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SEARCHING FOR THE LEXICAL CORE
OF PROTO-INDO-EUROPEAN LANGUAGE

Abstract: The existing reconstruction of PIE does not distinguish nuclear and peripheral languages and vocabulary. However, there are signs that a number of branches are peripheral, in particular, the well-studied Germanic branch. The paper makes an attempt to find the lexical core of PIE, basing on structurally similar languages: Balto-Slavic (the authors are also developing a reconstruction of its vocabulary — in particular, the Swadesh list), Greek, Italo-Celtic and Indo-Iranian. The technique of searching for roots common in all four branches is described. The study has identified, for instance, such roots with *g, *g', *gh, *g'h, *gw (42 examples for the latter), as well as *(s)gh- (22 examples) and *sk'- (10 examples) — sources of the initial *x- in Slavic. Several hundred of such 4-way matching roots are already found, more than 1000 are expected. The authors also reveal lexicographic and organizational problems encountered in the course of reconstruction.
Keywords: etymology, proto-Indo-European, Sanskrit, Greek, Latin, Lithuanian, proto-Balto-Slavic, reconstruction, method, *gw, *sgh, *sk'.

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В ПОИСКАХ ЛЕКСИЧЕСКОГО ЯДРА ПРАИНДОЕВРОПЕЙСКОГО ЯЗЫКА

Аннотация: Существующая реконструкция ПИЕ не выделяет ядерные и периферийные языки и лексику. Однако есть признаки того, что ряд ветвей являются периферийными, в частности, хорошо изученная германская. В статье описана попытка выделить лексическое ядро ПИЕ на основе структурно близких языков: балтославянских (авторы также разрабатывают реконструкцию их словника — в частности, списка Сводеша), греческого, кельто-италийских и индоиранских. Описана методика поиска корней, общих во всех четырех ветвях. Авторами найдены, в частности, такие корни-четверки с *g, *g', *gh, *g'h, *gw (последних — 42 примера), а также *(s)gh- (22 примера) и *sk'- (10 примеров) — источники славянского начального *x-. Общее количество найденных корней-четверок уже составляет несколько сотен, ожидается более 1000. В статье также описаны лексикографические и организационные проблемы, встреченные на пути реконструкции.

Ключевые слова: etymology, proto-Indo-European, Sanskrit, Greek, Latin, Lithuanian, proto-Balto-Slavic, reconstruction, method, *gw, *sgh, *sk'.

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1. Introduction

If we consider a proto-language as an active language system, we can assume two parts in its vocabulary: the lexical core and the dialect vocabulary. The lexical core contains the words, which are understood by all native speakers of the language, while the dialectal vocabulary contains locally used terms. Obviously, the lexical core is reflected in the descendants of the proto-language to the greatest extent. It can even be assumed that in the central languages of the family, the core vocabulary will mainly remain, only with some

shift in semantics and with the replacement of homonymous words. The more time passes, the more words go into the peripheral vocabulary or are replaced due to homonymy, and their place in such languages is occupied mainly not by borrowings, but by formations from other roots and onomatopoeia. For peripheral languages, however, contact phenomena are characteristic, up to the replacement of half of the vocabulary and syntax.

The Indo-European language family shows relatively good documentation of its constituent languages (some of them — up to the level of more than 3,000 years ago). The kinship of these languages is visible to the naked eye and at the origin of linguistics led to the concept of their common proto-language. The first researchers (Johannes Goropius, Abraham Ortelius) declared Dutch to be a common proto-language, but by the 18–19 centuries there was a consensus that Proto-Indo-European language (PIE, or as the Germans call it, "indogermanisch") was a separate language, to varying degrees far from the languages of our time. The method of Goropius (explanation of words of foreign languages by gluing the roots of someone's native language) was rightly branded under the name "goropism". Hypothetical Proto-Indo-Europeans who lived many thousands of years ago were associated with PIE, and their place of residence was reconstructed by different researchers depending on their political preferences: from the Germanic lands to India.

In parallel with the study of PIE, modern languages related to it were documented (Baltic, Slavic, Iranian, etc.), old manuscripts were discovered (Irish, Tocharian, Hittite, etc.), and collections of ancient Greek, Latin, and Sanskrit texts were published. As a result by the 20th century Indo-European studies had the opportunity to publish academic dictionaries of Proto-Indo-European roots with references to each language [40; 35] (in German), followed by a dictionary of Proto-Indo-European verbal roots in the framework of the three-laryngeal theory [36] (in German), and then the Leiden (the Netherlands) series of dictionaries ([19; 20; 21; 22] etc.), describing each language branch in a separate volume, and in the near future it is planned to combine them into a common dictionary called "Indo-European Etymological Dictionary".

It turns out that the reconstruction remained germanocentric, and the new dictionaries continue and elaborate the old ones, which in turn are collections of randomly found examples from different languages known to the authors. The most known to them, of course, are the Germanic languages. Relatively more work is invested in these languages: in the Leiden series, 3 people are responsible for Germanic languages (Guus Kroonen, Dirk Boutkan, Sjoerd Siebinga), 2 — for Iranian languages (Garnik Asatrian, Johnny Cheung), one for each of others, except Baltic and Slavic: only one researcher (Rick Derksen) was found for both, despite the abundance of material.

However, there is a decrease in the relative share of Germanic words involved: for example, the etymological dictionary of Greek of 1960 [24] had in its index 20 pages of Germanic cognates, 19 Italic, 17 Indo-Aryan, 10 Baltic, 9 Slavic, 6 Iranian, 5 Celtic, etc., and in the mentioned verb dictionary of 2001 [36] there are 16 pages of Indo-Aryan, 14 Greek, 12 Germanic, 11 Iranian, 8 Italic, 8 Baltic, 7 Slavic, 6 Celtic, etc. (if combined in primary branches: 27 pages of Indo-Iranian, 15 Balto-Slavic, 14 Italo-Celtic, 14 Greek (Macedonian material is missing) — against 12 Germanic). Obviously, the Germanic languages are already so well studied that new Germanic roots are not expected in the reconstruction of PIE, but words from other languages can still be attracted.

Germanic languages show all the signs of peripherality in PIE. According to F. Brown, unethymologized material makes up about 30% of the entire vocabulary of Germanic languages [1, p. 25], according to Fennemann — 32,6% [30, p. 148], among the strong verbs, according to Mailhammer, there are 45,3% [30, p. 168]. Moreover, these percentages do not

include Germanic roots that were used for the reconstruction of the PIE, but are absent in all 4 main branches — for example, in the dictionary [35]: *dēg-, *dīp-ro-, *dhen-3, *dhembh-, *dheubh- (found only in Hesychius), *gandh-, *ghrē-, *geid-, *gred-, *leizd-, *mod-, *(s) nēbh-ri, *(s)nerb- (found only in Hesychius), *perg-2, *su̯ento-.

For comparison, in Sanskrit such "dark" words are less common by an order of magnitude. Kuiper [26, pp. 137–185] found 383 words of non-Indo-Aryan origin in the Rigveda — about 4% of the dictionary, Oberlies [32, pp. 333–349] identified 344–358 "reliably" non-Indo-European, and Witzel [41] writes that only 211–250, i.e. 2% of the Rigveda dictionary, remains after removal of foreign proper names.

In addition, Germanic languages are strongly distinguished by the morphology and syntax of names [4, pp. 58–78] and verbs [30].

The other branches give too little material (no more than 50% of the Germanic).

For example, the multi-volume Hittite etymological dictionary [25] gives each root an average of two pages, which sums up to about 1000 roots in the entire dictionary. In the index of [36] there are 5 pages of Hittite words and one page for all other Anatolian languages.

