two auxiliary vowels to facilitate the pronunciation of this group; b) the place where they appear." So *e.g.* a group **CR̥hC* could be pronounced in DIE with one vowel, **CR°hC* or **C°RhC*, or with two, **C°R°hC*, **C°Rh°C*, or **CR°h°C*.

Compounds with sonorants like **CR̥C*, **R̥R̥V*, **TRV*, and **SMV* among others are known to behave differently even within the same languages and proto-languages (Adrados, Bernabé, and Mendoza 2010). It is only natural that DIE or NWIE groups that should be traced back to **CRV* and **VRC* could similarly show unstable outputs that confound any attempt to obtain a stable sound law. That 'instability' solution could account for all variants found in the different branches, and within them.

Different outputs are proposed for **CRH* groups before certain vowels (Lubotsky 1997): "It is clear that the "short" reflexes are due to laryngeal loss in an unaccented position, but the chronology of this loss is not easy to

determine. If the laryngeal loss had already occurred in PIIrr., we have to assume that PIIrr. *CruV subsequently yielded CurvV in Sanskrit. The major problem we face is that the evidence for the phonetically regular outcome of *CriV and *CruV in Indo-Iranian is meager and partly conflicting."

II.2.5.3. Cogwill's law

The contentious Cogwill's law seems to be a late, independent development reconstructed for three Proto-Germanic forms, whereby $*h_3$ and possibly $*h_2$ would turn into Proto-Germanic $*k$ when directly preceded by a sonorant and followed by $*u̯$. This would need an evolution CIE $*h_3^w \rightarrow *g^w$ that remained only in Germanic, and is as such a poor explanation of these few peculiar developments.

II.2.5.4. Language contacts

It should be expected that surviving laryngeals in North-West Indo-European should be seen in borrowings attributed to the language (or its early dialects) or be necessary to reconstruct its proto-languages. However:

- Merge of laryngeals into a single DIE phoneme—probably the voiceless laryngeal fricative /h/—is supported by the Late Proto-Uralic borrowings with a single phoneme (*ś), and by the advanced process of laryngeal loss attested in the borrowings (see above *§2.3.2. Late Uralic–Late Indo-European contacts*).

- No laryngeal is necessary for Proto-Italic or Proto-Celtic reconstructions (de Vaan 2008; Matasović 2009).

- No laryngeal can be reconstructed for Palaeo-Germanic (Pre-Germanic to Proto-Germanic) loanwords (Schrijver 2014), either in Proto-Finno-Samic or in later contacts (see above *§4.18.4.1. Palaeo-Germanic borrowings*).

- Against the reconstruction in Kortlandt (2016), no laryngeal can be reconstructed for loanwords of Proto-Balto-Slavic, Early Proto-Baltic,

or Proto-Slavic into western Finno-Volgaic languages (see above *§4.18.5. Contacts with Balto-Slavic*).

II.2.6. Laryngeal reflexes in North-West Indo-European

Assuming a common North-West Indo-European community and language, we can establish these common developments, from which to derive changes in daughter proto-languages Italic, Celtic, Germanic, and Balto-Slavic.

II.2.6.1. Initially before consonant or resonant

Initially before PIE consonants or resonants laryngeals are lost. This is the result in most historic languages, except in Greek, Armenian and Anatolian, where they are preserved with some limitations in all of them.

- PIE *$h_1$rud^{h}rós → NWIE *rud^{h}rós, 'red'; cf. Gk. *erut^{h}rós*, Lat. *ruber*, Goth. *rauþs*.
- PIE *$h_1$smós(i) → NWIE *smos(i) 'we are'.
- PIE *$h_1$imós(i) → NWIE *imós(i) 'we go'.
- PIE *$h_2$iu̯-u̯Hen^s- → NWIE *i̯úu̯ōn 'young', cf. Lat. *iuvenis*, OInd., *i̯úvan-*.
- PIE *$h_2$ster^s → NWIE *stḗr 'star', but cf. Gk. *astḗr*.
- PIE *$h_3$lígos → NWIE *lígos 'little, scarce', cf. Lith. *ligà* 'illness', Gk. *olígos*, Arm. *ałk`* 'poor'.
- PIE *$h_3$minég^{h}mi / *$h_3$míng^{h}oh$_2$ → NWIE *minég^{h}mi / míng^{h}ō 'I piss'.
- PIE *h_3r̥néumi → NWIE *r̥néumi 'I move'.
- PIE *$h_1$úpo → NWIE *úpo 'under'.
- PIE *$h_{2/3}$upélos → NWIE *upélos 'evil'.
- PIE *h_2u̯ésoh$_2$ → NWIE *u̯ésō 'I stay'.
- PIE *$h_1$pi̯oh$_2$ → NWIE *ápi̯ō, 'I reach'.
- PIE *h_3b^{h}ruHs → NWIE *b^{h}rūs, 'eyebrow'.

II.2.6.2. Initially before vowel

- PIE *$h_1$ésmi → NWIE *ésmi 'I am'.

- PIE *$h_1$ómHsos* → NWIE *$ómsos$ 'shoulder'.

- PIE *$h_1$édsi* → NWIE *$édsi$ 'you eat'.

- PIE *$h_1$óng^w-ol^s* → NWIE *$óng^wōl$ 'coal'.

- PIE *$h_1$eíti* → NWIE *$eíti$ 'goes'.

- PIE *$h_1$óimos* → NWIE *$óimos$ 'march'.

- PIE *$h_1$egóh$_2$* → NWIE *$egṓ$ 'I'.

- PIE *$h_1$óg^{wh}is* → NWIE *$óg^{wh}is$ 'worm, snake'.

- PIE *$h_2$énus* → NWIE *$ánus$ 'grandmother'.

- PIE *$h_1$órsos* → NWIE *$órsos$ 'tail'.

- PIE *$h_2$égeti* → NWIE *$ágeti$ 'bears'.

- PIE *$h_2$ógmos* → NWIE *$ógmos$ 'track'.

- PIE *$h_3$enos* → NWIE *$ónos$ 'load'.

- PIE *$h_2$eiṷós* → NWIE *$aiṷós$ 'lifetime-lasting'.

- PIE *h_3éṷis* → NWIE *$óṷis$ 'sheep'.

- PIE *$h_2$óiṷu* → NWIE *$óiṷu$ 'vital energy'.

- PIE *$h_3$épos* → NWIE *$ópos$ 'work'.

- PIE *$h_3$ólh$_1$neh$_2$* → NWIE *$ṓlnā$ 'elbow'.

- PIE *$h_3$éidos* → NWIE *$óidos$ 'tumor'.

- PIE *$h_3$ók^{w}o-* → NWIE *$ók^wos$ 'eye'.

II.2.6.2.1. *Special cases: initial vocalisation*

- PIE *$h_2$íh$_2$sṷeh$_2$* → NWIE *$óisịā$ 'rudder'.

- PIE *h_2uH$_1$i-* → NWIE *$áṷis$ 'bird'.

- PIE *h_2ń̥h$_2$e* → NWIE *$ána$ 'on'.

- PIE *h_2ŕ̥gn̥tom* → NWIE *$árgn̥tom$ 'silver'.

- PIE *(H?)álb^{h}os* → NWIE *$álb^hos$, 'white', cf. Hitt. *alpa-*, 'cloud'.

