ARTICULATORY PHONETICS AND RECONSTRUCTION VERIFICATION
(Indo-Iranian data)

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Abstract

Articulatory phonetic data of living Indo-Iranian languages may be used to verify reconstructed subsystems of Indo-European, Proto-Aryan and Proto-Iranian phonological systems. Analysis of the articulatory aspect of historical changes helps to solve some disputable problems in the history of Indo-Iranian languages.

Using typological evidence to verify or correct data obtained through comparative-historical method allows to reveal systemic relationships between reconstructed units, including phonetic units, and to make the reconstructed system more probable /1/. Thus, articulatory phonetics and phonology of living Indo-Iranian languages discloses interesting typological parallels to various reconstructed subsystems of Indo-European, Aryan and Iranian protolanguages. This makes for a better understanding of the functioning of these subsystems in the synchronically viewed reconstructed protosystems and diachronic processes accompanying both the emergence of these systems and their subsequent changes.

One example of such parallels is a system of triads of consonants: "palatalized - simple - labialized" of the type C' - C - C°, which is observed in several living Indo-Iranian languages: in one of the Iranian languages - Yazghulami - in West Pamir (consonants k̃ - k - k°, g̃ - g - g°) /2/, in one of the Nuristani (Kafir) languages - Kati - in the province of Nuristan in Afghanistan (cerebral shibilants ṣ̌' - ṣ̌ - ṣ̌°, ž̌' - ž̌ - ž̌°) /3/ and in one of the Dardic languages - Kashmiri (consonants of almost all the zones and series, e.g. t' - t - t°, tʻ' - tʻ - tʻ°, d' - d - d°, ṭ' - ṭ - ṭ°... k' - k - k°... s' - s - s° ... h' - h - h°) /4/. These triads, particularly in Yazghulami and Kashmiri, are typological parallels to early Indo-European triads of gutturals, laryngeals and, possibly, sibilants /5/.

Attention to the articulation of the consonants forming these triads in the above-mentioned languages helps to better understand the functioning and evolution of corresponding Indo-European triads.

"Simple" members of the triads of the "guttural" group (of the type k' - k - k°) appear to be unmarked members of the oppositions and are represented by velar consonants characterized by wide variation and ability to merge with palatalized and labialized consonants in certain positions. With predominance of the palatal focus, the palatalized members of the triads easily shift to the front zone and become affricated (by the type k̃→k̃→č and so on). This accounts for the tendency towards turning into affricates and further changes of Indo-European palatal consonants: *k̂ > Aryan *č̂ > *ś from which derive Nurist. c, Indo-Aryan and Iranian ś (its transition into s is a relatively later phenomenon which did not occur in all the Iranian languages). Depalatalization and a back-lingual shift k̂ > k is less frequent. The labialized members of the triads are represented by velar consonants with a second labial focus, not always synchronous with the main one: labial articulation may begin earlier than velar implosion and end later than velar explosion. Labiality may disappear completely or transfer to the neighbouring vowel. Its predominance and the change of a labialized consonant into labial is rare.

This evidence supports the possibility of the functioning, in early Indo-European, of triads of guttural consonants, and discloses the main principles of their change in the eastern area, i.e. in satəm languages: a)the shift forward of palatalized - palatal consonants (with affrication and possible assibilation), b) the loss by the labialized consonants of the labial articulation component leading to their merger with the "simple" consonants /6/. The reverse pattern in the frequency of processes, i.e. depalatalization of palatalized consonants and their merger with "simple" ones, and the predominance of the labial focus in the labialized consonants with their transition to the labial group - characterizes the changes in

these triads in the western area, i.e. in centum languages.

Positional presentation of sibilants as shibilants in various languages (e.g. see /7/) points to the pattern of transition of Indo-European *s > š following *i, *u, *r, *k, *k̂ in satəm languages: appearance of a secondary focus (additional point of articulation) of *s - a palatal focus after *i, *k̂ and velar or post-alveolar focus - after *u, *r, *k. The secondary focus brought about shibilants (of *š, *ṣ̌ type), the phonologization of which (and consequently, the phonologization of the opposition s ~ š /8/ occured much later, after the satəm group had diverged into a number of subgroups (partly even after the divergence of Aryan protolanguage).