Only 964 roots were drawn from the Armenian language in the most extensive research [15], at best case it is said about 1040 root words [23]. This is despite the fact that 10772 different roots are reflected in the ancient Armenian literature [1, p. 22]. In [36] only two pages of the index are dedicated to the Armenian language.

Albanian etymological dictionary [16] contains some 3000-4000 dictionary entries, of which less than half are unique Proto-Albanian roots (the rest are formations from them, phonetic variants and borrowed words). In the index of [36] there are also only two pages devoted to the Albanian language.

The Tocharian languages have 6½ pages of words (Tocharian B — 3½, Tocharian A — 3), but on these pages, as in Hittite ones, almost every word occupies two lines.

Of the Illyrian, Messapian, Phrygian, and Thracian languages, only a few words are involved in the reconstruction of PIE, due to the poverty of the surviving monuments of these languages. But this does not explain the situation with Germanic, Armenian and Albanian. Obviously, PIE consisted of dialects, like any observed language [2]. And in the case of Germanic, even the pre-Germanic substrate is proposed [30]. This explains the old observation that there is practically no PIE word reflected in all Indo-European languages [17, p. 99], that's why did N. S. Trubetskoy even doubt the existence of Proto-Indo-Europeans as such [12, p. 69].

And with all this incompleteness and one-sidedness, the existing reconstruction of the PIE is being used as a basis for typological, glottochronological, macrocomparativistic, and even cultural studies. Moreover, there even was an attempt to exploit the incompleteness of the PIE reconstruction to justify the validity of macrocomparativistic constructions: "…we randomly selected a phoneme of moderate frequency (namely, PIE *gw) and looked for roots that contain it (in any position) and are met in five of the most «important» branches of IE: Indo-Iranian, Greek, Latin, Germanic, and Slavic. The count ended at six (*gwou- 'cow', nogw- 'naked', *gwer- 'to gather', *gwei̯- 'to live', *gwer- 'to swallow', *gweru̯- 'throat, neck') and the absolute majority of the etymologies had various phonetic, morphological and semantic problems in at least several branches" [6].

2. Materials and methods

After considering the whole situation, it becomes clear that it is better to start restoring the lexical core of PIE only for 4 main branches (Indo-Iranian, Italo-Celtic, Balto-Slavic, Greek-Macedonian), which are lexically and syntactically close to each other.

It should be taken into account that many etymologies can often be proposed for a single word, including several etymologies that can be of "industrial quality" (without defects in phonetics, semantics, and morphology). It is not known for sure which of them is actually true (even several etymologies may be true at the same time because of multiple motivation) and is there at least one true etymology among them. Pairwise comparisons in this aspect are very unreliable, so this study should consider the roots reflected in **each** of the 4 main branches.

The research method is proposed as follows:

Stage 1G ("G" for Greek).

Take the first language pair. It will be Greek and Slavic. This pair allows us to reconstruct all the PIE phonemes except the laryngeals (and possibly the initial laryngeal). The order of languages in the pair was chosen for the convenience of searching for etymologies by a Russian-speaking researcher.

From a fairly large dictionary of the first language (for Greek, we take [5], already marked up in in the Alpha program, for search we additionally use [34]) write out all the roots in one column of the table. Try to combine words with the same roots in one table cell, with their meanings.

Each initial consonant (and later other examples for this consonant) comes in a separate table. We can also group *CVl-, *CVr- separately for ease of comparison.

Stage 2G.

For these roots, collect possible cognates in the second language (with columns for all the supposed sound correspondences, if they are in doubt). For Slavic words not included in the standard "modern Russian literary language", add the meaning. There may be several etymologies in each cell, and the best one must be the first.

If new co-root words of the first language are found in the course of this most difficult and painstaking work, group them again.

Sort etymologies by classes:
1   "industrial quality";
2   with questionable semantics;
3   with defects (metathesis, changed sonority, incomprehensible suffix...).

Stage 3G.

Confirm every phonetic correspondence with at least 10 "industrial quality" examples and approximately as many additional examples (some correspondences are considered certain, such as p-p, t-t, k-k, vowels, sonorants...). This will be the evidence base for reconstruction of PIE. It is hard to estimate the number of random matches. Thus, a rational threshold is taken, to avoid too many "possible phonetic correspondences". Otherwise, for example, one can suggest a pair of "alternations" that are unlikely to both be true: *Cebh-~*Cw- (11 examples) [3] and *Ce-~*Cwe- (9 examples) [39].

Stage 4G.

Leave all three sorts of etymologies and all sound matches in the same column, except for etymologies with unconfirmed sound correspondences. (If these are confirmed by word inflection and derivation in the language, such as Greek mr > (m)br, they are accepted.) Regardless of the initial consonant, all the roots are collected in one table.

For a single root in the first language, there may be several interpretations in the second language, all of them in a single cell.

For a single interpretation in the second language, there may be several rows in the table corresponding to different roots in the first language and different PIE proto-forms.

Stages 1S–4S ("S" for Sanskrit).

Repeat steps 1–4 for the Sanskrit — Slavic pair according to the dictionary [31], in addition, we use a fully electronic dictionary [38] for search.

Stages 1L–4L ("L" for Latin).

Repeat steps 1–4 for the Latin — Slavic pair according to the dictionary [33]. For search we also use [27], which is completely marked up in electronic form.

Stage 5.

Use one of the obtained tables (etymologies in one language pair) as a base. Add the third column — the estimated PIE root proto-form. Add the fourth column — the supposed semantics of this root. Add two more columns for the two remaining branches.

Add the information of the two remaining branches in accordance with the proposed proto-forms. If there is a conflict between the 4 branches, split the row in two.

Stage 6.

Try to fill the gaps in Indo-Iranian etymologies using the etymological dictionary of Iranian languages [10] and the etymological dictionary of Iranian verb [20].

Try to fill the gaps in Greek etymologies using the Hesychius dictionary (which also contains Macedonian words).

Try to fill the gaps in Italo-Celtic etymologies using the etymological dictionary of Latin and the other Italic languages [21] and the etymological dictionary of proto-Celtic [22]. Unfortunately, we can't use the material of Romance languages not reflected in Latin — there is still no etymological dictionary of Romance languages, except the single-volume dictionary of 1864 [18].

Stage 7.

We have a table with 2, 3 or 4 matches for each PIE proto-form. Discard rows with 2 matches. Try to fill the gaps in the rows with 3 matches using other dictionaries.

Stage 8.

Sort the table by Balto-Slavic column, looking through it and trying to find repeated uses of words. If possible, leave unique interpretations in the first place in such cells, most corresponding to the available data of all branches in their rows.

Stage 9.

Sort the table by the expected PIE meanings, trying to avoid repetitions and to find all the terms of Swadesh list [37, pp. 456–457], and if possible, the terms of Basic English. The result of the study is all the rows found with 4 matches. According to preliminary estimates, there will be over 1,000 of them.

3. Discussion

Advantages of the method compared with the existing PIE reconstruction technique: comparisons are made anew, which limits the inclusion of defective etymologies that have appeared in the literature before the discovery of sound laws.

For example, let's look at the pair: Lat. equus — Greek ἵππος. By its form ἵππος (Byzantine encyclopedia Etymologicum Magnum gives ἵκκος, *kʷ is also confirmed by the Mycenaean written data) must come from PIE *sikʷkʷ-, and equus — from PIE *ekʷ-.

– *ekʷ- regularly corresponds to Greek ἔπ-οχον 'saddle-cloth, housing' (the second part — from ὀχέω 'to carry'), Rus. екнуть 'to slam, to bang, to hit' and Sanskr. अक् ak- 'to wind or move tortuously; to go'.