II.2.6.3. *Double initial laryngeals*

- PIE *$h^oh^w_2$etmos* → NWIE *$átmos$ 'breath'.

- PIE *$h_{2/3}$eh$_3$imi* → NWIE *$ṓimi$ 'I believe'.

- PIE *$h^o h^w{}_2 etmén^s$ → NWIE *$ātmḗn$ 'spirit'.

- PIE *$h_3 éh^w{}_3 smi$ → NWIE *$ṓsmi$ 'I open'.

- PIE *$h_3{}^o h^w{}_3 sis$ → NWIE *$óusis$ 'ear'.

- PIE *$Héh^i{}_2 dmi$ → NWIE *$ā́dmi$ 'I dry'.

- PIE *$H_1 óH_2 u̯i̯om$ → NWIE *$ṓu̯i̯om$ 'egg'.

- PIE *$h_3 eh^w{}_3 s$ → NWIE *$ōs$ 'mouth'.

- PIE *$H^o{}_3 eH^i{}_2 kris$ → NWIE *$ókris$ 'summit'.

- PIE *$H^o H^{wo}{}_1 los$ → NWIE *$áulos$ 'tube'.

II.2.6.4. Internally before a vowel

- PIE *$d^h h_1 ent$ → NWIE *$d^h ent$ 'they placed'.

- PIE *$sth_2 ent$ → NWIE *$stant$ 'they stood'.

- PIE *$dh_3 ent$ → NWIE *$dont$ 'they gave'.

- PIE *$h_2 u̯oh_1 d^h h_1 éi̯oh_2$ → NWIE *$u̯ōd^h éi̯ō$ 'I push'.

- PIE *$sk^w h_2 ólos$ → NWIE *$sk^w ólos$ 'stumbling' (noun).

- PIE *$h_2 u̯óh_1 d^h h_1 onom$ → NWIE *$u̯ṓd^h onom$ 'pushing'.

- PIE *$skélh_2 onom$ → NWIE *$skélonom$ 'splitting'.

- PIE *$somh_2 ós$ → NWIE *$somós$ 'same'.

- PIE *$réth_2 onti$ → NWIE *$rétonti$ 'they run'.

- PIE *$h_1 ésHos$ → NWIE *$ésos$ 'master, lord'.

II.2.6.5. Internally before vowel, after resonant

- PIE *$mélh_2 esi$ → NWIE *$mélesi$ (not *$mélasi$) 'you grind'.

- PIE *$sténh_2 esi$ → NWIE *$sténesi$ (not *$sténasi$) 'you resound'.

II.2.6.6. Second position in compounds

- PIE *$neu̯ognh_1 ós$ → NWIE *$neu̯ognós$ 'newly born'.

- PIE *$k^w ék^w lh_1 o$- → NWIE *$k^w ék^w lom$ 'wheel'.

II.2.6.7 Internally after a vowel

- PIE *$h_1 réh_1 poh_2$ → NWIE *$rḗpō$ 'I creep'.

- PIE *Hréh₃doh₂ → NWIE *ródō 'gnaw'.

- PIE *meh₂térˢ → NWIE *mātḗr 'mother'.

- PIE *meh₂is → NWIE *māis 'more'.

- PIE *péh₂smi → NWIE **pā́smi* 'I heed'.

- PIE *préh₂tis → NWIE **prā́tos* 'sale'.

- PIE *dʰidʰéh₁mi → NWIE *dʰidʰḗmi 'I put'.

- PIE *gígnh₁H₂ei → NWIE *gígnāi 'I am born'.

- PIE *stistéh₂mi → NWIE **stistā́mi* 'I stand'.

- PIE *didéh₃mi → NWIE *didṓmi 'I give'.

- PIE **h₃néhᵘ₃mn̥* → NWIE **nṓmn̥* 'name'.

- PIE **pr̥néh₂mi* → NWIE **pr̥nā́mi* 'I sell'.

- PIE **soh₁déi̯oh₂* → NWIE **sōdéi̯ō* 'I settle'.

- PIE *dhoh₁mós → NWIE *dʰōmós 'thesis, opinion'.

- PIE *stóh₂nom → NWIE **stā́nom* 'place'.

- PIE *stóh₂los → NWIE *stṓlos 'table'.

II.2.6.7.1. Special case: Osthoff's law

- PIE **h₂u̯éh₁n̥tos* → NWIE **u̯éntos* 'wind'.

- PIE *meh₁msóm → NWIE *mĕmsóm 'meat'.

II.2.6.7.2. Special case: Stang's law

- PIE *pipéh₃imi → NWIE *pipṓmi 'I drink'. Extended to other forms:

- PIE *pipéh₃iti → NWIE *pipṓti 'he drinks'.

II.2.6.7.3. Special case: laryngal metathesis

- PIE ***spi̯Hutós* → **spi̯uHtós* → NWIE **spi̯ūtós* 'spat' (part.).

- PIE **bʰh₂utós → *bʰuh₂tós → NWIE *bʰūtós 'been'.

- PIE **siHutós → **si̯uHtós* → NWIE **si̯ūtós* 'sewn'.

- PIE **lh₃itós → *lih₃tós → NWIE *lītós 'poured'.

- PIE **ph₃ilós → *pih₃lós → NWIE *pīlós 'having drunk'.

- PIE *ph₃itós → NWIE *pītós 'drunk'.

- PIE *pHutós → NWIE *pūtós 'cleaned'.

- PIE *liHtós → NWIE *lītós 'poured'.

- PIE *gʷiHu̯ós → NWIE *gʷīu̯ós 'alive'.

II.2.6.8. Internally between two consonants

- PIE *ph₂térˢ → NWIE *patḗr 'father'.

- PIE *kh₃tós → NWIE *katós 'sharp'.

- PIE *mh₂déh₁i̯oh₂ → NWIE *madḗi̯ō 'I am wet'.

- PIE *h₂u̯oh₁dʰh₁tós → NWIE *u̯odʰatós 'pushed'.

- PIE *pr̥nh₂mós(i) → NWIE *pr̥namós(i) 'we sell'.

- PIE *dhidʰʰh₁mós(i) → NWIE *dʰidʰamós(i) 'we put'.

- PIE *stísth₂mos(i) → NWIE *stístamos(i) 'we stand'.

- PIE *dídh₃mos(i) → NWIE *dídamos(i) 'we give'.

- PIE *sth₂tós → NWIE *statós 'stood'.

- PIE *peph₃té → NWIE *pepaté 'keep drinking' (2ⁿᵈ pl.).

II.2.6.8.1. Special case: concave syllable between two consonants

- PIE **sh₁déh₁i̯oh₂ → NWIE *sedḗi̯ō 'am seated'.

- PIE **lh₁góm → NWIE *legóm 'I collected'.

- PIE **lh₁bʰóm → NWIE *labʰóm 'I caught'.

- PIE **luh₃óm → *lh₃u̯óm → NWIE *lou̯óm 'I washed'.

II.2.6.9. Internally between consonant and resonant or between two resonants

II.2.6.9.1. Generalised Saussure effect

Some examples are affected by "Pinault's law" (Byrd 2015).

- PIE *tórh₁mos → NWIE *tórmos 'hole'.