The difference of articulation of *š in different regions of Proto-Iranian language brought about differences in sibilant subsystems of various Iranian languages. In the Western and North-Eastern subgroups, "soft" (palatalized) articulation of *š with a secondary palatal focus prevailed. The result was an appearance in these languages of a two-member opposition s - š (except Ossetic which lacks this opposition, and where the single phoneme /s/ has different dialectal realizations [s, ś, s', š]). In the South-Eastern subgroup, the influence of a substratum similar to the substratum for Indo-Aryan languages resulted in the predominance of "hard" articulation of *š, with a secondary velar focus, which, in this region, was associated with the cerebral phonological zone. As the opposition /š̌/ - /ṣ̌/ developed in the same region, an "empty slot" for the "soft" /š/ appeared in the phonological system of these languages, which was later filled with positional variants of other consonants - reflexes of Proto-Iranian *š, *č etc. The result was the establishment of a three-member opposition s - š - ṣ̌, to some extent similar to the Old Indian opposition.

One of genealogical features differentiating the East-Iranian language group from the West-Iranian - is a reflection of Proto-Iranian *b-, *d-, *g- as West-Iranian b-, d-, g- ~ East-Iranian v-, δ-, γ- in word-initial position. Individual exceptions in East-Iranian languages, such as the initial b-, d- instead of *v-, *δ-, can be explained by relatively late articulatory tendencies already within these languages themselves. Thus, Ossetic at some stage became to be characterized by the strengthening of articulation of word-initial voiced consonants. As a result, borrowings from Old Ossetic (Alan) into Hungarian display the complementary distribution, which existed at that period, of voiced stops and fricative consonants in word-initial and middle posi-

tions: b- : -v-; d- : -δ- (the latter being represented by Hungarian z). Significant in this respect, are cases of reflection of the Old Iranian resonant *u̯ in Ossetic b-, and almost complete absence in Modern Ossetic of original words with initial v-. This evidence shows that the articulatory tendency characterizing a one-word speech segment, i.e. articulatory "border mark", resulted in a "deviation" in historical development of consonantism, a "violation" of the phonetic law. A similar tendency is observed in Khotanese. In several East-Iranian languages (Yagnobi and Ishkashmi) "deviations" occur only in the reflection of *δ - and connected with the general instability of articulation of *v̄, *δ in these languages area: *v̄ changes, relatively early, into t or s, and *δ- - usually into d- (probably, not without Tadjik influence). In the neighbouring area the unstable articulation of *δ brought about the transition *δ > l. This occured in Iranian languages - Pashto and Munji, and also in one of the Nuristani languages - Prasun, - which shows that this phenomenon is regionally rather than genetically conditioned.

As to reflexes of East-Iranian *γ-, such deviations in the form of its reflection as *g- are non-existent. The reason of this is its articulatory characteristic: very early and virtually across the whole of Iranian linguistic area *γ shifted to the uvular (postvelar) zone, therefore its "return" to the velar stop *g- became impossible. Even the word-initial strengthening in Ossetic resulted only in its transition in one of the dialects, into the unvoiced uvular q- - the only stop in this phonemic group (the other dialect retains γ-).

