2

Indo-European and the Indo-Europeans

2.1 Proto-Indo-European

PROTO-INDO-EUROPEAN is the traditional name given to the ancestor language of the Indo-European family that is spread from Iceland to Chinese Turkestan and from Scandinavia to the Near East. A PROTO-LANGUAGE (Gk. *prõtos* 'first') refers to the earliest form of a language family presupposed by all of its descendants. There will forever be major gaps in the reconstruction of proto-languages, but as general linguistic knowledge becomes more sophisticated, so do the tools of reconstruction.

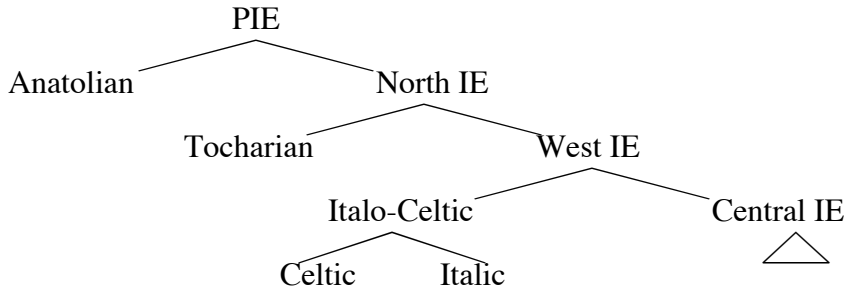
The so-called Anatolian subfamily, consisting of Hittite, a language of the 2nd millennium BCE from central Turkey, and its immediate relatives from Turkey and the Near East, is by far the most archaic branch of Indo-European. Since Anatolian was the first subfamily to break off, the ancestor family is sometimes referred to as INDO-HITTITE.

Another archaic branch is Tocharian, from western China (Xinjiaáng). This is widely recognized as the second branch to split off from the rest. Much of the evidence for this evolutionary history is recent, and the terminology is not yet fixed. Instead of Indo-Hittite, many scholars still prefer Proto-Indo-European (PIE) as the name of the earliest reconstructable ancestor language of this family.

Figure 1 is a recent cladistic model (from Ringe 2006: 5) of the Indo-European languages.[1]

[1] Cladistics (from Gk. *kládos* 'branch') is a phylogenetic system of classification that arranges organisms (and other entities) by their evolution. The cladogram in Figure 1 is a 'tree-like' reconstruction of the Indo-European languages by their evolutionary history.

Figure 1: Major divisions of the Indo-European family



The main member of Italic is of course Latin. Central Indo-European consists of the other subfamilies, most important for our purposes being Greek, Indo-Iranian, and Germanic.

Within Indo-Iranian, the language most often referred to here is Sanskrit. Early Old Indic is attested in the Vedic (Ved.) literature, earliest of which is the *ṛgveda*, Rig Veda (RV), ten books of (over 1000) hymns to deities, composed (at least the older portions, books 2-7) c.1100 BCE in northwest India. Of the later vedic texts, the Atharvaveda (AV) [c.1000–800] is the most important. Next came the prose Brāhmaṇas (B) [c.800–500] devoted to the mystical interpretation of the vedic rituals, in roughly the language for which the grammarian Pāṇini devised rules (reduced to about 4000 algebraic *sūtras* 'threads; rules') in his *Aṣṭādhyāyī* 'eight chapters' composed between c6 and c4 BCE. The two epics, the *Mahābhārata* and the *Rāmāyāṇa*, are products of a very old tradition (especially the former), but the final redaction was in the 2nd or 1st century BCE. Later Old-Indo-Aryan is represented by *saṃskṛta-* ('adorned, purified'), i.e. Classical Sanskrit (Skt.), an artificial literary language fixed by the rules of Pāṇini. It is the language of the major poetic works, drama, tales, technical treatises on grammar, philosophy, and ritual.

Figure 2 is an approximate geographical overview of the Indo-European family.