- PIE *kl̥mh₂-rós → NWIE *klamrós 'weak'.

- PIE *gémh₁ro- → NWIE *gémros 'son-in-law'.

- PIE *(s)porHnós → NWIE *pornós 'feather'.

- PIE *pélh₁u → NWIE *pélu 'much'.

- PIE *bhólh₁/₂i̯om → NWIE *bʰóli̯om 'leaf'.
- PIE *h₂érh₃u̯r̥ → NWIE *áru̯ar 'grain'.
- PIE *míHi̯etoi → NWIE *mí̄i̯etoi 'decreases'.
- PIE *kʷríh₂tor → NWIE *kʷrī́tor 'was bought'.
- PIE *dʰúh₂lis → NWIE *dʰū́lis 'soot'.
- PIE *bʰh₂úi̯etoi → *bʰúh₂i̯etoi → NWIE *bʰū́i̯etoi 'becomes, begins'.
- PIE *léu̯h₂trom/ *léh₂u̯trom → NWIE *lóutrom 'bath'.
- PIE *skélh₂tis → NWIE *skéltis 'splitting'.
- PIE *skl̥h₂i̯oh₂- → NWIE *skl̥i̯ō 'I split'.
- PIE *térh₁i̯oh₂ → NWIE *téri̯ō 'I rub'.
- PIE *sokʷh₂i̯ós → NWIE *sokʷi̯ós 'allied'.
- PIE *megh₂i̯ós → NWIE *megi̯ós 'bigger'.
- PIE *kn̥h₁i̯ó- → NWIE *kani̯ós 'recent'.
- PIE *gn̥h₁i̯etoi (=*gígnetoi) → NWIE *gnai̯etoi 'is born'.
- PIE *sth₂i̯éh₁m → NWIE *stai̯ḗm 'I would stand' (aor.).
- PIE *sth₂ih₁nt → NWIE *stai̯ī́nt 'they would stand'.
- PIE *dh₃i̯éh₁m → NWIE *dai̯ḗm 'I would give' (aor.).
- PIE *dh₂ih₁nt → NWIE *dai̯ī́nt 'they would give'.
- PIE *h₂u̯oh₁dʰh₁i̯óm → NWIE *u̯odʰai̯óm 'I pushed' (aor).

II.2.6.9.2. Special case: Retention of laryngeal

- PIE *h₂énh₁mos → NWIE *ánˀmos 'breath, soul', cf. Toch. A *āñcäm* (obl. *āñm-*), B *āñme* PT *āñc(ä)me* 'self, soul', Lat. *animus*, Osc. *anamúm*, OIr. *animm*, OFris. *omma*.
- PIE *kerh₂srom → NWIE *kerˀsrom 'brain'.
- PIE *temh₁sreh₂e → NWIE *temˀsrā 'darkness', cf. OInd. *tamisra*, Lat. *Tenebrae*. Compare also *e.g.* PIE *temHs-* → OHG *demar*, 'twilight'. However, there are also reasons to reject such reconstruction in favour of PIE *temHosó-*, as OInd. *tamasá-*, 'dark-coloured' (Müller 2007).

II.2.6.9.3. Special case: Internal vocalisation

- PIE *sh_2neh_2mi → NWIE *sánāmi* 'I satiate'.

- PIE *$térh_1d^hrom$ → NWIE *$téred^hrom$* 'auger', cf. Lat. *terebra*, Gk. *téretron*, OIr. *Tarathar*.

- PIE *$kr̥tús$ → NWIE *kartús* 'strong'.

II.2.6.10. Blocked laryngeal with a resonant

The regular reflex of *$CR̥HC$ in Italic and Celtic is *$CR̄aC$ no matter which laryngeal is involved. The $ē$ found in Italic (in Lat. *plēnus*, Umb. *plener*) and partially Celtic (in Corn. *luen*, Bret. *leun*) is likely an especial dissimilation not to confuse the word with *$plānos$. Analogy with the corresponding perfect is the common explanation for other results different from $ā$, as found in certain participles; cf. *nōtus*, *sprētus*, *crētus*, etc. (Bolotov 2012).

- PIE *$pl̥h_1nós$ → NWIE *$pl̥ʔnós$* 'full', cf. Ita. *$plānos$, Cel.*hlēn-, *hlān-, Gmc. *$φullaz$, Bal. *$pîlna$-, Sla. *pĭlnŭ.

- PIE *$gr̥h_2nóm$ → NWIE *$gr̥ʔnóm$* 'corn', cf. Lat. *grānum*, OIr. *grān*, Gmc. *kurna-, Bal. *žirniã̃, Sla. *zĭrno.

- PIE *$gn̥h_1tós$ → NWIE *$gn̥ʔtós$* 'born', cf. Lat. *gnātus*, Umb. *natine*, OIr. *cned*, Gaul *cintu*-, Gmc. *kundaz, Bal. *žn̂ôta-.

- PIE *$gn̥h_3tós$ → NWIE *$gn̥ʔtós$* 'known', cf. Toch. A. *āknats*, *aknātsa*, Lat *nōtus* (but Lat. *gnāvus*<*$gn̥h_3uós$, 'wise'), OIr. *gnāth*, Gmc. *kundaz, Bal. *žint-, Sla. *žĭn-.

- PIE *$pr̥h_2uos$ → NWIE *$pŕ̥ʔuos$* 'first', cf. PT *pärue, Sla. *pĭrvŭ.

- PIE *$str̥h_3tós$ → NWIE *$str̥ʔtós$* 'strewn', cf. Lat. *strātus*, OIr. *sreth*, Bal. *stirtẫ, Sla. *-stĭrtŭ.

- PIE *$g^wr̥h_2ús$ → NWIE $g^wr̥ʔuús$ 'heavy', cf. Lat. *gravis* (*brutus*), MIr. *bair* (*bruth*), Gmc. *kuru-, Bal. *grûta-.

- PIE *$pr̥h_2tós$ → NWIE *$pr̥ʔtós$* 'sold'.

- PIE *$kŕ̥h_2tis$ → NWIE *$kŕ̥ʔtis$* 'wickerwork'.

- PIE *$pépr̥h_3th_2ei$ → NWIE *$pépr̥ʔtai$* 'you got production'.

- PIE **pépr̥h₂dʰi* → NWIE **pépr̥ʔdʰi* 'keep selling!'

However, no evidence for laryngeal after **r̥* can be traced in:

- PIE **u̯éu̯r̥th₂ei* → NWIE **u̯éu̯r̥tai* 'you got found'.

II.2.6.10.1. Special case: Laryngeal lost by generalised Saussure effect

For example in cases of **C_{red.}HRC* such as:

- **HRoC → *RoC* in Proto-Greek; in NWIE the general rule is laryngeal loss for any vocalism:
  - PIE **h₃meigʰ-* 'to urinate' → NWIE **méigʰō, *mingʰō, *moigʰós*, but cf. Gk. *omeíkʰō / moikʰós*.
- **CoRHC → *CoRC*:
  - PIE **kólHnis* → **NWIE kólnis* 'hill'.
  - PIE **sólh₂u̯o-* → **sólu̯o-* 'all, the whole'.

II.2.6.10.2. Special case: With brief resulting vowel

- PIE **pŕ̥Htis* → NWIE **prátis* 'fern'.
- PIE **kń̥h₂meh₂* → NWIE **kánmā* 'leg'.