The tendency toward a spirant character of word-initial voiced consonants in East-Iranian languages may be rooted in the ancient past. It is known that Proto-Iranian *b, *d, *g are reflexes of the two Proto-Aryan consonant series merged: aspirated *bh, *dh, *gh and non-aspirated *b, *d, *g (corresponding to series I and II of the Indo-European model suggested by T.V. Gamkrelidze and V.V. Ivanov). During Proto-Iranian, as well as during Proto-Aryan and Indo-European periods, there was no fricative/stop opposition for voiced consonants. Even in late Indo-European "dialects", and later periods - up to individual Indo-Aryan languages - voiced aspirated consonants may be phonetically realized as voiced fricatives /9/ and/or as freely varying sounds of *bh/v type, etc. A similar articulation type may be assumed also for those early Aryan dialects from which Iranian languages later originated. This clarifies the further development of articulation of voiced consonants in early Iranian dialects:

two phonological series were merging differently in different dialectal groups. In Western dialects, owing to a strong occlusive component and weak aspirated one, the consonants of the aspirated series quickly lost their aspiration and merged with non-aspirated consonants, becoming similar to the latter (*b, *d, *g). Eastern dialects which had a longer contact with Indo-Aryan languages, retained for a longer time the aspirated component in the articulation of voiced consonants (and/or their spirant articulation). As a result, when the two series merged into one, the articulation characteristic to the other series prevailed, i.e. that of the series of aspirated (and/or spirant) consonants.

Thus, the phonetic – articulatory tendency toward a spirant realization of voiced aspirated consonants, which could have operated already in dialects of Late Indo-European, continued to operate also in dialectal zones of Proto-Aryan, remaining for a long time at the phonetic level. Word-initial voiced spirants became phonemic much later – after the two Proto-Aryan series of voiced consonants had merged into one series in Proto-Iranian and after the opposition "stop/fricative" in the subclass of voiced phonemes became – much later – phonologically relevant, in the period when Iranian languages were already divided into the main groups. Different factors – internal and external – contributed to the phonological independence of these oppositions, which progressed unevenly in different language subgroups and areas, and even – within one language system – in different articulatory zones.

Thus, attention to the articulatory phonetics of living Indo-Iranian languages provides a typological background for verification and correction of reconstructed phonetic and phonological systems and their change patterns, whereas attention to the articulation aspect of historical changes sheds light on the character of the main tendency in these changes, possible deviations from it, and relative chronology of a number of processes. This helps to narrow the gap between the comparative-historical postulates and the studies of living languages.

The above-described procedures may also help to solve some specific disputable problems in the history of Indo-Iranian languages. They help to reveal the lack of uniformity of Proto-Iranian in different regions (even with respect to different phonetic presentations of phonemes forming a single phonemic series), and possible areas of substratum and adstratum influences on Indo-Iranian languages. These procedures help to differentiate internal and external factors in the development of this language family, starting from an earliest period.

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terms of description, the senior terms being semantico-phonological classes. Classes of lexical etymologies and grammatical classes comprise the temporal parameter - they are spread out ("smeared") in time, the functional load of distinctors in the system being measured in their actual or potential transformations. Distinctors can combine into hypermerismata - or they can discompose into hypomerismata. This idea was expressed for the first time in the Tbilissi Phonological School. Synthesis (resp. discomposition) of features presupposes absorption (resp. emanation) of information and functional load /5/. The functional load freed from the segmental (phonemic) level, is used in phonotactics or prosodic structures. These transformations expose an important property of surface distinctors, which are revealed in neutralizations. They interchange, and their mutations are most clear when the distinctors transgress from one phonological level to another. We explain this phenomenon in the following way: surface distinctors are "incarnations" or "reincarnations" of deep-structure merismata, the latter are less numerous and quite invariable. Group phonemes, syllabophonemes and units of word prosody may be treated as transforms of phonemes, and vice versa.

The possibilities of the model were investigated by G.S. Klychkow and L. Hertzenberg /6,7/. The model comprises variables x, y ..., the slots C and V as parts of the syllable CV, stages segmental Cx or Vx, suprasegmental C^x or V^x, and connected /CV/ vs. disconnected /C-V/. If "x" is laringality, then /CV/^{x} is a syllable with stϕd-like accent, /C$_V$ = x_1/ should be interpreted as H or schwa, C^xV - syllable with aspirated initial, CV^x - syllable with long vowel, CxV as HV, CVx as CVH, where H represents the segmental laryngeal. It is worth noting that one feature in the binary slot CV can be distributed in the four patterns CV, CxV, CV^x, C^xV^x; the model thus presupposes some restrictions.

a). Only one feature is considered, so CV is excluded because it would mean introduction of new binary feature - "$\overline{x}$",

b). The feature can be used only once; C^xV^x, H$\overline{V}$, C^hV, C^hVH, HVH are all excluded (Grassmann's law).