– *sikʷkʷ- corresponds to Rus. сек-сек 'interjection for calling horses' (PIE *i > Slav. ь), and with o-grade *soikʷkʷ- (PIE *oi > Lat. ū) — Lat. succussor 'a jolter, said

of a horse' ~ succŭtĭo (usually derived from sub-quatiō, despite the counter-examples, such as, for -q-: ac-quīrō ~ quaerō, for -a-: suc-căvus ~ căvus) and Sanskr. सेक्‌ sek- (PIE *oi > Vedic Sanskr. ai > Sanskr. e) 'to move'.

In this pair, a trace of early linguistic thought is evident, with the search for cognates using translation.

Another textbook example: Lat. nūdus ~ Greek. γυμνός ~ Sanskr. नग्न nagna. Formally, the first corresponds to PIE *noid-, the second — to PIE *gum-n- or *gʷəm-n-, the third — to PIE *neg-n- or *negʷ-n-.

–   *noid- corresponds to Rus. недра, Czech ňadra (PIE *oi > Slav. ě) 'breast, bosom, sinus' ([13] equates them to the word "ядро", which has no such meanings), Greek νηδύς (it is possible with vocalization *nēid-) 'belly, entrails, mother's womb', Sanskr. नेद neda 'near'.

–   *gʷəm-n- corresponds to Rus. гунявый 'bald', Lat. vānus 'empty' (PIE *mn > Lat. n, not to be confused with PIE *pn > Lat. mn), without the suffix: Sanskr. गम gama '(in math.) removal (as of fractions)', from the Sanskr. गम् gam — 'to go, to come, to go away' — also Lith. gìmti 'to be born' and Lat. ventus 'arrival'. The same root in the form of *gʷm̥-n- is reflected in the Greek. βαίνω (PIE *-m̥- > Greek -a-, PIE *-niV- > Greek. –inV-) 'go, go away' (the variation γυ/βα is the same as in Greek γυνή/βανά 'woman'), and in the form of *gʷem-n- — in Lat. veniō (PIE *mn > Lat. n) 'come, approach'. Beekes [19, p. 192] argues that *gʷm̥- gives Greek ban- (before i̯), Lat. ven- (before a plosive) by itself.

–   *negʷ- in zero grade *ngʷ- corresponds to Lat. inguen 'groin, abdomen, genitals', Greek *ἄβα/ἄßη 'pubis' (obviously, long ago confused with ἄβα/ἥβη 'youth' and in all known texts written exactly this way), and in o-grade *nogʷ- — Rus. нагой, Lit. núogas 'naked'.

So, instead of three decent reconstructions, we have one defective, mindlessly wandering from one book to another.

phonetic laws are not taken for granted but are explicitly deduced. Although there is some subjectivism of the researcher, when he assumes possible phonetic correspondences by typology (some of them are later eliminated).

when searching for comparisons, we can find new laws on a much larger array of cases compared to lists from the literature.

no examples with 2–3 random languages out of a dozen. Many such examples can be coincidences (it is especially easy to find coincidences between Satəm and Centum languages, or between languages strongly destroyed phonetically). Moreover, the reconstruction consists of examples not for any 4 languages, but for specific 4 languages, — that is much more reliable. In the table form, it will be filled with data completely, not consisting mainly of empty cells (unlike, for example, the table by López-Menchero [28]).

when searching for comparisons, we are not limited to a given PIE proto-form, which might be based on a defective etymology.

we obtain not a collection of randomly found special cases (as in [35] — with 15 roots meaning 'swell (schwellen)', because it's easy to pull semantics on), but a fairly complete coverage of PIE as a system, because we consider PIE as a language. Of course, we must keep in mind that, for example, in Russian there are 166 words meaning 'snow, ice', 25 words meaning 'horse', and 25 words meaning 'dog' [8].

Disadvantages of the method compared to the ideal:

1   From Greek, Latin and Sanskrit, almost all the roots are tried, but not all of Baltic and Slavic roots. Even for Slavic languages the root list is being compiled since 1961 and still not finished [14]. In some cases, we can use large lists of Slavic roots (for example, to find matches on Greek γ-, χ-, β-, we prepare a list of Russian roots on г-, ж-, з- from [13]).

2   Theoretically possible that the same algorithm, linked not to the Balto-Slavic, but to a different branch, would give a 3-match row after merging three tables, where the 4th cell is to be filled at stage 7, using additional Baltic and Slavic dictionaries. Unfortunately, this method does not allow to find such triples (and the resulting fours).

3   It's quite difficult for a non-speaker to find Baltic matches. This way we might lose some Balto-Slavic roots. Just in case, we can make another pass later: write out all the roots from the Lithuanian dictionary (for example, [29]), then paste them into the common table. To reduce labor costs, we can skip Lithuanian roots with known Slavic matches: take the list of Lithuanian roots, find Slavic matches for them, then compare the unmatched roots to other branches. Authors' preliminary estimate for Lithuanian roots on a-, g-, ž-, gave an intersection with Slavic by 80% (21% of these etymologies contain defects). We are also working on Swadesh list for proto-Balto-Slavic (at an author's website [9]) — possible proto-roots are already found for all 207 terms, and all of them have PIE etymology.

4   The merging of three tables is completely manual. This is because a single cell can contain several interpretations (their number, in principle, is not limited). If we divide the cells and duplicate the remaining information, it will be difficult to edit such a table at the initial stages. To organize a relational database, we will need a complex software product to present and edit data in visual form.

5   The search for etymologies (the most labor-intensive stage) is not automated. This is due to the fact that many dictionaries are not available to researchers in the form of text files, and those that are available are not marked up for machine processing. Theoretically, we can find words and interpretations by parsing the text and output all possible proto-forms. But this will give a lot of "garbage" data that will have to be "cleaned out manually". In addition, to automatically search for etymologies, you need a fairly complete database of semantic transitions and bilingual dictionaries with software interface (because the interpretations in dictionaries are given in different languages).

6   The evaluation of etymologies is not automated. Since there is no sufficiently complete database of semantic transitions, the evaluation of possibility of intersection or derivability of the semantics of two words should be made by a person. This can be done simultaneously with the search for etymologies.

4. Results

At the time of writing, only the Greek and Latin parts for *g-, *g'-, *gh-, *g'h-, *gw- have been collected. They are summarized in a common table, where the Sanskrit part is added to roots common to three other branches (the full Sanskrit part is not compiled yet).

We were mostly limited with Latin, where were just around 300 roots available for comparison (g-, h-, v-), versus 400 in Greek (γ-, χ-, β-), 400 in Lithuanian (g-, ž-), and 600 in Russian (г-, ж-, з-; see below about х-, ш-).