II.2.6.10.3. Special case: Lost laryngeal in a compound

- PIE **kompl̥h₁nós* → NWIE **kompl̥nós* 'extremely full'.
- PIE **komgnh₃tós* → MID **komgn̥tós* 'completely known', cf. Lat. *cognitus*.

II.2.6.10.4. Special case: Palma rule

- PIE **pĺ̥h₂meh₂* → NWIE **pĺ̥mā* 'palm'.
- PIE **pĺ̥h₂seh₂* → NWIE **pĺ̥sā* 'mantle, covering'.
- PIE **(s)pŕ̥hₓseh₂* → NWIE *pŕ̥sā* "winged animal, sparrow'.

Similar cases:

- PIE **h₂/₃u̯ĺ̥h₁-neh₂* → NWIE **u̯ĺ̥ʔnā* 'wool', cf. OInd. *ū́rṇā-*.
- PIE **pl̥h₂ń̥goh₂* → NWIE **pĺ̥n̥gō* 'I beat'.
- PIE **gʰĺ̥h₃tóm* → NWIE **gʰĺ̥tóm* (not *ˣgʰl̥ōtóm*) 'gold'.
- PIE **mĺ̥h₂dʰh₁os* → NWIE **mĺ̥dʰos* 'mild'.

- PIE *$sk\!lh_{2/3}tós$ → NWIE *$sk\!ltós$ (not ˣ$skl\bar{V}tós$) 'split' (part.).

- PIE *$pr\!nh_2énti$ → NWIE *$pr\!nánti$ 'they sell'.

II.2.6.11. Final position before a vowel

- PIE *$u̯óidh_2e$ → NWIE *$u̯oida$ 'I know'.

- PIE *$u̯óid\text{-}th_2e$ → NWIE *$u̯oista$ 'you know', but cf. Gk. $óist^ha$, OInd. $vett^ha$.

II.2.6.11.1. Special case: vocalisation of a laryngeal appendix

- PIE *$ste\text{-}stoh^{w}{}_2h_2e$ → NWIE *$stéstōu̯a$ 'I am standing'.

- PIE *$d^he\text{-}d^hoh^{i}{}_1h_2e$ → NWIE *$d^héd^hōi̯a$ 'I have put'.

- PIE *$de\text{-}doh^{u}{}_3h_2e$ → NWIE *$dédōu̯a$ 'I have given'.

II.2.6.12. Final position after a vowel

- PIE *$díg^heh_2$ → NWIE *$díg^hā$ 'goat'.

- PIE *$h_1roh_{12}u̯éh_2$ → NWIE *$rōu̯ā́$.

- PIE *$héh^{i}{}_2seh_2$ → NWIE *$ā́sā$ 'altar'.

- PIE *$g^wéneh_2$ → NWIE *$g^wénā$ 'woman'.

- PIE *$déikoh_2$ → NWIE *$déikō$ 'I show'.

- PIE *$w\!l̥k^woeh_1$ → NWIE *$u̯l̥k^wō$, *$u̯l̥k^wo$ 'with (the) wolf'.

II.2.6.13. Final position after a consonant or a resonant

- PIE *$pleh_1i̯ósh_2$ → NWIE *$plēi̯ósa$ 'more'.

- PIE *$megh_2$ → NWIE *$méga$ 'big'.

- PIE *$Hith_2$ → NWIE *$íta$ 'so'.

- PIE *$h_1ń̥d^hh_2$ → NWIE *$ń̥d^ha$ 'then'.

- PIE *$h_3néh^{u}{}_3monh_2$ → NWIE *$nṓmona$ 'names'.

- PIE *$u̯l̥k^wíh_2$ → NWIE *$u̯l̥k^wíˊ$ 'she wolf'.

- PIE *$uŕ̥h_2dih_2$ → NWIE *$uŕ̥ˀdī$ 'root'.

- PIE *$b^hh_2mésd^hh_2$ → NWIE *$b^hamésd^ha$ 'we speak'.

- PIE *$b^hh_2u̯ésd^hh_2$ → NWIE *$b^hau̯ésd^ha$ 'we two speak'.

II.2.6.14. Kortlandt effect

- PIE ***úddʰh₁r̥* → **úh₁dʰh₁r̥* → NWIE **ū́dʰr̥* 'udder'.
- PIE **dédr(H)is* → NWIE *dḗris 'separation', cf. Gk. *dḗris* 'dispute', OInd. *veṇu-dāri-*.
- PIE **tr̥dtós* → NWIE **tr̥ˀtós* (<***tr̥h₁tós*) 'pierced'.
- PIE **médmi → *meh₁mi → NWIE *mḗmi 'I measure'.
- PIE *h₂éhⁱ₂dmi → **h₂ehˡ₂h₁mi → NWIE **ā́mi*, *ādmi, cf. *aidʰō 'I burn'.
- PIE **gʰdéh₂u̯r̥* → ***gʰh₁éh₂u̯r̥* → NWIE **gʰḗu̯r̥* 'emptiness'.
- PIE *bʰidtrós → **bʰih₁trós → NWIE *bʰītrós 'trunk'.

II.2.6.14.1. Exceptions

- PIE **penkʷédkm̥th₂* → NWIE **penkʷédkm̥ta* 'fifty', but cf. OInd. *pañčāśát-* <**penkʷéh₁km̥th₂*.
- PIE *h₂ed → NWIE *ad 'at, to', but cf. OInd. *ā* < *h₂eh₁.
- PIE *Hud → NWIE *ud 'outside'.

II.2.6.15. Consonantal change

- PIE *piph₃oh₂ → NWIE *píbō 'I drink'.

II.2.6.16. Martinet's rule

- PIE *h₃ésteh₂ˀ → NWIE *kóstā 'rib'.
- PIE **dʰh₁Hi̯oh₂* → NWIE **dʰáki̯ō* 'I do'.

II.3. In search for a stable paradigm

II.3.1. A more conservative model for laryngeal loss

Some authors tend to support an independent, quite late dialectal loss of laryngeals:

- Kortlandt supports the presence of distinct laryngeals in *Central* and *Satem* Indo-European, and a single glottal stop in Balto-Slavic. "The loss of the laryngeals after a vocalic resonant is posterior to the shortening of pretonic long vowels in Italic and Celtic" (Kortlandt 2007).

- "As a rule, the laryngeals were disposed of only after the Proto-Indo-European era" (Meier-Brügger 2003).

- "The current picture of laryngeal reconstruction necessitates repeated loss of laryngeals in each language branch" (Clackson 2007).

Clackson compared this independent loss of laryngeals to the Maltese and Modern Hebrew examples, languages isolated from Semitic into an Indo-European environment for centuries. That is indeed a *plausible* explanation: that all Indo-European branches, after having split up from a Common Indo-European language, would have become independently isolated, and then kept in close contact with (or, following the Maltese example, *surrounded by*) non-IE languages without laryngeals. Then, every change in all branches could be explained by way of *diachronic* and *irregular* developments of vowel quality. After all, "(…) the comparative method does not rely on absolute regularity, and the PIE laryngeals may provide an example of where reconstruction is possible without the assumption of rigid sound-laws."