Figure 2: Indo-European Language Family: geographical view

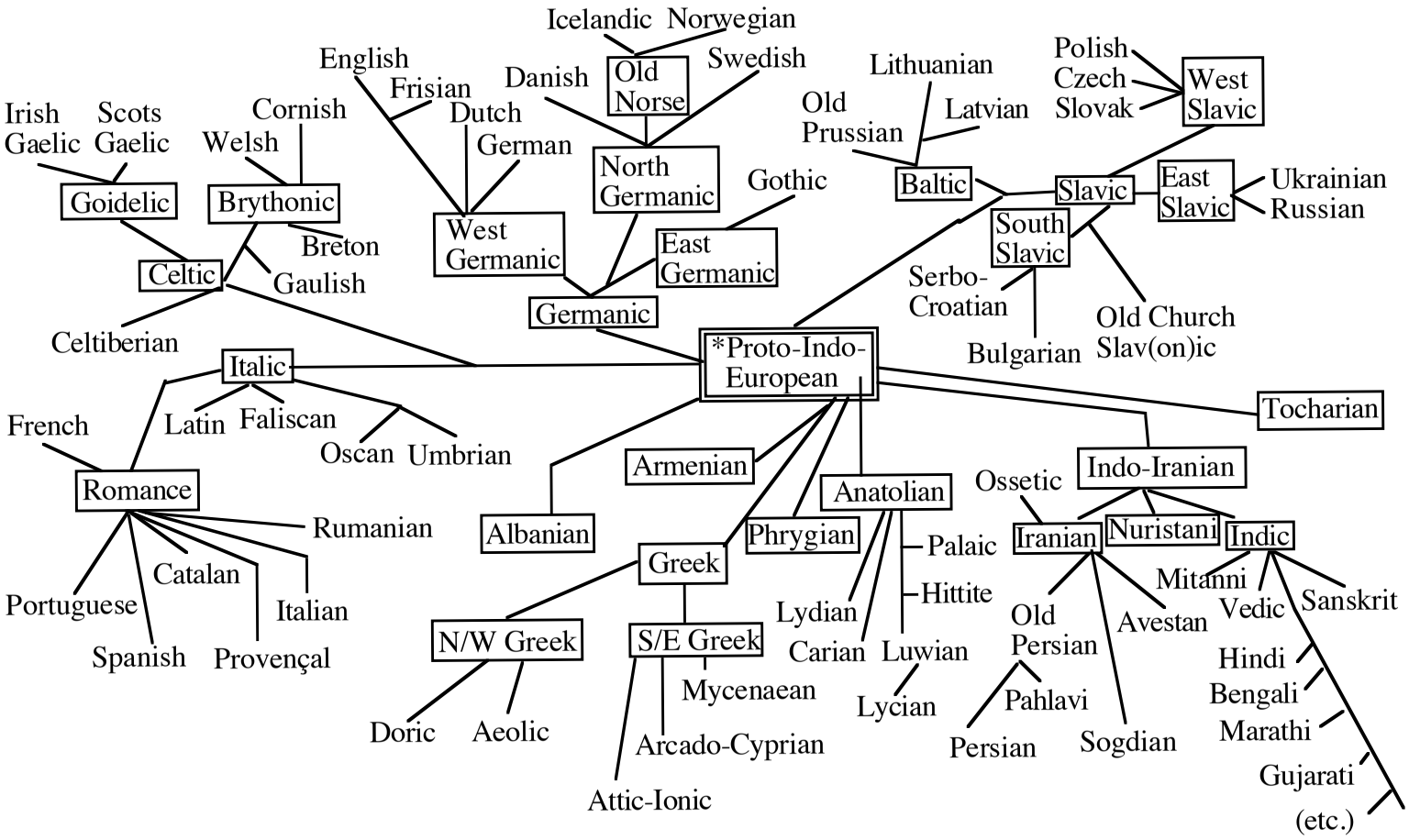
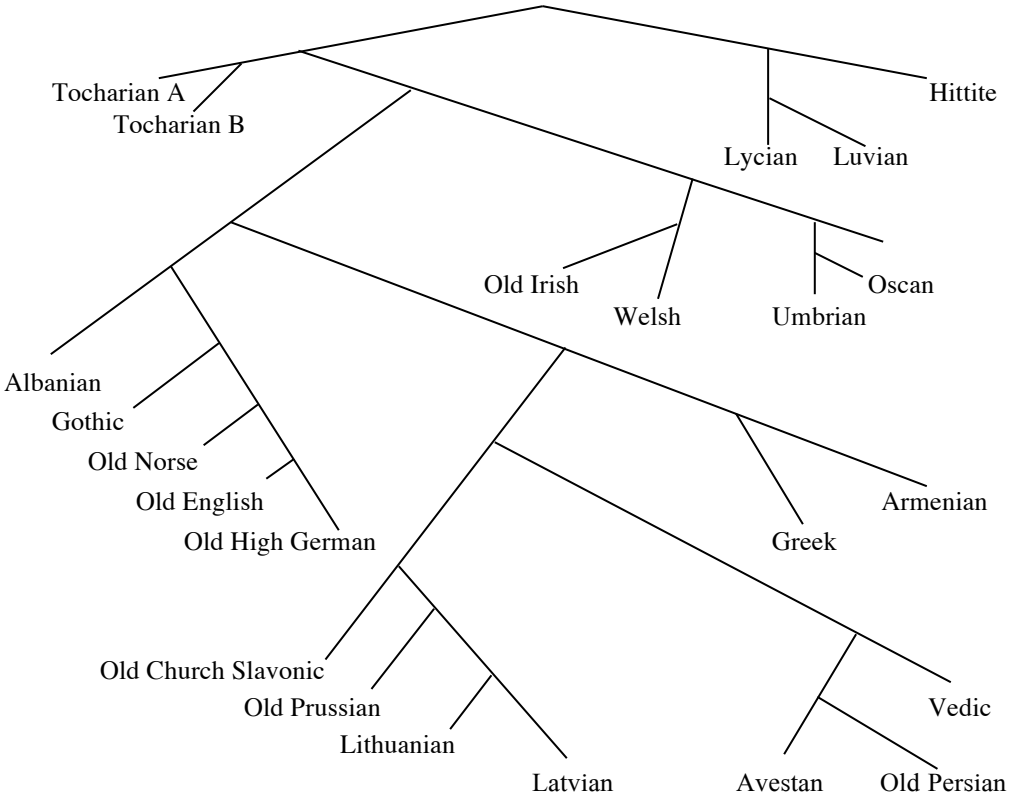


Figure 3 is a more elaborated cladogram of the Indo-European languages, from Ringe, Warnow, and Taylor (2002).