Using this data, we have found the following number of matches for all 4 branches (we also added words with the specified consonants not in the first position):

– *g: 18 quality matches, 5 with defects in vowel length, 21 with serious defects.
– *gh: 13 quality matches, 8 with defects in vowel length, 17 with serious defects.
– *g': 17 quality matches, 6 with defects in vowel length, 7 with serious defects.
– *g'h: 16 quality matches, 3 with defects in vowel length, 6 with serious defects.
– *gw: 15 quality matches, 8 with defects in vowel length, 21 with serious defects. This is the answer to the claim of abovementioned macrocomparativists (the order of languages is Russian — Latin — Greek — Sanskrit, if not noted otherwise):

1   желать 'to wish' — volō 'to wish' — βόλομαι 'to wish' — gardha 'desire';
2   жив 'alive' — vīvō 'to live' — βία 'life' — jīvati 'to live';
3   жена 'woman' — Venus 'goddess of love' — γυνή 'woman' — jani 'woman';
4   гора 'mountain' — verrūca 'hill' — Βορέᾱς 'north' — giri 'mountain';
5   голубь 'pigeon' (*ǫb ~ небо 'sky') — volō 'to fly' — βάλλω 'to fall' — garut 'wing';
6   голямо 'strongly' — valeō 'to be strong' — βλεμεαίνω 'to exult' — garva 'pride';
7   гора (с плеч) 'load' — gravis 'heavy' — βάρος 'heavy' — gariman 'heaviness';
8   глобá 'path' — vola 'sole, footprint' — βλαῦται 'kind of footwear' — garta 'hole';
9   жица 'thread' — vieō 'to weave' — βιός 'bow-string' — jyā 'bow-string';
10   говорить 'to speak' — voveō 'to promise' — βοά 'cry' — gu- 'to sound';
11   гунявый 'bald' — vānus 'empty' — γυμνός 'nude' — gama 'removal';
12   жеребя 'foal' — gremium 'lap' — βρέφος 'fetus' — gárbha 'womb';
13   гуди́ть 'to cheat' — Vandali 'redheads?' — βασσάριον 'fox' — gaṇḍi 'fox';
14   головка 'bulb of onion' — volva 'womb' — βολβός 'bulb of onion' — gṛñjana 'kind of onion or garlic';
15   голый 'nude' — vellō, volsī 'to depilate' — βᾰλᾰνεῖον 'bath' — gal- 'to filter';
16   нагой 'nude' — inguen 'genitals' — *ᾰ̆βα 'pubis' (see above) — nagna 'naked';
17   гать 'causeway' — vea/via 'road' — βᾰτός 'passable' — ga- 'going, moving';
18   жрать 'to devour' — vorō 'to devour' — βορός 'devouring' — gṝ- 'to devour';
19   гнать 'to chase' — vēnor 'to hunt' — βόνασ(σ)ος 'wild bull' — gandh- 'to injure';
20   Pol. ogół 'entirety' — vulgō 'make common' — βέβηλος 'common' — gṝ- 'to proclaim';
21   гряду 'I go' — gradus 'pace' — βρενθύομαι 'to swagger' — gṛdhyati 'to strive after';
22   гадать 'to tell fortunes' — vador 'to put under bail to appear in court' — βάσᾰνος 'interrogation' — gadati 'to speak';
23   желабóлка 'bump' — volvō 'to roll' — βῶλος 'lump' — gula 'ball';
24   желудь 'acorn' — glāns 'id.' — βάλᾰνος 'id.' — garikā 'kernel of a cocoa-nut';
25   рожь 'rye (used for brown bread)' — ergastulum 'slave prison' ("in tenebris ergastularibus" — Sidonius Apollinaris, Epistulae 7:9:20)' — ἔρεβος 'darkness' — rajas 'id.';

26   рожéц 'pea husk' — ervum 'vetch' — ὄροβος 'bitter vetch' — raṅga-latā 'Senna auriculata (legume family, not used for coloring, despite the first meaning of raṅga-)';

27   Old Polish glogowycz 'saliunca (kind of mint)' — pulegium/pūlēium/ pullēium 'kind of mint' (< Umbr. *pulehium, cf. Umbr. pu- < quo-?) — βληχώ/γλήχων 'pulegium' — gāraka 'Eclipta prostrata (medical plant)'/gorakṣā 'medical plant';

28   Ukr. грунь 'hill' — grūmus, verrūca 'hill' — βουνός/γουνός 'hill' — grāvan 'mountain';

29   глек 'slime' — glaesum 'amber' — βλέννος 'slime' — gṛ- 'to moisten';

30   Russian Church Slavonic гатати 'to speak in riddles' — vetō/votō/vetuō 'to forbid' — βαττᾰρίζω 'to stutter' — gātu 'song';

31   Czech uhlupiti 'to destroy' — glaber 'sodomite' — βλάπτω, fut. βλᾰβήσομαι 'to harm' — grābha 'a demon causing diseases' (*gwleb- 'to harm'?);

32   говядо 'cattle' — vacca 'cow' — βοῦς/βῶς 'bull, cow' — gáu 'cow';

33   гроздь 'bunch' — gragulus 'jackdaw (rogue bird)' — βρᾰχίων 'arm' — grah- 'to grasp' (*gwreg'h- 'to grasp'?);

34   гвáзда 'mud' — vadum 'ford' — βάδος (ᾰ) 'way' — gādha 'fordable';

35   голбец/гольбец 'partition' — vāllum 'wall' — βαλβίς 'hurdle' — gharghara 'curtain, door, a particular form of a temple';

36   жезл 'rod' — vexō 'to injure', vacerra 'wooden post or stake' — βάκλον, βακτηρία 'rod' — śalākā (*k'l < *gk'l?) 'any small stake or stick, rod';

37   горб (or from *gъb-rъ?) 'hump' — vārus 'bent outwards' — ῥαιβός 'crooked' (from *bairos < **gwǝrios?) — grath- 'to be crooked';

38   гáжла 'a water plant' — vāgīna 'sheath' (dissimilation?) — βάπτω 'to submerge' — gáṅgā 'Ganges' (*gwǝ(n)gw- 'to submerge');

39   гасить 'to extinguish' — vesper 'evening' — σβέννῡμι 'to extinguish' — jāsáyati 'id.';

40   грызть 'to gnaw' — grūs, gruis (-h- lost?) 'a type of siege weapon' — βρύχω (ῡ) 'to bite' — girika 'mouse';

41   вогкий (or from *vъlg-?) 'wet' — ūvidus 'wet' — ὑγρός 'wet' — ukṣ- 'to wet';

42   Slovene hôst 'thicket', Serb. гвозд 'forest' — vespicēs 'dense shrubbery' — βᾶσσα 'wooded combe' — guṣpita 'accumulation'.

We have found only 4 full matches for *gwh in all positions (снег, легкий, деготь, жар), that make us doubt the existence of this phoneme. Using the word brevis < *mrégʰu- as an example, we can explain Latin levis ~ легкий. «Деготь» can be traced not to τέφρα/ τέφρη 'ash', but to τεχνάω 'make' (like 'to cook' and 'to burn clay'). As for «жар», instead of translation of it by dictionary (θέρος 'heat') we can use χάρμα/χάρμη 'eagerness for combat'. Greek νῐφάς -άδος 'snow, snowflake', νείφω/νίφω 'to snow' may be due to contamination with νέφος 'cloud'.

An interesting group of words was also found: Slavic x- ~ Latin h- ~ Greek (σ)χ- ~ Sanskrit gh- (>h-), which we are reconstructing as *(s)gh- (initially proposed by Illich-Svitych [7], but there were no 4-way examples). The first language is Russian if not noted otherwise:

1   хоровúна 'un-tanned skin' — Lat. harvīga/arvīga 'sacrificial ram' — Greek χρώς, χρωτός 'skin' — Sanskr. jarāyu 'the cast-off skin of a serpent; the outer skin of the embryo';

2   хоровúна 'wife's mother' — Lat. hērēs 'heir' — Greek χήρα 'widow' — Sanskr. hārya 'to be born';

3   OCS хътѣти — Cymr. chwant, Bret. hoant 'desiderium' — Greek χᾰτέω 'to want', σχέτλιος 'steadfast' — Sanskr. hava 'direction, order, command', hūta 'called';

4   шерсть 'wool', шершавый 'rough', хорéй 'a sharp pole used to drive deer' — Lat. hirsūtus, hirtus 'ruffled, rough, untreated' — Greek χᾰράσσω/χᾰράττω 'to sharp, to sharpen; to make notches' — Sanskr. hr̥ṣyati 'become erect or stiff or rigid';