As Kortlandt has repeated in many of his papers, there appears to be a general tendency for historical linguists to date prehistoric developments as far back in time as they possibly can. In fact, "the attractiveness of projecting a variety of formations back in time lies in the freedom it allows the investigator to choose between different reconstructions in accordance with his theoretical

preconceptions. The history of Indo-European reconstruction can to a large extent be seen as a gradual limitation of this freedom" (Kortlandt 2012). While Kortland acknowledges the necessity for a strict chronological ordering of phonological changes, he nevertheless advocates a reconstruction of laryngeals up to a proto-historic time for many dialects. This option, widespread today among historical linguists for papers, books, and manuals on Indo-European linguistics alike, offers precisely this vague, atemporal framework of an immutable, millennia-long 'laryngeal' Indo-European, which allows for that criticised huge freedom to attribute all phonological irregularities to an abstract entity that ends just before a language is first attested.

The most likely historical development of Indo-European-speaking communities and their language is described as stepped expansions into different regions, and with different population admixtures, which were likely to bring about important linguistic changes. The common, stepped laryngeal loss seen in the chronology described in this paper seems a reasonable account of this natural evolution.

II.3.2. Linguistic, archaeological, and genetic data

The most probable assumptions then, taking into account prehistorical developments, is that the different common stages of laryngeal loss might have happened in the following manner:

- It seems that the original nature and position of laryngeals in Indo-Hittite may be reconstructed, apart from Anatolian data, with the help of Proto-Uralic (Hyllested 2009), presupposing a common earlier Indo-Uralic stage (Kloekhorst 2008). If such an ancient Indo-Uralic community can be identified as coincident with the Early Indo-European stage (Kortlandt 2002), it should then correspond to the historical-cultural community formed by the developing Neolithic Pontic-Caspian cultures in the North Pontic area (Mariupol) and in the Don-Volga-Ural region (Samara-Orlovka). Attempts to reconstruct the earliest possible Proto-Indo-European phonology are common

nowadays, but probably lack the necessary data to obtain reliable reconstructions.

- Following this linguistic model, an Indo-Hittite-speaking early Khvalynsk culture would leave the early Sredni Stog culture as Uralic-speaking. Laryngeals seem to have begun their deletion process during this common period, including the dialect ancestral to Anatolian (Kloekhorst 2006; Kortlandt 2003-2004), split probably ca. 4500 BC. This time is coincident with the expansion of Khvalynsk to the west Pontic area with Suvorovo chiefs, who dominated over the lower Danube area.

- Secondly late Repin (and probably late Khvalynsk) period ca. 4000-3500/3300 BC represents CIE, including Northern and Southern dialectal differentiation (Adrados 1998). The colouring and lengthening of vowels, as well as the merging of laryngeals in a common $*h$ were probably coincident with the disintegration of the CIE-speaking community.

- During this early DIE period ca. 3300-3000 BC the late Repin/early Yamna migrations included an expansion eastwards into the Altai (Pre-Tocharian as the Afanasevo culture) and west into the North Pontic area. In a later migration wave starting ca. 3100/3000 BC, Yamna settlers would migrate along the Danube westwards into the Carpathian Basin (NWIE) and into the Balkans (Palaeo-Balkan). Linguistic and cultural features in common with NWIE and Palaeo-Balkan groups in the west must be dated to this common periods of migration (Adrados 1998).

- Other changes must have arisen after the split, from around the mid–3rd millennium BC, i.e. during the westward migration of North-West Indo-European-speaking Yamna migrants as the Classical East Bell Beaker folk (Harrison and Heyd 2007; Mallory 2013). This would include alternating outputs of some groups in dialects of the same branches, and potential frozen laryngeal remnants reconstructed for

proto-languages. For some, the European expansion of Late Indo-European dialects represents already a post-laryngeal period of the language (Koch 2013).

While there are reasons to support remnants of the DIE merged laryngeal in later periods, there seems to be no strong argument for the survival of DIE merged *h* into later proto-languages, and still less to support the maintenance of the generalist, abstract differentiation into three laryngeals in DIE and later stages of Proto-Indo-European.

Typologically it is already quite difficult to accept that both models of full laryngeal loss—a common development vs. similar independent phonetic changes—are equally likely. A common evolution seems a priori more likely than multiple independent events, as an explanation for the similar development attested in contemporaneous dialects. All ancient Indo-European languages derived from CIE had lost the merged laryngeal before their first recording, all with similar outputs. Even the potential laryngeal remnants (*laryngeal hiatuses* or glottal stops) must have been lost in an early period as productive outputs of laryngeals—since they are found only rarely (if at all) as frozen remains, presupposed behind certain forms in old compositions of ancient dialects.

An almost complete loss of laryngeals during the Late Proto-Indo-European stages (see Figure 10 and Table 2) fits into a coherent timeline within the known dialectal evolution. With that a priori assumption, we limit the need for unending ad hoc sound-laws for each dialectal difference involving a sonorant, which would in turn need their own exceptions. Following Clackson's (2007) reasoning (see above), we need only "rigid sound-laws" that account for CIE and DIE developments, with irregularities being explained assuming dialectal variation due to either internal evolution or language contact.

Therefore, we would dispense with unnecessary hypotheses of the comparative method, offering the most conservative approach to the reconstruction.
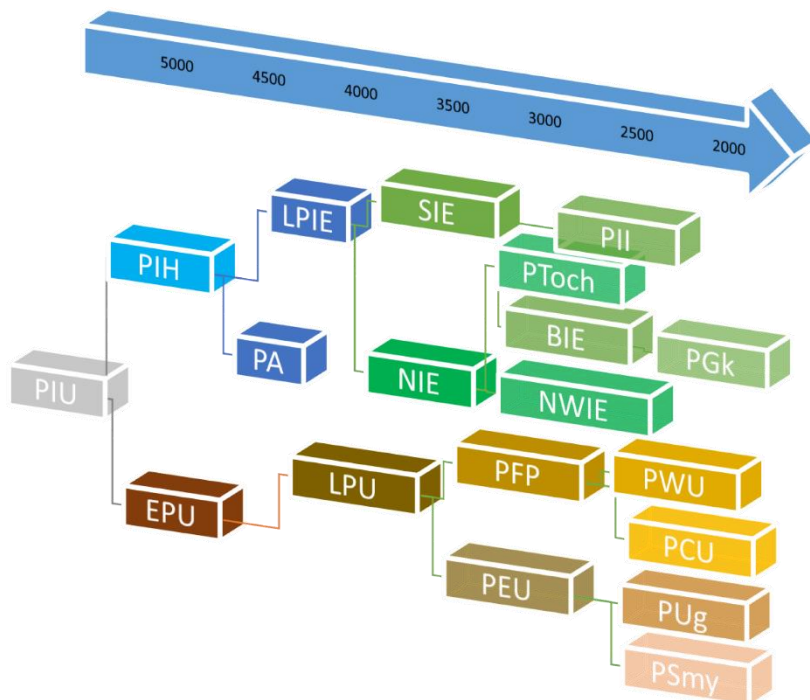

Figure 10. Stages of Proto-Indo-European and Proto-Uralic evolution. The period between Balkan IE and Proto-Greek could be divided in two periods: an older one, called Proto-Greek (close to the time when NWIE was spoken), probably including Macedonian, and spoken somewhere in the Balkans; and a more recent one, called Mello-Greek, coinciding with the classically reconstructed Proto-Greek, already spoken in the Greek peninsula (West 2007). Similarly, the period between Northern Indo-European and North-West Indo-European could be divided, after the split of Pre-Tocharian (PToch.), into a North-West Indo-European proper, during the expansion of Yamna to the west, and an Old European period, coinciding with the formation and expansion of the East Bell Beaker group.