Figure 3: Elaborated IE cladogram



According to Figure 3, Greek shares affinities with Armenian and also (not present) Phrygian (cf. Rau 2010: 173).

Germanic shares the most features with Balto-Slavic and Indo-Iranian. This is expressed by these three subfamilies branching from the same macronode. At the same time, however, there was considerable contact between Germanic and Celtic:

> This split distribution of character states leads naturally to the hypothesis that Germanic was originally a near sister of Balto-Slavic and Indo-Iranian … that at a very early date it lost contact with its more easterly sisters and came into close contact with the languages to the west; and that that contact episode led to extensive vocabulary borrowing at a period before the occurrence in any of the languages of any distinctive sound changes that would have rendered the borrowings detectable. (Ringe, Warnow, and Taylor 2002: 111)

Such crossovers create difficulties for the family tree model, as discussed recently by Labov (2007), Miller (2010: i. 56–61; 2012: 2ff.), and others. One of the most important alternatives for our purposes is the WAVE MODEL, according to which a change begins in one geographical area and spreads to other areas.

1.2 Indo-European culture

Roots that exhibit archaic derivational patterns and/or have a broad range of occurrence around the Indo-European languages have a good chance of being lexical items of Proto-Indo-European. Useful lists of those roots appear in Buck (1988 [1949]), Delamarre (1984), and especially Mallory and Adams (1997).

Typical of agricultural societies, tools and farm implements were known (40+ entries), e.g. **h₂erh₃-tr-o-m* Lat. *arātrum* 'plow'; **yug-o-m* YOKE, Lat. *jugum sub*JUG*ate*. The Indo-Europeans tended (**kʷel-* 'turn', Lat. *col-e-re / cultus* CULTIVATE) various barnyard animals: **gh(a)id-o-* GOAT; **ukʷsōn* OX; **gʷow-* COW, Lat. *bōs / bov-* BOVINE; **h₃ew-i-s* EWE, Lat. *ovis* 'sheep' OVINE; **péku* FEE 'movable wealth; cattle,', Lat. *pecū* 'flock' PECUNIARY; **seuh-/*sū-* (SOW / SWINE) 'adult pig'; **porḱ-o-* 'young pig' FARROW / Lat. *porcus* PORK (Benveniste 1969: i. 27–36).

The very large number (100+) of reconstructable animals and the types best attested invite the conclusion that the Indo-Europeans dwelt in a forested region of Eurasia with a temperate climate. Congenial to this idea are the wolf **wl̥kʷ-o-s*, bear (**h₂r̥tḱ-o-s* Gk. *árktos* ARCTIC, Lat. *ursus* URS-), elk **elk-*, beaver **bhe-bhr-u-s*, otter **udr-o-s* (Gk. *húdros* 'water-snake' cf. HYDRA), eel **angʷh-i-s* (Lat. *anguis* 'snake' ANGUINE), salmon [more likely, salmon trout] (**laḱs-* or **loḱs-o-* LOX), goose **ǵhans-*, duck (**h₂enh₂t-* Lat. *anas / anat-* ANATIDAE), bee **bhei-*, etc. The absence of *grouse* excludes the far north,

and absence of reconstructable words for *crocodile, elephant, cobra, python, camel, monkey, lion, tiger, cat, ass* would seem to suggest a temperate Eurasian homeland. If it could be proven that such words were not simply lost after the emigration of the Indo-European tribes (cf. Cowgill 1986: 66ff.), a southeast Asian, Levantine, or African homeland could be excluded, as also on the evidence of the absence of certain types of vegetation, e.g. *palm*, *vine, olive, banana, banyan, bamboo, sandalwood, rice, lotus*.

Some fifteen well documented tree types also suggest (but in no way prove) a temperate forested area, the far north being excluded by absence of a common word for *fir* or *spruce*. Attested trees include beech **bhāg-o-*, birch **bherHǵ-*, and oak (**perk^{w}u-* Lat. *quercus* QUERCINE). The problem is that most of the tree-names are shared with Finno-Ugric (and Altaic), e.g. **apsā-* ASPEN (cf. Siberian Altai *apsak*), **ey-wo-* YEW (cf. Vogul *jiw* 'tree, wood'), and it is not clear whether the correspondences are due to (distant) genetic relationship, contact, or both (Campbell 1990). The apple **ab(e)l-* was not PIE but a northern Eurasian word.

The common Indo-European words for snow **sneig^{w}h-/*snoig^{w}h-o-*, ice **eis*, and frost **prus-to-* (cf. **prus(w)-īna* Lat. *pruīna* 'hoarfrost' PRUINOSE) support a temperate climate, as do the seasons: winter **ǵhei-m- / *ǵhyem-* (Lat. *hiēms* HIEMAL), spring (**wes-r̥ /*wes-n-* Lat. *vēr / vern-* VERNAL), summer **sem- / *sm̥h$_2$-ero-*, fall / harvest **kerp- / *karp-* (Lat. *carp-e-re* 'to pluck' CARPET). Together with the absence of a word for *ocean* or *island*, these considerations localize the Indo-Europeans in Eurasia.