5   Rus. Church Slav. шелыга 'rod' (and Rus. голья́ 'branch') — Lat. gladius 'plough, ploughshare' (can also be ~ железо 'iron', χάλκειος 'copper or bronze', híraṇyam 'gold') — Greek σχᾰλίς 'pole with a fork' — Sanskr. hrā 'vein, artery' (*sghel- 'splitting'?);

6   холостой 'unmarried' (and also голый 'naked') — Lat. nihil (possibly from *hel) 'nothing' — Greek σχολά 'leisure, free time' — Sanskr. hr̥ta 'deprived, having lost, -less';

7   холод (and also гáлага/гáлога 'fog, frost') — Lat. hālō 'to breathe, to blow' — Greek χάλαζα (χᾰ) 'hail' — Sanskr. hari 'the wind';

8   хоромы 'chamber', хоронить 'to bury' — Lat. horreum 'barn, granary, warehouse' — Greek χηρᾰμός 'burrow, lair, cave' — Sanskr. harmyám 'fortress';

9   ходить 'to sail' — Lat. Hadria 'Adriatic sea' — Greek σχεδία 'boat, raft' — Sanskr. haṇḍikā 'an earthen pot or boiler' (*sghed- 'vessel');

10   Czech ochabiti 'to weaken somebody' — Lat. hebes 'dull, weak' — Greek κωφός (*gh-bh > *k-bh according to Grassmann's law) 'dull' — Sanskr. jabh- 'to destroy';

11   хáбить 'to grab' (Ukr. гáбати 'id.') — Lat. habeō 'to take' — Greek ὀχμάζω (khbh > khm?) 'to grab hard' — Sanskr. gábhastiṣ (*gh-bh > g-bh: Grassmann's law) 'hand';

12   шест 'pole' — Lat. hasta 'pole' — Greek σχοῖνος 'reed' — Sanskr. hasta 'hand';

13   шест 'yard (zone)' — Lat. andrōn 'corridor' (≠ἀνδρῶν 'apartment for males'?) — Greek σχᾰδών 'honeycomb' — Sanskr. hādi 'a spider' (< 'web'?) (*sghed- 'cell'?);

14   Rus. Church Slav. xyca 'robbery' — Lat. hauriō 'to take' — Greek σχαστηρία 'cable transmission' — Sanskr. ghoṣa 'Luffa foetida (climbing plant)' (*sghews- 'catch'?);

15   холка 'crest' — Lat. hāmus (hal+m?) 'iron comb' — Greek σχελίς 'rib' — Sanskr. hali 'large plough' (*sghel- 'comb'?);

16   худовѝна 'possessions' — Lat. praehendō 'to grab' — Greek χανδάνω (kh-dh > kh-d?) 'to hold' — Sanskr. gādha (*gh-dh > g-dh: Grassmann's law) 'greediness';

17   хороший, хоровитый 'good (adj.)' (= гарный) — Lat. grātiā 'for the sake of' and horior/hortor 'to urge, encourage' — Greek χρή 'needed' and χαίρειν 'rejoice' — Sanskr. haryat mfn. 'eager, willing, glad';

18   хмырь/гмырь 'bumpkin' — Lat. homo/hemo 'human' — Greek σχῆμα/σχέμᾰ 'view, appearance' — Sanskr. haṃho 'a vocative particle';

19   ше-лупѝна 'skin' (лупить 'to peel') — Lat. hiulcus 'split' — Greek σχίζω 'to split' — Sanskr. heya 'to be abandoned' (*sghei- 'to split'?);

20   шалить 'to play pranks' — Lat. horror 'horror' (hol-r-?) — Greek χλεύη 'joke' — Sanskr. ghr̥ṇā 'horror' (*sghel- 'to scare');

21   холить 'to care for' — Lat. hēluor 'to spend immoderately' — Greek χλῐδή 'luxury' — Sanskr. harmya 'house of a wealthy person';

22   нехáть 'to let off' (не- 'not') — Lat. haereō 'to stop' — Greek σχάω 'to stop' — Sanskr. ha 'abandoning, avoiding'.

   The number of examples for the unambiguous *sgh- is limited by the preserved Greek words. We can only suppose *sgh- at Slavic *x-, not always (for example, there are expressive alternations: смурый/хмурый, слоп-/хлоп-).

The s-mobile problem is still waiting for its researcher. We can note Greek σμύραινα/ μύραινα 'sea-eel or murry', σμύξων/μύξων presumably 'grey mullet', σμύρνα/μύρρα 'myrrh', σμικρο-/μικρο- 'small', σμαρίλη/μαρίλη 'smoldering coal, heat', σκύλλαρος/ κύλλαρος presumably 'hermit crab', σκορδύλος/κορδύλος 'water-newt', σχερός 'mainland'/ χέρσος 'dry'. In Balto-Slavic: Rus. топа/стопа 'ream', тень/стень 'shadow', скрозь/через 'through', кора ~ Pol. skóra 'bark (of a tree)', Pol. krzydło/skrzydło 'wing', Rus. мурый/сму- рый 'gloomy', Rus. торчать ~ Bulg. стърчá 'to stick up', OCS тоуждъ/стоуждъ 'alien', OCS пльвати ~ Lith. spjáuti 'to spit', Lith. kabéti 'to hang' ~ Rus. скоба 'cramp, staple', Czech čirý ~ Pol. szczery 'clear', Serb. kväriti 'to spoil' ~ Rus. скверна 'dirt'.

We have also found another possible source for Slavic *x: ~ Lat. h- ~ Greek σκ- ~ Sansk. ch-, reconstructed as *sk'-:

1 шист 'stone breaking into leaves' [11, column 962] — Lat. scindō 'to cut, break, split' — Greek σκινδάλᾰμος 'splinter' — Sanskr. chinna (dn > nn? cf. channa 'covered' ~ chad- 'to cover') 'cut off, cut, divided';

2 ходить 'to walk' — Lat. scandō 'to ascend' — Greek σκάζω 'to walk lame' — Sanskr. chandas 'scansion, metrical aspect of verse';

3 шелыгáнить 'to deceive' — Lat. scelus 'crime, wickedness' — Greek σκᾰλᾰθυρμάτιον 'foolery' — Sanskr. chal- 'to deceive, cheat, delude, outwit; to feign';

4 халужина 'long twig' — Lat. scālae 'ladder' (< scall-?) — Greek σκέλος 'leg' — Sanskr. challī 'creeper; a kind of flower; offspring; bark';

5 халуга 'fence', халява 'bootleg' — Lat. scalmus 'oarlock' — Greek σκαλμός 'id.' — Sanskr. chardis 'fence' (*sk'el- 'to take in'?);

6 шест 'post' — Lat. scandula 'roof-shingle' — Greek σκανδάληθρον 'a stick in a trap' — Sanskr. chadis, chandas 'roof';

7 OCS шоуи 'on the left' — Lat. scaevus 'left' — Greek σκαιός 'left, on the left hand' — Sanskr. chi- 'abuse' (< 'wrong'?);

8 хáлпить 'to kill' — Lat. scalpō 'to scratch' — Greek σκόλοψ 'stake; point of fishing hook' — Sanskr. chṛp- 'to vomit' (cf. Rus. рвать 'to tear, vomit') (*sk'elp- 'to tear');

9 хáпать 'to seize', охапка/охвапка 'armful' — Lat. scopiō 'stalk or pedicle of grapes' — Greek σκᾰπτον/σκῆπτρον 'a stick, staff', σκήπτω 'press one thing against another' — Sanskr. chupa 'touch; a shrub, bush' (*sk'wep- 'to seize'?);

10 шебалá 'rag', шóбон 'tattered clothes' — Lat. scabiēs 'roughness' — Greek σκάφος 'digging, hoeing' — Sanskr. chubuka (ch-bh > ch-b?) 'chin' (*sk'ebh- 'rough'?).