Table 2. Abbreviations of Proto-Indo-European language stages and dialects, with names used in this work and reference to older works, including approximate rounded date guesstimates (for more precise dates, see the archaeological-genetic research).

Abbr.	Guesstimates	Name	Alternative names
PIU	7000-5500	Indo-Uralic	Early Indo-European; Indo-Uralic
PIA	5500-4000	Proto-Indo-Anatolian	Indo-Hittite; Middle Proto-Indo-European
LPIE	4000-3000	Late Proto-Indo-European	Late Indo-European; Classical Indo-European; Inner Indo-European; Core Indo-European
CIE	*4000-3500*	*Common Indo-European*	
DIE	*3500-3000*	*Disintegrating Indo-European*	
NIE	3500-3000	Northern Indo-European	
Pre-NWIE	*ca. 3500-3000*	*Early NWIE*	
NWIE	*ca. 3000-2500*	*Classical NWIE*	
Post-NWIE	*ca. 2500-2000*	*Old European*	West Indo-European; *Northern Indo-European*
SIE	3500-3000	Southern Indo-European	Graeco-Aryan
BIE	*ca. 3500-3000*	*Balkan Indo-European*	
PGk	*ca. 2500-2000*	*Proto-Greek*	
Pre-PIIr	*ca. 3000-2500*	*Pre-Proto-Indo-Iranian*	
PIIr	*ca. 2500-2000*	*Proto-Indo-Iranian*	
Post-PIIr	*ca. 2000-1500*	*Late Proto-Indo-Iranian*	*Pre-Proto-Indo-Aryan, Pre-Proto-Iranian*

II.4. Conclusion: An evolutionary view of laryngeal PIE

A unitary, immoveable, 'Brugmannian' Proto-Indo-European was developed for decades, where all differences between branches were attributed to dialectal exceptions in the vocalism of the parent language. That concept was changed for another one, represented by the widespread acceptance of a 'laryngeal' Proto-Indo-European—thanks especially to the decipherment of Hittite.

However, the simplistic view—already present more than seventy years ago—of a unitary, abstract, atemporal parent language, from which all other branches would have split at the same time, has changed little. The field has changed one simple concept by another, slightly more correct. But the main error remains: immobility.

Phonetics seems to be often the subject of change in the field: first the satem-centum distinction, then to shared isoglosses, then from vocalism to laryngeals, including the gradual acceptance of the archaic nature of Anatolian.

With this paper, we propose that what is often described as infinite independent events of laryngeal loss, intertwined with multiple independent exceptions, be exchanged for general rules of stepped laryngeal loss, coupled with a reasonable number of exceptions for each dialectal period.

III. The three-dorsal theory

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The evolution of the velar system in the attested Indo-European dialects gave rise initially to the three-dorsal theory, which was immediately—and has been since then—rejected by an important part of Indo-Europeanists.

Nevertheless, this artificial reconstruction, based on the centum-satem distinction, remains a prevalent hallmark of the most common handbooks on Indo-European linguistics used in university courses around the world.

In this paper we examine the reasons in favour of a two-dorsal system and against the reconstruction of a series of palatalised velars, illustrating it with the history of the development of both theories, highlighting the weak finds that seem to be the strongest link to an original system of three velars.

III.1. Introduction

The Proto-Indo-European phonetic reconstruction is strongly tied to the past: acceptance of traditional distinction of three series of velars is still widespread today in handbooks and articles on the parent language and on early Indo-European proto-languages alike.

Direct comparison in early IE studies, informed by the *centum-satem* isogloss, yielded the reconstruction of three rows of dorsal consonants in Late Proto-Indo-European by Bezzenberger (1890), a theory which became classic after Brugmann included it in the Second Edition of his *Grundriss*. It was based on vocabulary comparison; so e.g. from PIE **kṃtóm* 'hundred', there are so-called *satem* (cf. OInd. *śatám*, Av. *satəm*, Lith. *šimtas*, OCS *sto*) and *centum* languages (cf. Gk. *-katón*, Lat. *centum*, Goth. *hund*, OIr. *cet*).

To explain the phonetic differences between both groups, a series of labiovelars **kʷ*, **gʷ*, and **gʷʰ*, and another of palatovelars **kʲ*, **gʲ*, and **gʲʰ*, were reconstructed along with the plain velar series. These sounds underwent a characteristic phonetic change in both dialectal groups, whereby three original "velar rows" became two in all attested Indo-European dialects. After that original belief, then, the centum group of languages merged the palatovelars **kʲ*, **gʲ*, and **gʲʰ* with the plain velars **k*, **g*, and **gʰ*, while the satem group of languages merged the labiovelars **kʷ*, **gʷ*, and **gʷʰ* with the plain velars **k*, **g*, and **gʰ*.

The reasoning for reconstructing three series was very simple: the easiest and most straightforward solution for the parent PIE language was that it had *all* three rows reconstructed for the proto-languages, which would have merged into two rows depending on their dialectal (centum vs. satem) situation – even if no single IE dialect shows three series of velars. Also, for a long time this division was identified with an old dialectal division within the Indo-European-speaking territory, especially because both groups appeared not to overlap geographically: the centum branches were to the west of satem languages. Such an initial answer should be considered unsound today, at least

as a starting point to obtain a better explanation for this 'phonological puzzle' (Adrados, Bernabé, and Mendoza 2010).

Many Indo-Europeanists still keep a distinction of three distinct series of velars for the parent Indo-Hittite language (and mostly unchanged for the Late Proto-Indo-European stage), although research has constantly supported that the palatovelar series were most likely a late phonetic development of certain so-called satem dialects. This model was formulated quite early in the development of the velar series by Antoine Meillet (1894), and has been followed by many linguists since then, such as Hirt (1899), (1927), Lehmann (1952), Georgiev (1966), Bernabé (1971), Steensland (1972), Miller (1976), Allen (1978), Kortlandt (1980), Shields (1981), etc.

The general trend is to reconstruct labiovelars and plain velars, so that the hypothesis of two series of velars is usually identified with this theory. Among those who support two series of velars there is, however, a minority who consider the labiovelars a secondary development from the pure velars, and reconstruct only velars and palatovelars, such as Kuryłowicz (1935), already criticised by Bernabé, Steensland, Miller, and Allen. Still less acceptance had the proposal to reconstruct only a labiovelar and a palatal series by Magnusson (1967).

III.2. In support of two series of velars

Arguments in favour of only two series of velars include:

III.2.1. Allophones

Palatovelars appear to be generally allophones resulting from the neutralisation of the other two series in specific phonetic circumstances. Their dialectal articulation was probably constrained, either to an especial phonetic environment (such as the Romance evolution of Latin *k* before *e* and *i*), or to the analogy of alternating phonetic forms.