Indo-Europeans knew how to build (**dem-*) houses (**dom-o-s* Lat. *domus* DOMICILE), possibly mainly of wood, on the evidence of the Germanic derivative, Gothic *tim(b)rjan* 'to build', E *timber*, but specialization in a region of abundant wood is possible. They cooked (**pek^{w}-* Lat. *coqu-e-re* COOK) their foods. Their beverages included the honey drink MEAD **medhu* (cf. Gk. *méthu* 'wine; mead' AMETHYST), and possibly wine (**woin-o-* Lat. *vīnum* WINE/VINE). Despite the limited distribution of the latter (Lat. *vīnum*, Gk. *(w)oĩnos*, Arm. *gini,* Hitt. *wiyana-*) and the presence of the same word in Semitic (Arabic *wain*), Caucasian (Georgian *γvino*), and other language families (Gamkrelidze and Ivanov 1984: 557–62), an Indo-European origin of the word is possible (EDHIL 1012; EDG 1058f.), especially since Georgian *γv-* points to a borrowing from Proto-Armenian (Matasović 2012: 288, w. lit). Mead is better attested: Bomhard and Kerns

(1994: 665f.) posit a Proto-Nostratic[2] root (#543) **madw-/*mədw-* 'honey, mead', but no Proto-Nostratic root for wine.

A full array of Indo-European weaponry is known (**ag^{w}si-* AXE; **skei-* / **skoit-o-m* SHEATH, Lat. *scūtum* 'shield' (E)SCUDO, etc.), but these and the few sailing terms (**neh$_2$u-/*nāu-* 'boat': Lat. *nāvis* 'ship' NAVAL; **mh$_2$s-d-/*mazd-o-s* MAST; **h$_1$reh$_1$-t-* RUDDER, Gk. *eretmós* 'oar'; etc.) are inadequate to localize the homeland.

2.3 Homeland of the Indo-Europeans

Despite the volumes written about the homeland of the Indo-Europeans, speculations range from Scandinavia to the steppes of southern Russia to Babylonia, and there is little agreement among scholars, succinctly summarized in Baldi (1999: 39–44), Raulwing (2000: 67–75), and Anthony (2007). The previous section outlined in broad terms evidence in favor of a Eurasian origin. This section presents a little of the more technical evidence.

> [T]he regions where PIE was spoken were near both the Urals — which was the old and persistent border between neolithic and hunter-gatherer societies during the fourth and third millennia BC — and the Caucasus. There is little doubt that PIE influenced Proto-Uralic, and loanwords into that proto-language are counted by the dozens …. (Matasović 2012: 285)

One alternative to the Eurasian steppe origin of the Indo-Europeans is the Anatolian homeland (Renfrew 1988a, 1988b, 2001). This hypothesis encounters several major problems and is rejected by most Indo-Europeanists (see Garrett 2006, Anthony 2007, Matasović 2012). One problem involves Greek vocabulary. If the Indo-Europeans migrated from Anatolia to Greece in the middle of the 7th millennium BCE, "it is

[2] Nostratic is one cornerstone of the hypothesis that all language families descend ultimately from a common ancestor. Proto-Nostratic would have been spoken c.15,000 BCE, and includes Indo-European, Kartvelian (South Caucasian), Afroasiatic, Uralic-Yukaghir, Elamo-Dravidian, and Altaic (Bomhard and Kerns 1994: 34). For discussion, see the papers in Salmons and Joseph (1998). There is also a less extravagant hypothesis that PIE and Proto-Uralic descended from Indo-Uralic (Matasović 2012: 285, w. lit). Reconstruction that far back is fraught with difficulties and contact remains a likely account.

curious that the Greeks themselves, though ensconced on the Mediterranean littoral for five hundred years before the first appearance of their language in the Linear B tablets, should nevertheless have been largely dependent on a foreign vocabulary for their characteristic flora and fauna…" (Jasanoff 1988: 802).

A second problem is Hittite vocabulary. That the Hittites were relatively recent in Anatolia is suggested by the fact that Sumerian and Akkadian have almost no words borrowed from Hittite.[3] By contrast, on the count of Tischler (1979: 266f.), Hittite has only some 420 words with good Indo-European etymologies vs. 240 core vocabulary items of assured foreign provenience.[4]

Gamkrelidze and Ivanov (1984, 1990) claim that Indo-European cattle breeding, agriculture, and wheeled transport suggest a homeland in the Near East, to which these were confined until the end of M4 BCE. This would be consistent with loanwords (e.g. **tauro-* = Sem. **ṯawr-* 'bull', **ḱ(o)rn-* = Sem. **qr̥n-* 'horn'), if scholars could agree which words were borrowed.[5] Moreover, association of the Indo-Europeans with horses and chariots raises some issues. The ensuing discussion is from Raulwing (2000) and Anthony (2007). The Indo-Europeans knew the horse (**h₁éḱw-o-s* / **h₁éḱ-wo-s* Lat. *equus* 'horse' EQUINE), which some have thought to be borrowed (e.g. Raulwing, pp.