5. Conclusion

This paper raises issues of PIE reconstruction completeness and of allocation of its lexical core. The research will continue, and as it progresses, the authors will publish tables of cognates that could be used in future work (online resource [9]).

Let's note the factors that directly affect the degree of development of the problem:
– There is still no complete etymological dictionary of Greek dialects (in particular, taking into account Tsakonian and Italiot Greek) and a serious etymological dictionary of Romance languages. For Slavic languages such a dictionary is being compiled for many years and is still not published to the end;
– Many dictionaries (largely due to the existing business model) are not available to researchers as text files, and those that are available are not marked up for machine processing;
– There is no sufficiently complete database of semantic transitions;

– Baltic and Slavic languages are not well involved in the reconstruction of the PIE. However, in the territory of the former USSR, little Indo-European study is carried out, so it's hard to assemble a team to compile a full dictionary (specialists of necessary profile are mainly engaged in macro-comparativistics);

– Certain traditions make it necessary to spend time not on searching for cognates, but on compiling a bibliography for them, which is not used in practice (the value of the theory should not depend on who expressed it, it is only important to provide data for verification);

– The theme is bogged down by a lot of fragmentary works, which creates the illusion of sufficient knowledge, the illusion of infinity, and a negative attitude to attempts to reform the situation.

However, let us hope that the indefatigable philological thought will eventually fill these lacunae in comparative linguistics. The theory of language will also undoubtedly find its dedicated enthusiasts, opening up new horizons in science.

СПИСОК ЛИТЕРАТУРЫ

1   *Асмангулян А. А.* Против гипотезы о "двуприродности" армянского языка // Вопросы языкознания. 1953. № 6. С. 21–36.

2   *Бирнбаум Х.* Праславянский язык: Достижения и проблемы в его реконструкции: пер. с англ. / вступит. ст. В. А. Дыбо; общ. ред. В. А. Дыбо и В. К. Журавлева. М.: Прогресс, 1986. 320 с.

3   *Гринь А. (Phersu).* Возможное чередование bh и sw в PIE (Possible correlation of -bh- and -sw- in PIE) // LingvoWiki. URL: https://wiki.lingvoforum.net/wiki/index.php/%D0%A3%D1%87%D0%B0%D1%81%D1%82%D0%BD%D0%B8%D0%BA:Phersu/%D0%92%D0%BE%D0%B7%D0%BC%D0%BE%D0%B6%D0%BD%D0%BE%D0%B5_%D1%87%D0%B5%D1%80%D0%B5%D0%B4%D0%BE%D0%B2%D0%B0%D0%BD%D0%B8%D0%B5_bh_%D0%B8_w_%D0%B2_PIE (дата обращения: 01.07.2020).

4   *Десницкая А. В.* О мнимом структурном единстве индоевропейских языков // Известия Академии Наук СССР. 1941. № 1. С. 58–78.

5   *Дворецкий И. Х.* Древнегреческо-русский словарь: в 2 т. М.: Гос. изд-во иностранных и национальных словарей, 1958. Т. 1. С. 1–1043. Т. 2. С. 1044–1904.

6   *Дыбо А., Старостин Г.* В защиту сравнительно-исторического метода (возражения на критику А. Вовина) // Аспекты компаративистики. М.: Изд-во РГГУ, 2008. Вып. 3. С. 175–176.

7   *Иллич-Свитыч В. М.* Один из источников начального х- в праславянском (Поправка к «закону Зибса») // Вопросы языкознания. 1961. № 4. С. 93–98.

8   Названия снега в русском языке // Alonecoder.nedopc.com. URL: http://alonecoder.nedopc.com/ling/SNOW.txt (дата обращения: 01.07.2020).

9   Промежуточные материалы по реконструкции ПИЕ // Alonecoder.nedopc.com. URL: http://alonecoder.nedopc.com/ling/PIE/index.html (дата обращения: 01.07.2020).

10 *Расторгуева В. С., Эдельман Д. И.* Этимологический словарь иранских языков. М.: Наука, Восточная литература, 2000–2011. Т. 1. 327 с. Т. 2. 502 с. Т. 3. 493 с. Т. 4. 415 с. Т. 5. 566 с.

11 Словарь церковно-славянского и русского языка, составленный Вторым Отделением Императорской Академии наук: в 4 т. СПб.: Тип. Императорской Академии Наук, 1868. Т. 4. 512 с.

12   *Трубецкой Н. С.* Мысли об индоевропейской проблеме // Вопросы языкознания. 1958. № 1. С. 65–77.

13   *Фасмер М.* Этимологический словарь русского языка: в 4 т. / пер. с. нем. и доп. О. Н. Трубачева; под ред. с предисл. проф. Б. А. Ларина. М.: Прогресс, 1986–1987. Т. I. 576 с. Т. II. 672 с. Т. III. 832 с. Т. IV. 864 с.

14   Этимологический словарь славянских языков Etimologicheskii slovar' slavianskikh iazykov (Etymological dictionary of Slavic languages): the proto-Slavic lexical Fund. Issues 1–41. М.: Наука, 2018. Вып. 41 (*pala — *ražьnъ(jь)). 280 с.

15   *Acharian Hrachia.* Հրաչեալ Աճառեան: Երեւանի Համալսարանի Հրատարակչութիւն, Երեւան, 1926 // Etymological dictionary of Armenian. URL: http://www.nayiri.com/imagedDictionaryBrowser.jsp?dictionaryId=7 (дата обращения: 01.07.2020).

16   Albanian Etymological Dictionary / by Vladimir Orel. Leiden, Boston, Köln: Brill, 1998. 712 p.

17   *Dixon Robert M. W.* The rise and fall of languages. Cambridge: Cambridge University Press, 2001. 169 p.

18   *Donkin T. C.* An Etymological Dictionary of the Romance Languages: Chiefly from the German of Friedrich Diez. London, Edinburgh: Williams and Norgate, 1864. 482 p.

19   Etymological dictionary of Greek / by Robert Beekes; with the assistance of Lucien van Beek // Leiden Indo-European etymological dictionary series. Leiden, Boston: Brill, 2010. Vol. 10/112. 1808 p.

20   Etymological dictionary of Iranian verb / by Johnny Cheung // Leiden Indo-European etymological dictionary series. Leiden, Boston: Brill, 2007. Vol. 2. 625 p.

21   Etymological dictionary of Latin and the other Italic languages / by Michiel de Vaan // Leiden Indo-European etymological dictionary series. Leiden, Boston: Brill, 2008. Vol. 7. 825 p.

22   Etymological dictionary of proto-Celtic / by Ranko Matasovic // Leiden Indo-European etymological dictionary series. Leiden, Boston: Brill, 2009. Vol. 9. 458 p.

23   Etymology of Armenian language // Armenianlanguage.org. URL: http://armenianlanguage.org/etymology/etymology.html (дата обращения: 01.07.2020).

24   *Frisk H.* Griechisches etymologisches Wörterbuch. 3 Bde. Heidelberg: Carl Winter, Universitätsverlag, 1960–1972. Band I. 968 p. Band II. 1154 S. Band III. 312 S.

25   Hittite Etymological Dictionary. (Trends in linguistics. Documentation (*Jaan Puhvel*)). Berlin, Boston, NY, Amsterdam: De Gruyter Mouton, 1984–2013. Vol. 1–9.

26   *Kuiper F. B. J.* «Rigvedic loanwords». / Spies (ed.). Studia Indologica: Festschrift für Willibald Kirfel. Bonn: Orientalistisches Seminar der Universität, 1955. S. 137–185.