However, it is difficult to pinpoint exactly what the circumstances of the allophony are, although it is generally accepted that neutralisation occurred

after *s and *u, and often before *r or *a; also apparently before *m and *n in some Baltic dialects. The original allophonic distinction was disturbed when labiovelars were merged with plain velars. This produced a new phonemic distinction between palatal and plain velars, with an unpredictable alternation between palatal and plain velars in related forms of some roots (those originally with plain velars) but not others (those originally with labiovelars). Subsequent analogical processes generalised either the plain or palatal consonant in all forms of a particular root. Those roots where the plain consonant was generalised are those traditionally reconstructed as having plain velars in the parent language, in contrast to palatovelars.

III.2.2. Complementary distribution

The reconstructed palatovelars and plain velars appear mostly in complementary distributions, what supports their explanation as allophones of the same phonemes. Meillet (1902) established the contexts in which there are only velars: before *a, *r, and after *s, *u; while Georgiev (1966) clarified that the palatalisation of velars had happened before *e, *i, *i̯, and before liquid or nasal or *u̯ + e, i, offering statistical data supporting his conclusions. The presence of palatalised velar before o is thus explained as analogical, appearing in roots in which (due to the ablaut) the velar phoneme is found before e and o, so the alternation *k^je/*ko was levelled to *k^je/*k^jo.

III.2.3. Labiovelars in satem dialects

There is residual evidence in the so-called satem languages of a former distinction between velar and labiovelar consonants:

- In Sanskrit and Balto-Slavic, in some environments, resonants become *iR after plain velars but *uR after labiovelars.
- In Armenian, *k^w seems to be in some cases distinguishable from *k before front vowels.
- In Albanian, *k^w and *g^w have distinct outputs from *k and *g before front vowels.

This evidence shows that the labiovelar series was distinct from the plain velar series in Late Proto-Indo-European, and could not have been a secondary development in the centum languages. However, it says nothing about the palatovelar vs. plain velar series.

When this debate initially arose, the concept of a phoneme and its historical emergence was not clearly understood, and as a result it was often claimed (and sometimes is still claimed) that evidence of three-way velar distinction in the history of a particular Indo-European language indicates that this distinction must be reconstructed for the parent language. This is theoretically unsound, as it overlooks the possibility of a secondary origin for the distinction.

III.2.4. Natural evolution

The palatovelar hypothesis would support an evolution $*k^j \rightarrow *k$ of centum dialects, i.e. a move of palatovelars to back consonants, which is clearly against the general tendency of velars to move forward its articulation and palatalise in these environments. A trend of this kind is unparallelled and therefore typologically a priori unlikely (although not impossible), and needs further assumptions to be made.

III.2.5. Statistics of velars

The plain velar series is statistically rarer than the other two in a PIE lexicon reconstructed with three series; it appears in words entirely absent from affixes, and most of them are of a phonetic shape that could have inhibited palatalisation.

Common examples include:

- *ịug-óm* 'yoke', cf. Hitt. *iukan*, Gk. *zdugón*, Skt. *źugá-*, Lat. *iugum*, OCS *igo*, Goth. *juk*.
- *g^hosti-* 'guest, stranger', cf. Lat. *hostis*, Goth. *gasts*, OCS *gostĭ*.

According to Clackson (2007), "The paradigm of the word for 'yoke' could have shown a palatalising environment only in the vocative *$*yug-e$*, which is

unlikely ever to have been in common usage, and the word for 'stranger' *gʰosti-* only ever appears with the vocalism *o*."

III.2.6. Differences among satem dialects

Alternations between plain velars and palatals are common in a number of roots across different satem languages, where the same root appears with a palatal in some languages but a plain velar in others.

This is consistent with the analogical generalisation of one or another consonant in an originally alternating paradigm, but difficult to explain otherwise:

- *ak-/ok-* 'sharp', cf. Lith. *akúotas*, OCS *ostrŭ*, OInd. *asrís*, Arm. *aseln*, but Lith. *asrùs*.
- *akmon-* 'stone', cf. Lith. *akmuõ*, OCS *kamŭ*, OInd. *áśma*, but Lith. *âsmens*.
- *keu-* 'shine', cf. Lith. *kiáune*, Russ. *kuna*, OInd. *svas*, Arm. *sukh*.
- *bʰleg-* 'shine', cf. OInd. *bʰárgas*, Lith. *balgans*, OCS *blagŭ*, but Ltv. *blâzt*.
- *gʰerdʰ-* 'enclose', cf. OInd. *gr̥há*, Av. *gərəda*, Lith. *gardas*, OCS *gradŭ*, Lith. *zardas*, Ltv. *zârdas*.
- *su̯ekros* 'father-in-law', cf. OCS *svekrŭ*, OInd. *śvaśru.*
- *peku-* 'stock animal', cf. OLith. *pẽkus*, Skt. *paśu-*, Av. *pasu-*.
- *kleus-* 'hear', cf. Skt. *śrus*, OCS *slušatĭ*, Lith. *kláusiu*.

It could be argued, as does Clackson (2007), that "such forms could be taken to reflect the fact that Baltic is geographically peripheral to the satem languages and consequently did not participate in the palatalisation to the same degree as other languages."

III.2.7. Alternation

There are different pairs of *satemised* and *non-satemised* velars found within the same language.

The old argument proposed by Brugmann (and later copied in many dictionaries) about "*centum loans*" is not tenable today. For more on this, see Szemerényi (1978) Mayrhofer (1952), or Bernabé (1971). Examples include:

- **selg-* 'throw', cf. OInd. *sṛjáti*, *sargas*.
- **kau/keu-* 'shout', cf. Lith. *kaukti*, OCS *kuꭓati*, Russ. *sova*, OInd. *kauti*, *suka-*.
- **kleu-*, 'hear', Lith. *klausýti*, *slove*, OCS *slovo*; OInd. *karnas*, *sruti*, *srósati*, *śrnóti*, *sravas*.
- **leuk-*, 'light', OInd. *rokás*, *ruśant-.*

III.2.8. Number of satemisation trends

The number and periods of satemisation trends reconstructed for the different branches are not coincident (see above *§3.4.1. Indo-Iranian evolution* and *§4.13.1. Balto-Slavic evolution*).

III.2.9. Generalised palatalisation trend

In most attested languages which present aspirates as a result of the so-called palatovelars, the palatalisation of other phonemes is also attested (*e.g.* palatalisation of labiovelars before *e*, *i*), which may indicate that there is an old trend to palatalise all possible sounds, of which the palatalisation of velars is the oldest attested result.

It is generally believed that satemisation could have started as a late dialectal 'wave', which eventually affected almost all PIE dialectal groups. The origin is probably to be found in velars followed by *e*, *i*, even though alternating forms like **gen/gon* caused natural analogical corrections within each dialect, which obscures still more the original situation. Thus, non-satemised forms in so-called satem languages would be non-satemised remains of the original situation, just as Spanish has *feliz* and not ×*heliz*, or *fácil* and not ×*hácil*, or French *facile* and *nature*, and not ×*fêle* or ×*nûre* as one should expect from its phonetic evolution.