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[3] There was, however, a pre-equestrian Indo-European language, which Whittaker (2004) calls Euphratic, that had settled in Mesopotamia between 3200 and 2500 BCE and left some fifty loanwords in Sumerian, e.g. *uwi* 'ewe' (**h₂owi-* 'sheep'), *gu(d/r)* 'ox, bull' (**gʷow-* 'ox, cow'), *ubur* 'udder' (**uh₁dʰr̥* 'id.'), *agar* 'arable tract' (**h₂eǵr-o-* 'field'), *hurin* 'eagle' (**h₃or-en-* 'id.'), *gurud* 'heavy' (**gʷr̥h₂-ú-* 'id.'), etc.

[4] On a larger database (EDHIL), Alwin Kloekhorst (p.c.) counts 1104 lemmata of which 697 have likely IE sources. Thirty-five consist of desinences. Counting derivatives, that reduces the total number by about three times. This yields a more conservative figure than that of Tischler. But Kloekhorst cannot determine from his files how many words are assured to be foreign. It remains possible that the number of foreign words compared to native is very high, as claimed by Tischler.

Lexicostatistics / glottochronology, the discredited method of measuring time depth by means of a list of putative common words, has recently been bolstered by computational methods derived from evolutionary biology. Using this model, Gray and Atkinson (2003) conclude that the initial break-up of Indo-European occurred no later than c.8000 BCE. Although Indo-Europeanists have disputed this early date, Gray and Atkinson conclude that it supports Renfrew's hypothesis — a total non-sequitur.

[5] For Bomhard and Kerns (1994: 327f.), 'bull' was a Proto-Nostratic word (#148: **tʸ[ḥ]awr-*). By contrast, 'horn' is a derivative from IE **ḱer-* 'head'; Gamkrelidze and Ivanov (p. 876) take the Semitic root from Indo-European.

106–9).[6] Domesticated horses were probably brought to Anatolia by Indo-Europeans. The speakers of PIE "were acquainted with the general principle of a wheeled vehicle drawn by paired bovids under the yoke" (Raulwing, p. 18). These were carts or wagons. The spoked-wheel chariot, not to be confused with two-wheelers of M3 BCE, first appears at the beginning of M2 in central Anatolia, and later in the Levant, Mesopotamia, and Greece. The training of chariot horses, drivers, and warriors first became feasible in the city states of the ancient Near East, and this is supported archaeologically. While individual languages adapted Indo-European roots to the chariot and its parts (**aḱs-* AXLE, Lat. *axis* 'id.' [AXIS]; etc.), many of the terms are more easily explained as borrowings. Even the wheel gives evidence of several reinventions, with different words (Huld 2000), one from the root **k^{w}elh$_{1}$-* 'revolve': **k^{w}e-k^{w}l(h$_{1}$)-o-*: Ved. *cakrá-* 'wheel', Gk. *kúklos* 'circle' CYCLE; OE *hweowol / hwēol* WHEEL (~ *hweogol*[7]) (LHE 108). These chronological facts are difficult for the hypotheses of Renfrew and Drews. The horse-drawn spoked-wheel chariot that figures so prominently in Indo-European and Greek society and myth was not inherited from Indo-European but the result of horizontal transmission (cultural diffusion) c.2100 / 2000 BCE; cf. Sumerian *gigir*, Semitic **galgal*, Kartvelian *grgar* 'wheel' (West 2007; Valério 2008). Spoked-wheel chariots were a later replacement of the Indo-European block-wheeled wagons which dated to c.3300 BCE (cf. West 2007: 40).

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[6] It is highly unlikely that 'horse' was borrowed (Jasanoff 1988: 802). It is unknown where and when the horse was first domesticated (Levine 1999). In the Black Sea steppe region as late as the Early Bronze Age there is still no evidence that horses were harnessed or ridden (Rassamakin 1999). According to Drews (2004), horseback riding did not appear until the Iron Age. Nevertheless, horses are known since M5 BCE (cf. Huld 2007). There were horse formulas of Indo-European date, e.g. *ōkées híppoi* (*Iliad* 5.257+) 'swift horses' = Ved. *áśvās … āśávaḥ* (RV 10.119.3) from IE **h$_{1}$ōḱ-ewes h$_{1}$eḱ-wōs* 'swift swifties' (Katz 2010: 360f.). Finally, the North Caucasian words for 'horse' (Lezgian *šiw* etc.) may well be borrowings from PIE or even a satem variety of Indo-European (Matasović 2012: 291).

[7] This form is supposedly problematic: **k^{w}ek^{w}los* > **χ^{w}eχ^{w}las* (GL) > **h^{w}eγ^{w}laz* (VL) > **h^{w}ewl(a)z* > **h^{w}ewulz* > OE *hweowol*. Ringe (2006: 108) attributes the *g* of *hweogol* to analogy with other *w* ~ *g* alternations. This assumes that it is accidental that an epenthetic /u/ developed in precisely the environment where */g^{w}/ became [g] (§3.1), i.e. **χ^{w}eγ^{wu}laz* (cf. Kiparsky 2010) developed to **h^{w}eg^{u}l(a)z* preserved only in an Old English alternant.