27   *Lewis Charlton T., Short Charles.* A Latin Dictionary // Perseus.tufts.edu. URL: http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.04.0059%3Aalphabetic+letter%3DA%3Aentry+group%3D1%3Aentry%3DA1 (дата обращения: 01.07.2020).

28   *López-Menchero F.* The Late Proto-Indo-European Etymological Lexicon, v. 7 // Academia Prisca. URL: https://indo-european.info/indo-european-lexicon-v7-2019.xls (дата обращения: 01.07.2020).

29   *Lyberis A.* Lietuvių-rusų kalbų žodynas. Ketvirtoji laida / spec. redaktorius prof. habil. dr. Valerijus Čekmonas. Vilnius: Mokslo ir enciklopedijų leidybos institutas, 2005. 951 p.

30 *Mailhammer R.* The Germanic strong verbs: foundations and development of a new system (Trends in linguistics. Studies and monographs; 183). Berlin, New York: Mouton de Gruyter, 2007. 272 p.

31 *Monier-Williams M.* Sanskrit-English Dictionary / revised by E. Leumann, C. Cappeller, et al. // Sanskrit.inria.fr. URL: https://sanskrit.inria.fr/MW/1.html (дата обращения: 01.07.2020).

32 *Oberlies T.* (1994). «Review Article: F. B. J. Kuiper: Aryans in the Rigveda». Indo-Iranian Journal. № 37 (4). P. 333–349.

33 Oxford Latin Dictionary / P. G. W. Glare (Editor). Oxford: Clarendon Press, 1968–1982. 2126 p.

34 Perseus Greek Word Study Tool // Perseus.tufts.edu. URL: https://www.perseus.tufts.edu/hopper/morph?l=a&la=greek (дата обращения: 01.07.2020).

35 *Pokorny J.* Indogermanisches Etymologisches Wörterbuch. Band 1–3. Bern, München: Francke Verlag, 1959. 1183 S.

36 *Rix H.* Lexikon der indogermanischen Verben. 2nd ed. Wiesbaden: Dr. Ludwig Reichert Verlag, 2001. 824 S.

37 *Swadesh M.* «Lexicostatistic Dating of Prehistoric Ethnic Contacts» // Proceedings of the American Philosophical Society. Vol. 96. № 4. 1952. URL: https://books.google.ru/books?id=S6bwzXHWLWUC&pg=PA452&hl=ru&source=gbs_toc_r&cad=3#v=onepage&q&f=false (дата обращения: 01.07.2020).

38 The Cologne Digital Sanskrit Lexicon // Sanskrit-lexicon.uni-koeln.de. URL: https://www.sanskrit-lexicon.uni-koeln.de/scans/MWScan/tamil/index.html (дата обращения: 01.07.2020).

39 *Vishnevskiy S.* Facultative loss of w, j in the Proto-Indo-European, 2018 // Academia.edu. URL: https://www.academia.edu/36639367/Facultative_loss_of_w_j_in_the_Proto-Indo-European (дата обращения: 01.07.2020).

40 *Walde A.* Vergleichendes Wörterbuch der indogermanischen Sprachen. 3 vols. / ed. by Julius Pokorny. Berlin, Leipzig: Walter de Gruyter, 1927–1932. Vol. 1. 985 S. Vol. 2. 716 S. Vol. 3. 273 S.

41 *Witzel M. E. J.* «The Languages of Harappa» // Proceedings of the conference on the Indus civilization, Madison 1998. URL: https://people.fas.harvard.edu/~witzel/HarLang.pdf (дата обращения: 01.07.2020).

REFERENCES

1 Asmangulian A. A. Protiv gipotezy o "dvuprirodnosti" armianskogo iazyka [Against the hypothesis of "double nature" of the Armenian language]. *Voprosy iazykoznaniia*, 1953, no 6, pp. 21–36. (In Russian)

2 Birnbaum Kh. *Praslavianskii iazyk: Dostizheniia i problemy v ego rekonstruktsii: translation from English* [Proto-Slavic language: Achievements and challenges in its reconstruction], introductory article by V. A. Dybo; general edition by V. A. Dybo and V. K. Zhuravleva. Moscow, Progress Publ., 1986. 320 p. (In Russian)

3 Grin' A. (Phersu). Vozmozhnoe cheredovanie bh i sw v PIE (Possible correlation of -bh- and -sw- in PIE) [Possible alternation of BH and W in the pie (possible correlation-BH-and-sw-in the PIE)]. *LingvoWiki*. Available at: https://wiki.lingvoforum.net/wiki/index.php/%D0%A3%D1%87%D0%B0%D1%81%D1%82%D0%BD%D0%B8%D0%BA:Phersu/%D0%92%D0%BE%D0%B7%D0%BC%D0%BE%D0%B6%D0%BD%D0%BE%D0%B5_%D1%87%D0%B5%D1%80%D0%B5%D0%B4%D0%B

E%D0%B2%D0%B0%D0%BD%D0%B8%D0%B5_bh_%D0%B8_w_%D0%B2_
PIE (accessed 01 July 2020). (In Russian)

4   Desnitskaia A. V. O mnimom strukturnom edinstve indoevropeiskikh iazykov [On the supposed structural unity of Indo-European languages]. *Izvestiia Akademii Nauk SSSR*, 1941, no 1, pp. 58–78. (In Russian)

5   Dvoretskii I. Kh. *Drevnegrechesko-russkii slovar': v 2 t.* [Ancient Greek-Russian dictionary: in 2 vols.] Moscow, Gosudarstvennoe izdatel'stvo inostrannykh i natsional'nykh slovarei Publ., 1958, vol. 1, pp. 1–1043, vol. 2, pp. 1044–1904. (In Russian)

6   Dybo A., Starostin G. V zashchitu sravnitel'no-istoricheskogo metoda (vozrazheniia na kritiku A. Vovina) [In defense of the comparative-historical method (objections to the criticism of A. Vovin)]. *Aspekty komparativistiki* [Aspects of comparative studies]. Moscow, Izdatel'stvo RGGU Publ., 2008, vol. 3, pp. 175–176. (In Russian)

7   Illich-Svitych V. M. Odin iz istochnikov nachal'nogo kh- v praslavianskom (Popravka k «zakonu Zibsa») [One of the sources of initial x - in proto-Slavic (Amendment to the "law of Zibs")]. *Voprosy iazykoznaniia*, 1961, no 4, pp. 93–98. (In Russian)

8   Nazvaniia snega v russkom iazyke [Names of the snow in the Russian language]. *Alonecoder.nedopc.com.* Available at: http://alonecoder.nedopc.com/ling/SNOW.txt (accessed 01 July 2020). (In Russian)

9   Promezhutochnye materialy po rekonstruktsii PIE [Intermediate materials for PIU reconstruction]. *Alonecoder.nedopc.com.* Available at: http://alonecoder.nedopc.com/ling/PIE/index.html (accessed 01 July 2020). (In Russian)

10   Rastorgueva V. S., Edel'man D. I. *Etimologicheskii slovar' iranskikh iazykov* [Etymological dictionary of Iranian languages]. Moscow, Nauka Publ., Vostochnaia literature Publ., 2000–2011. Vol. 1. 327 p. Vol. 2. 502 p. Vol. 3. 493 p. Vol. 4. 415 p. Vol. 5. 566 p. (In Russian)

11   *Slovar' tserkovno-slavianskogo i russkogo iazyka, sostavlennyi Vtorym Otdeleniem Imperatorskoi Akademii nauk. V 4 t.* [Dictionary of Church Slavonic and Russian, compiled by the Second Department of the Imperial Academy of Sciences. In 4 vols] St. Petersburg, Tipografiia Imperatorskoi Akademii Nauk Publ., 1868. Vol. 4. 512 p. (In Russian)