3. A more complex model has been developed in order to explain the phonology of the Indoeuropean Protolanguage disintegration. The transformation of a syllabomorphemic language into a family of what one would call word-and-phoneme languages is accepted as the diachronic axis for this model. It comprises two unvariable deep-structure merismata - $\mathcal{E}$ ("force") and $\mathcal{L}$ ("laryngality"), which appear as different surface distinctors on three phonological levels: the phonemic level

(Φ), the suprasegmental level (Σ) and the word-prosody level (Λ).

"Features" and phonological levels	Deep-structure merismata	
supra-seg-mental Σ	the high register	the broken contour
phonemic Φ	"force" (suffocancy &c)	aspiration
word proso-dy Λ	distinctors of stress paradigms	distinctors of contact

Then the following consonant changes show how the protolanguage developed into two main filiations

I. $D \rightarrow T^*/$ II. $D \rightarrow DH/$
$D \rightarrow D /$ $D \rightarrow D/$

The consonant sets correspond in the following way:

Language branches	Proto-Indo-euro-pean	Arian	Armeno-germa-nic	Balto-slavic
Typo-logi-cal formu-lae	$\Sigma\mathcal{L}\mathcal{E}$ (Φ) (Λ)	(Σ) $\Phi\mathcal{L}$ $\Lambda\mathcal{E}$	(Σ) $\Phi\mathcal{E}$ $\Lambda\mathcal{L}$	$\Sigma\mathcal{L}$ (Φ) $\Lambda\mathcal{E}$
I	(D)	D		D$\check{V}$
II	(D)		T^{∂}	D$\check{V}$
		DH		
III	(D)		D	D$\acute{V}$

The "experiences" of the merism $\mathcal{L}$ had been investigated by G.S. Klychkov /5,6/, those of the merism $\mathcal{E}$ - by V.A. Dybo /8/. L. Herzenberg has revealed the merismata mutations in the prehistory of Anatolian, Greek, Italic and other branches of Indoeuropean /7/. The reconstruction of Indoeuropean phonological diachrony thus requires a theory with two kinds of "features":

a) unvariable "deep-structure" merismata,

b) surface distinctors being "incarnations" and "reincarnations" of the

merismata ; their mutual transformations and their transgressions from one phonological level to another are mutations which seem to be determined by typological language change tendencies.

The models introduced above presuppose dynamic realizations of linguistic units with the remaining constant character of their inner regenerational patterns. The relation "dynamic realization - constant structural pattern" is the main feature of all processes determinating the unity of linguistic families. 4. The next step in complicating the model is the introduction of semantic features. Relations between semantic and phonological features are supposed to lead to flexible non-discreet merismatic structures. Linguistic material is represented in the model as large dynamic and semantic sets. Processing of material necessarily becomes computerized. Three classes of Indo-European etymologies: words for "water", natural phenomena and an open class of random etymologies were described in terms of 35 semantic features and 35 phonological distinctors. Correlation coefficients between the classes on semantic features and phonological distinctors were calculated and the agree criterion x^2 was computerized twice. First it was phonological coefficients that were taken as theoretical data with semantical coefficients as semantical data, then vice versa. The main result obtained in the experiment lies in the realization of the fact that semantic and phonological relations in all the classes are orthogonal.

It becomes evident that both in speech production and speech perception the principle of shuttle movement is dominant. The focus of actualization moves incessantly between the vocal and consonant, between phonemic, suprasegmental and word-prosody components, between merismata and "files", between the phonological and semantic spheres.

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