Proto-Anatolian and Proto-Indo-European may have split east of the lower Dnieper, "between the arrival of ox traction and the arrival of the wheel, probably in the first half of the fourth millennium" (Darden 2001: 220)[8] Woolly sheep feature prominently in Darden's account as well as that of Barber (2001) who, likewise, places Proto-Indo-European in the steppe region of *Caucasia* east of the Dnieper, where certain woollen goods originated c.3000 BCE. The same plaid twills are identified also with the ancestors of the Celts in Hallstatt, Austria [1200–400], and the likely ancestors of the Tocharians near Hami in Chinese Turkestan [1200–700] (Barber 2001: 13). Ancestors of the Tocharians, with type O blood, light hair, and other Europoid genotypes, are preserved in mummies from the Tarim Basin [c.1800 BCE+] (Mallory and Mair 2000; Day 2001: 352–5).

Rapid dispersal over Eurasia, "perhaps by elite dominance or folk migrations, would account for archaic traits cropping up even on the peripheries of the IE world" (Day 2001: 303). But the dispersal of the languages of the periphery was rapid, probably triggered by an internal collapse (Garrett 2006). This is also consistent with the cranioskeletal evidence that the steppe groups of Eurasia essentially coincided with the regions of later Indo-European speakers (Day 2001: 306f.). Light hair and skin pigmentation also correlate and presuppose endogamy at least in the upper classes (Day, pp. 306–10). On reaching certain areas, such as India and Anatolia, Indo-European spread by contact-induced language shift (Day, p. 314f.), of the testimony of the Hattic influence on Hittite, the Minoan influence on Greek, etc. (Garrett 2006: 147). If this is on the right track, it is further evidence against an Anatolian origin of the Indo-Europeans. Day concludes (p. 317ff.) that the origin had to be in the Western Eurasian steppe.

Indo-Europeans were dwelling in the Dnieper-Ural region (*zone 1* in Mallory 2002) c.5000 BCE. Anthony (1995, 2007) proposes an expansion of the Indo-Europeans from

[8] If the recent dates obtained by computational methods are at all accurate, the dates in this section will have to be adjusted. For instance, nothing precludes the possibility that Indo-Hittite split earlier and that the wheel spread as a major cultural item, necessitating the creation (or adaptation) of a word for it. The initial split could have occurred early and subsequent splits and migrations in the more generally agreed time-frame.

the Ukrainian steppes along the Dnieper c.3500 BCE. The Hittite subgroup seems to have settled Anatolia in M3 BCE, around the same time Indo-Europeans settled the Pontic steppe (the "European" branch). Indo-Iranian spread to Bactria–Margiana c.2000 BCE (Drews 1988: 41-55, 149ff.; Mallory 2002; Garrett 2006: 146). Other migrations to account for dialect interconnections, as posited, e.g. by Gamkrelidze and Ivanov (1984, 1990) and others, remain speculative, given the difficulties of matching specific peoples with archaeological remains (Thomas 1991; Raulwing 2000).

Vocabulary and typological features shared with the Kartvelian languages of the Caucasus localize the Indo-Europeans in the eastern region north of the Black Sea (Matasović 2012). It has also been suggested that the grammatical and lexical similarities (e.g. the potential 601 Proto-Nostratic roots in Bomhard and Kerns 1994) could indicate distant genetic relationship rather than contact (cf. Hayward 1989), but the contacts are geographically specific. For instance, PIE and Proto-Kartvelian shared a restriction against initial */r/ (on balance, this is widespread because syllables optimally begin with segments low in sonority: Miller 2010: i. 182f., w. lit). Although rejected by most Indo-Europeanists, the two protolanguages may have had glottalics instead of voiced stops. For a recent discussion, see Miller (2010: i: 88–93). As stressed by Miller (ibid.) and Matasović (2012: 294f.), no better account has been offered by Indo-Europeanists. PIE and Kartvelian made use of a productive pattern of apophony / ablaut. For instance, root alternations like Kartvelian **derk'-* : **drek'-* : **drk'-* 'bend' are claimed to resemble IE **derḱ-* : **dreḱ-* : **drḱ-* 'see' (Gamkrelidze and Ivanov 1984: 252–63; Bomhard and Kerns 1994: 73–90; Matasović 2012: 296f.). On balance, apophony is widespread crosslinguistically, including Afroasiatic (Miller 2013: chs. 10, 14, w. lit). As in languages of the Caucasus (Matasović 2012: 300f.), there is also number suppletion in the personal pronouns (cf. Eng. *I* : *we*; *thou* : *ye*). Similar to PIE neuters, NE Caucasian nouns have a two-stem inflection; cf. PIE **yēkʷr*, GEN **yekʷns*; cf. Lat. *iecur* : *iecin(or)is* 'liver' (Matasović, p. 301f.). Other typological features shared by (P)IE and the languages of the Caucasus include a system of grammatical gender and an inflectional optative. Matasović (2012) concludes that the features shared by PIE and especially NE Caucasian cannot be accidental and suggest early contacts between PIE and the North Caucasian languages. These results agree with the widespread hypothesis

that the PIE homeland was the region north of the Black Sea (Anthony 2007), more specifically, the region to the northeast (Matasović 2012).