III.2.10. Palatalisation not defined by dialectal branch or territory

Contrasting with the idea of an areal centum-satem distinction is the existence of satem languages like Armenian, related to Greek, a centum one; or Balto-Slavic, a North-West Indo-European language; as well as the presence of Tocharian, a centum dialect, in Central Asia, a satem territory; and Albanian, a satem language in the Balkans, a centum territory.

The traditional explanation of a three-way dorsal split requires that all centum languages share a common innovation that eliminated the palatovelar series, due to the a priori unlikely move of palatovelars to back consonants (see above). Unlike for the satem languages, however, there is no evidence of any areal connection among the centum languages, and in fact there is evidence against such a connection – the centum languages are geographically non-contiguous.

Furthermore, if such an areal innovation happened, we would expect to see some dialect differences in its implementation (cf. the above differences between Balto-Slavic and Indo-Iranian), and residual evidence of a distinct palatalised series. However, neither type of evidence exists, suggesting that there was never a palatovelar series in the centum languages. Evidence does, however, exist for a distinct labiovelar series in the satem languages (see above).

External evidence shows a conspicuous absence of reconstructed palatovelars in Uralic loanwords of Late Proto-Indo-European origin (Holopainen 2018), with only later dialectal borrowings—of Indo-Iranian or Balto-Slavic origin—displaying clear phonetic correspondances to palatalised velars.

III.2.11. Prevalence of velar systems

A system of two gutturals, velars and labiovelars, is a linguistic anomaly, isolated in the Indo-European occlusive subsystem—there are no parallel oppositions b^w-b, p^w-p, t^w-t, d^w-d, etc. Only one feature, their pronunciation

with an accompanying rounding of the lips, helps distinguish them from each other. Such a system has been attested in some ancient Indo-European languages. A system of three gutturals—palatovelars, velars and labiovelars—with a threefold distinction isolated in the occlusive system, is still less likely.

In the two-dorsal system, labiovelars turn into velars before *-u*, and there are some neutralisation positions which help identify labiovelars and velars. Also, in some contexts (*e.g.* before *-i*, *-e*) velars tend to move forward its articulation and eventually palatalise. Both trends led eventually to centum and satem dialectalisation.

III.3. In support of three series of velars

Those who support the model of the threefold distinction in PIE cite evidence from Albanian (Pedersen 1900) and Armenian (Pisani 1948), that they seem to treat plain velars differently from labiovelars in at least some circumstances, as well as the fact that Luwian could have had distinct reflexes of all three series.

It is disputed whether Albanian shows remains of two or three series (Ölberg 1976; Kortlandt 1980; Pänzer 1982), although the fact that only the worst—and one of the most recently—known (and neither isolated from external influences nor remote) IE dialect could be the only one to show some remains of the oldest phonetic system is indeed very unlikely. Clackson (2007), supporting the three series: "Albanian and Armenian are sometimes brought forward as examples of the maintenance of three separate dorsal series. However, Albanian and Armenian are both satem languages, and, since the $*k^j$ series has been palatalised in both, the existence of three separate series need not disprove the two-dorsal theory for PIE; they might merely show a failure to merge the unpalatalised velars with the original labio-velars."

Supporters of the palatovelars also cite evidence from Luwian, an Anatolian language, which supposedly shows a three-way velar distinction $*k^j$ $\rightarrow z$ (probably [ts]); $*k \rightarrow k$; $*k^w \rightarrow ku$ (probably [k^w]), as defended by Melchert

(1987). So, the strongest argument in favour of the traditional three-way system is that the distinction supposedly derived from Luwian findings must be reconstructed for the parent Indo-Hittite language. However, the underlying evidence "hinges upon especially difficult or vague or otherwise dubious etymologies" (Sihler 1995); and, even if those findings are supported by other evidence in the future, it is obvious that Luwian might also have been in contact with satemising languages, that it might have developed its own satemisation trend, or that maybe the whole system was remade within the Anatolian branch, which is still poorly understood.

Additionally, one of the most difficult problems which subsists in the interpretation of satemisation as a phonetic wave is that, even though in most cases the variation $*k^j/k$ may be attributed either to a phonetic environment or to the analogy of alternating apophonic forms, there are some cases in which neither one nor the other may be applied, i.e. it is possible to find words with velars in the same environments as words with palatals.

Compare for example $*ok^j tō(u)$ 'eight', which presents $*k$ before an occlusive in a form which shows no change—to suppose a syncope of an older $**ok^j itō$, as does Szemerényi, is an ad hoc explanation. Other examples in which the palatalisation cannot be explained by the next phoneme nor by analogy are $*su̯ekru$- 'husband's mother', $*akmōn$ 'stone', $*peku$ 'cattle', which are among those not shared by all satem languages.

Such unexplained exceptions, however, are not sufficient to consider the existence of a third row of 'later palatalised' velars (Bernabé 1971; Chen and Wang 1975), although there are still scholars who come back to the support of the hypothesis of three velars. So *e.g.* Tischler (1990), reviewed by Meier-Brügger (2003): "The centum-satem isogloss is not to be equated with a division of Indo-European, but rather represents simply one isogloss among many…examples of 'centum-like aspects' in satem languages and of 'satem-like aspects' in centum languages that may be evaluated as relics of the original

three-part plosive system, which otherwise was reduced every-where to a two-part system."

Newer trends to support the old assumptions include also Huld (1997), in which the old palatal *$kʲ$ is reconstructed as a true velar, and *k as a uvular stop, so that the problem of the a priori unlikely and unparallelled merger of palatal with velar in centum languages is theoretically solved.

III.4. Conclusion

As it is clear from the development of the dorsal reconstruction, the theory that made the fewest assumptions was that an original Proto-Indo-European had two series of velars. This should have shifted the burden of proof, already by the time when Meillet (1894) rejected the proposal of three series; but the authority of Neogrammarians and well-established works of the last century, as well as traditional conventions, probably weighted (and still weight) more than reasons. While most Indo-Europeanists would find the large inventory of consonants in the reconstructed Proto-Nostratic as methodologically primitive compared to most Indo-European sound laws (Kallio and Koivulehto 2018), tritectalism—just like the need to reconstruct laryngeals for every vocalic difference between dialect—does not follow the same methodological standard for Indo-European studies.

More than half century ago we had already a similar opinion on the most reasonable reconstruction, that still today is not followed, as American Sanskritist Burrow (1955) shows: "The difficulty that arises from postulating a third series in the parent language, is that no more than two series (…) are found in any of the existing languages. In view of this it is exceedingly doubtful whether three distinct series existed in Indo-European. The assumption of the third series has been a convenience for the theoreticians, but it is unlikely to correspond to historical fact. Furthermore, on examination, this assumption does not turn out to be as convenient as would be wished. While it accounts in a way for correspondences like the above which otherwise would appear

irregular, it still leaves over a considerable number of forms in the satem-languages which do not fit into the framework (…). Examples of this kind are particularly common in the Balto-Slavonic languages (…). Clearly a theory which leaves almost as many irregularities as it clears away is not very soundly established, and since these cases have to be explained as examples of dialect mixture in early Indo-European, it would appear simplest to apply the same theory to the rest. The case for this is particularly strong when we remember that when false etymologies are removed, when allowance is made for suffix alternation, and when the possibility of loss of labialisation in the vicinity of the vowel u is considered (*e.g. kravíṣ-*, *ugrá-*), not many examples remain for the foundation of the theory."

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