12   Trubetskoi H. S. Mysli ob indoevropeiskoi probleme [Thoughts on the Indo-European problem]. *Voprosy iazykoznaniia*, 1958, no 1, pp. 65–77. (In Russian)

13   Fasmer M. *Etimologicheskii slovar' russkogo iazyka: v 4 t.* [Etymological dictionary of the Russian language: in 4 vols.], translation from German and additions by O. N. Trubacheva; edited with a Preface by Professor B. A. Larina. Moscow, Progress Publ., 1986–1987. Vol. I. 576 p. Vol. II. 672 p. Vol. III. 832 p. Vol. IV. 864 p. (In Russian)

14   *Etimologicheskii slovar' slavianskikh iazykov the proto-Slavic lexical Fund. Issues 1–41* [Etymological dictionary of Slavic languages (Etymological dictionary of Slavic languages): proto-Slavic lexical Fund. Issues 1–41]. Moscow, Nauka Publ., 2018. Issues 41 (*pala — *paž'n"(j')). 280 p. (In Russian)

15   Acharian Hrachia. Հրաչեայ Աճառեան: Երեւանի Համալսարանի Հրատարակչություն, Երեւան, 1926 [Acharian Hrachia. I Don't Know. Yerevan University Press, Yerevan, 1926]. *Etymological dictionary of Armenian.* Available at: http://www.nayiri.com/imagedDictionaryBrowser.jsp?dictionaryId=7 (accessed 01 July 2020). (In Russian).

16   *Albanian Etymological Dictionary*, by Vladimir Orel. Leiden, Boston, Köln, Brill Publ., 1998. 712 p. (In English)

17   Dixon Robert M. W. *The rise and fall of languages*. Cambridge, Cambridge University Press Publ., 2001. 169 p. (In English)

18   Donkin T. C. *An Etymological Dictionary of the Romance Languages: Chiefly from the German of Friedrich Diez*. London, Edinburgh, Williams and Norgate Publ., 1864. 482 p. (In English)

19   Etymological dictionary of Greek, by Robert Beekes; with the assistance of Lucien van Beek. *Leiden Indo-European etymological dictionary series*. Leiden, Boston, Brill Publ., 2010. Vol. 10/112. 1808 p. (In English)

20   Etymological dictionary of Iranian verb, by Johnny Cheung. *Leiden Indo-European etymological dictionary series*. Leiden, Boston, Brill Publ., 2007. Vol. 2. 625 p. (In English)

21   Etymological dictionary of Latin and the other Italic languages, by Michiel de Vaan. *Leiden Indo-European etymological dictionary series*. Leiden, Boston, Brill Publ., 2008. Vol. 7. 825 p. (In English)

22   Etymological dictionary of proto-Celtic, by Ranko Matasovic. *Leiden Indo-European etymological dictionary series*. Leiden, Boston, Brill Publ., 2009. Vol. 9. 458 p. (In English)

23   Etymology of Armenian language. *Armenianlanguage.org*. Available at: http://armenianlanguage.org/etymology/etymology.html (accessed 01 July 2020). (In English)

24   Frisk H. *Griechisches etymologisches Wörterbuch*. 3 Bde. Heidelberg: Carl Winter, Universitätsverlag, 1960–1972. Band I. 968 S. Band II. 1154 S. Band III. 312 S. (In German)

25   *Hittite Etymological Dictionary*. (Trends in linguistics. Documentation (Jaan Puhvel)). Berlin, Boston, New York, Amsterdam, De Gruyter Mouton Publ., 1984–2013. Vol 1–9. (In English)

26   Kuiper F. B. J. "Rigvedic loanwords", Spies (ed.). *Studia Indologica: Festschrift für Willibald Kirfel*. Bonn, Orientalistisches Seminar der Universität Publ., 1955. S. 137–185. (In German)

27   Lewis Charlton T., Short Charles. A Latin Dictionary // Perseus.tufts.edu. Available at: at: http://www.perseus.tufts.edu/hopper/text?doc=Perseus%3Atext%3A1999.04.0059%3Aalphabetic+letter%3DA%3Aentry+group%3D1%3Aentry%3DA1 (accessed 01 July 2020). (In English)

28   López-Menchero F. The Late Proto-Indo-European Etymological Lexicon, v. 7. *Academia Prisca*. URL: https://indo-european.info/indo-european-lexicon-v7-2019.xls (accessed 01 July 2020). (In English)

29   Lyberis A. *Lietuvių-rusų kalbų žodynas. Ketvirtoji laida* [Lithuanian-Russian dictionary. Fourth release]. Ketvirtoji laida, spec. redaktorius prof. habil. dr. Valerijus Čekmonas. Vilnius, Mokslo ir enciklopedijų leidybos institutas Publ., 2005. 951 p. (In Lithuanian)

30   Mailhammer R. *The Germanic strong verbs: foundations and development of a new system (Trends in linguistics. Studies and monographs; 183)*. Berlin, New York, Mouton de Gruyter Publ., 2007. 272 p. (In English)

31   Monier-Williams M. Sanskrit-English Dictionary / revised by E. Leumann, C. Cappeller, et al. *Sanskrit.inria.fr*. Available at: https://sanskrit.inria.fr/MW/1.html (accessed 01 July 2020). (In English)

32   Oberlies T. (1994). "Review Article: F. B. J. Kuiper: Aryans in the Rigveda". *Indo-Iranian Journal,* no 37 (4), pp. 333–349. (In English)

33   *Oxford Latin Dictionary*, edited by P. G. W. Glare. Oxford, Clarendon Press Publ., 1968–1982. 2126 p. (In English)

34   Perseus Greek Word Study Tool. *Perseus.tufts.edu*. Available at: https://www.perseus. tufts.edu/hopper/morph?l=a&la=greek (accessed 01 July 2020). (In English)

35   Pokorny J. *Indogermanisches Etymologisches Wörterbuch. Band 1–3.* Bern, München, Francke Verlag Publ., 1959. 1183 S. (In German)

36   Rix H. *Lexikon der indogermanischen Verben. 2ⁿᵈ ed.* Wiesbaden, Dr. Ludwig Reichert Verlag Publ., 2001. 824 S. (In German)

37   Swadesh M. "Lexicostatistic Dating of Prehistoric Ethnic Contacts". *Proceedings of the American Philosophical Society.* Vol. 96. No 4. 1952. Available at: https:// books.google.ru/books?id=S6bwzXHWLWUC&pg=PA452&hl=ru&source=gbs_ toc_r&cad=3#v=onepage&q&f=false (accessed 01 July 2020). (In English)

38   The Cologne Digital Sanskrit Lexicon. *Sanskrit-lexicon.uni-koeln.de.* Available at: https://www.sanskrit-lexicon.uni-koeln.de/scans/MWScan/tamil/index.html (accessed 01 July 2020). (In English)

39   Vishnevskiy S. Facultative loss of w, j in the Proto-Indo-European, 2018. *Academia. edu.* Available at: https://www.academia.edu/36639367/Facultative_loss_of_w_j_in_ the_Proto-Indo-European (accessed 01 July 2020). (In English)

40   Walde A. *Vergleichendes Wörterbuch der indogermanischen Sprachen. 3 vols.*, ed. by Julius Pokorny. Berlin, Leipzig, Walter de Gruyter Publ., 1927–1932. Vol. 1. 985 S. Vol. 2. 716 S. Vol. 3. 273 S. (In German)

41   Witzel M. E. J. "The Languages of Harappa". *Proceedings of the conference on the Indus civilization,* Madison 1998. Available at: https://people.fas.harvard.edu/~witzel/ HarLang.pdf (accessed 01 July 2020). (In English)