2.4 Proto-Indo-European Phonological System

The main catalogue of information about the PIE phonological system is Mayrhofer (1986). English treatments are available in Beekes (1995), Meier-Brügger (2003), Ringe (2006), Fortson (2010), etc., of which Fortson's book is the most useful for beginners. The inventory of contrasting segments is presented in (1).

(1) PIE phonological segments

a) Obstruents

labial	coronal	palatal	velar	labiovelar
p	t	ḱ	k	k^w
b	d	ǵ	g	g^w
b^h	d^h	$ǵ^h$	g^h	g^wh
	s	h_1	h_2	h_3

b) Sonorants

non-syllabic	syllabic
m	m̥
n	n̥
r	r̥
l	l̥
y	i
w	u

e	o	a
ē	ō	ā

The voiced aspirates were kept only in Indic, where they remain to this day. They are typically described as breathy voiced but are technically voiced and aspirated, as demonstrated instrumentally by Prakash Dixit (1975). In Greek the voiced aspirates

were devoiced, e.g. **ǵhrīdh-* 'barley' > Myc. *ki-ri-ta* = χϱῑθᾰ́ /kʰrītʰā́/ > Att.-Ion. κϱῑθή́ 'barley'. The final change of /kʰ/ to /k/ when another aspirate follows in the same word is traditionally known as Grassmann's Law (discussion in Miller 2010: i. 78–83).

The palatal series merged with the velars in the geographically western IE languages (including Ancient Greek). For instance, PIE **ḱonk-*, as in Vedic *śaṅk-ate* 'worries, hesitates', yields pre-Gmc. **kank-*, whence Goth. *hāhan** 'to hang', etc.[9] Though easternmost of the Indo-European languages, Tocharian patterns in part with western Indo-European in having a velar stop (e.g. TochA *känt,* B *kante* 'hundred' = Lat. *centum* [kéntum], Gk. *he-katón*, etc.) where the (other) eastern dialects have a palato-alveolar continuant, e.g. Skt. *śatám*, Lith. *šimtas* 'hundred' < PIE **(d)ḱm̥t-ó-m* 'id.'.

The syllabic resonants (liquids, nasals, glides that occupy syllable nuclei, like vowels) subdivide into three categories. The glides */y, w/ alternate with vowels */i, u/. The syllabic nasals remained intact nowhere. In Greek and Sanskrit, they normally became *a*, in Latin *en/in, em/im*, and in Germanic *un, um*. So, for instance the PIE negating particle **n̥* yields Gk. ἀ(ν)-, as in *a-theist* or *an-archist*, Lat. *in-*, as in *in-secure*, and Gmc. *un-*, as in *un-likely*.

The syllabic liquids remained intact only in Indo-Iranian. In Germanic, they developed like the syllabic nasals, i.e. *-uR-* (R = any resonant), e.g. PIE **wĺ̥kʷ-o-s* > Skt. *vṛ́kaḥ*, PGmc. **wulf-az* (Grimm's Law) > **wolf-az* (low vowel assimilation) > *wolf* (loss of final syllables).

2.5 PIE laryngeals and apophony

The so-called laryngeals (**h₁* etc.) were preserved only in Anatolian. They also had a syllabic counterpart, generally represented as */ə/, e.g. Skt. *pitár-* 'father' = Gk. *patḗr*, Lat. *pater*, Eng. *father* < **pə₂tér-*, phonologically */ph₂tér-/.[10]

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[9] An asterisk after a word signals that it is attested in one or more paradigmatic forms but not the citation form in question.

[10] Epenthesis (gen. **pəh₂trés*) will be ignored here (see Byrd 2010), but see **mégh₂* under EXAMPLES. The reason for the reconstruction of */ə₂/ in **pə₂tér-* is that (i) since the root vowel shows up as /a/ in Greek, Latin, and Germanic, but as /i/ in Sanskrit *pitár-*, it cannot be simply */a/, which would yield /a/

The number and phonetic nature of the laryngeals is disputed (most scholars assume three), and they are variously transcribed. Watkins (2000), for instance, writes *ə₁, ə₂, ə₃*; others *h₁, h₂, h₃*. There is also a convention that writes *h₁* etc. when consonantal, *ə₁* etc. when syllabic (e.g. **pə₂tḗr* 'father' > Skt. *pitā́* / *pitár-*, Gk. πατήϱ, L *pater*), and *H* (or *X*) when the precise laryngeal is indeterminate or irrelevant. Some core reflexes follow.

**h₁e* > /e/	**eh₁* > /ē/
**h₂e* > /a/	**eh₂* > /ā/
**h₃e* > /o/	**eh₃* > /ō/
**Ho* > /o/	**oH* > /ō/

At least some long vowels result from contraction of a vowel plus laryngeal, and */o/ was not colored by any laryngeal. Since **h₁* is not written in any of the Anatolian scripts and had no vowel-coloring effects, it may have been a glottal stop */ʔ/. The vowel-coloring laryngeals may have been pharyngeals, e.g. */ʕ/ for *a*-coloring, and lip-rounded */ʕʷ/ for *o*-coloring (Beekes 1989, but see Job 1994; Rasmussen 1994b; Hyllested 2009). With the possible exception of **h₁*, then, the laryngeals were all fricatives (Byrd 2010: 4).

EXAMPLES (cf. Kimball 1999: 140–52, 379–426)

**h₁es-ti* 'is': Hitt. *ēš-zi*, Gk. *es-tí*, Lat. *est*, PGmc. **isti* > Goth. *ist*, E *is*

**séh₁-mn̥* 'seed' (Lat. *sēmen* 'seed; SEMEN') / collective **séh₁-mō* > PGmc. **sēmȭ* > OS, OHG *sāmo* 'seed' (LHE 74)

**mégh₂* 'great' > Hitt. *mēg* by laryngeal deletion, but the rest of Indo-European had epenthesis: **mégh₂ə* > Skt. *máhi*, Gk. *méga* (Byrd 2010: 85)

**h₂ent-i* 'in front' > **h₂ánti*: Hitt. *ḫānza*, Gk. ἀντί 'against; ANTI-', Lat. *ante* 'in front; ANTE-', PGmc. **andi* 'in addition; and' > (O)E *and*

**peh₂-* 'protect; feed' (Skt. *pā́-ti* 'protects') : **peh₂-trom* / **peh₂-dhlom*

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also in Sanskrit; cf. **ǵhans-* 'goose' (OHG *gans*) > Vedic *haṃsá-* 'id.' (IEL 82), and (ii) the specific choice of */ə₂/ (as opposed to, e.g., */ə₃/) is that Greek has the /a/ reflex, not, e.g., the /o/ reflex of */ə₃/ (see below).

> **pah₂-trom / *pah₂-dhlom* > Gmc. **fōðra-* FODDER / Lat. *pābulum* 'food; fodder; nourishment'; enlarged **peh₂-s-* > **pah₂-s-*: Hitt. *paḫš-* 'protect', Lat. *pāstor* 'shepherd'

**-éh₂* (factitive suffix) > **-ah₂*, e.g. **new-eh₂-* 'make new': Hitt. *nēw-aḫḫ-* 'renew; restore', Gk. *neãn* 'to plough up', Lat. *(re)nov-ā-re* 'to renew' (Jasanoff 2003: 139)

**peh₂wr̥* 'fire' > **pah₂wr̥*: Hitt. *pāḫḫur*; zero-grade **ph₂ur-* > **puh₂r-* (by metathesis) > Gk. *pũr*; Gmc. **fūr-i-* > OE *fȳr* FIRE

**h₂ów-i-* 'sheep': Hitt. *ḫāwi-*, Lycian *χawa-*, Lat. *ovis*, Gk. *óïs* (Att. *oĩs*), PGmc. **awiz* > OS *ewi* 'lamb' (cf. **awjō* > OE *ēowu* EWE)

**h₂ost-* 'bone' > Lat. *os / oss-*; cf. **h₂ost-eí-o-* > Gk. *ostéon* OSTEO-; collective **h₂ést-ōi* > Hitt. *ḫaštāi* 'bone(s)'

**peh₃(i)-* > **poh₃(i)-* > **pō(i)-* 'drink': Hitt. *pāš-* 'take a swallow' < **peh₃-s-* (Hittite lost **h₃* in many environments); Lat. *pō-tiō* 'a drink' POTION; zero-grade **ph₃-tí-* > **pə₃-ti-* > Gk. **po-ti-* > *po-si-* in *sumpósion* 'a drinking together; drinking party'

Since our concern is largely with the historic languages, laryngeals are included only in the earliest reconstructable forms.

Some of these examples raise the issue of PIE apophony or ablaut. These are the terms traditionally applied to the vowel alternations within roots, the most frequent of which are */e/, */o/, and Ø (zero-grade):

1. Full grade (or *e*-grade) is the basic vocalism of most primary verbal roots, e.g. **leikʷ-* > Gk. *leíp-ō* 'I leave'; **leǵ-* 'collect' (LIV 397) > Gk. l*ég-ō* 'I gather, count, tell, say' (cf. Rix et al. 2001: 5ff.).

2. *o*-grade is conditioned by certain morphological categories; cf. the Greek perfect *lé-loip-a* 'I have left' (< **le-lóikʷ-h₂e*), or deverbal nouns like *lógos* 'account; reason(ing); speech; word' (< **lóǵ-o-s*) (cf. Jasanoff 2003: ch. 2; Krasukhin 2004).

3. The zero-grade originally occurred when the root was unaccented or a suffix preceded or followed by an accented root or suffix (cf. Kiparsky 2010); cf. the Greek aorist *é-lip-on* 'I left' (< **(é-)lik^{w}-óm*), Latin past passive participle *(re)lic-tus* '(having been) left' (< **lik^{w}-tó-*).