

Typological Classification of the Siberian Phonological Systems as a Result of Using the Advanced Instrumental Investigation

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Abstract: The problem of the Ural-Altai languages typology has been for a long time and is still of interest for the linguists. The complex experimental-phonetic research of the vocalic and consonantal systems of the Siberian languages by using of the advanced instrumental techniques allowed clarifying the problem of the sound systems classification. The results of the experimental research of the Buryat, Mongol and some Turkic languages practically support the existence of the central vowel row that was theoretically predicted by L.V. Scherba. Objective data on Turkish (the Eastern dialect, Kazakhstan), Mongol and some other language vocalisms witness the necessity of distinguishing one more vowel row beside central namely, central-back which has all six degrees of rise. There have been added some corrections into articulatory classification of consonants: there have been singled out additional consonant classes, specified groups of compound units, introduced obligatory characteristic of sounds in accordance with the passive organs of speech.

Key words: Siberian peoples' languages, typological classification, phonology, experimental-phonetic methods, magnetic-resonance imaging, digital roentgenography, dental-palatography

INTRODUCTION

Instrumental researches of the sound systems of the languages of peoples of Siberia and neighboring regions have been carried out by the Laboratory of Experimental-Phonetic Researches (LEPR), Institute of Philology Siberian Branch of the Russian Academy of Sciences since 1968. At that time V.M. Nadyelyayev initiated a new investigation of minority languages and founded the Siberian Phonological School.

The laboratory staff has investigated different aspects of phonetics of more than forty languages without any written tradition or with newly appeared literary tradition including their territorial dialects and sub-dialects. The investigated idioms belong to different language families Turkic, Mongol, Tungus-Manchu, Samoyedic, Ob-Ugric, Yenisei and Paleoasian.

The first stage of experimental-phonetic Siberian studies (1970-1990s) was a period of an intensive accumulation of factual material and primary descriptions of the sound systems of individual languages and dialects. The results of the study of structural-taxonomical organization of the vocal and consonant systems were published in monographs, articles, dissertations (<http://www.philology.nsc.ru/departments/lefi/books/in>

[dex.php](http://www.philology.nsc.ru/departments/lefi/books/in)). At the turn of the century, along with continued work on gathering data on endangered languages, a series of contrastive monographic studies of vocal and consonantal systems within the same language family has been performed.

As the material on the vocalism and consonantism of languages of different families was accumulated, the problems of sound systems typology became of prime importance. The main purpose of this research is to work out a typological classification of phonological systems of the languages of the native peoples of Siberia.

MATERIALS AND METHODS

Descriptions of the sound systems of the Siberian languages given in the works of Russian and foreign scientists of the nineteenth and the first half of the twentieth century resulted mainly from auditive-visual impressions on which the tradition of indoeuropeistics influenced. Since, the middle of the last century, thanks to the active use of instrumental methods, ideas of the linguists on structural organization of Siberian phonological systems and the specifics of articulatory-acoustic bases of ethnic groups native speakers of the languages have received considerable development.

A complex methodology used by the Siberian phoneticians includes both the linguistic methods of phonological analysis and experimental-phonetic ones: somatic methods of static radiography, dental-palatography, labiography, linguography as well as acoustic ones spectrography, pneumo-oscillography, computer programs for creation and data processing of sound files. The unity of methods provides comparability of material (Ladefoged, 2003).

At the present stage of the development of high-precision X-ray and electronic technologies, it is necessary to transfer experimental-phonetic researches on a qualitatively new methodological and instrumental level. Since 2009, the phoneticians of LEPR have begun to use a Digital Roentgenography "Sibir-N" worked out at the Institute of Nuclear Physics SB RAS and Magnetic Resonance Imaging (MRI) (Selyutina *et al.*, 2012). MRI appears to be a perspective method for articulation processes visualization, providing almost unlimited number of images both static and dynamic. Digital laryngoscopy (Sawashima and Hirose, 1968) is the latest utilized by us method applied for obtaining articulatory information in the pharyngeal-laryngeal cavity (Fig. 1) displaying activities of the tongue root, the pharynx wall and vocal cords in a real-time mode.

As a result of an extensive work on fixing articulatory settings of vowels and consonants in the languages of

the peoples of Siberia and adjacent territories, an electronic database including materials received in 40 idioms was formed. These materials served as the basis for constructing a typological classification of the phonological systems of the Siberian region languages.

RESULTS AND DISCUSSION

The vowel systems typology classification: The research of qualitative and quantitative vowel's parameters in South-Siberian Turkic languages reveals the common principles of organization of phonological systems: all of them are structured on the oppositions of the articulation row and height as well as labialization and length.

Exception is made only for Tuvan (Bicheldei, 2001), Tofa (Rassadin, 1971) and also the Tuba dialect of the Altai language (Sarbasheva, 2004). Their systems of vowel phonemes' Constitutive-Differential Features (CDF) include the characteristics of pharyngealization: in the Tuvan vocalism it is one of its main phonological characteristics in the Tuba dialect it is a CDF concomitant with length in Tofa a pharyngealized vowel is a variant conditioned by the neighboring consonant sound. Thus, South Siberian Turkic languages can be divided in two groups:

- Languages with vocal systems structured according to the opposition pharyngealized/non-pharyngealized (Tuvan (Fig. 2 and 3), Tofa, Tuba)
- Languages in which pharyngealization is not a phonemic feature (the dialects of the Altai language)

Results of comparative-typological investigation witness that there is a tendency in Southern-Siberian Turkic languages to depolarize vowel characteristics in accordance with articulatory row (Shaldanova, 2007; Esenbayeva, 2010).

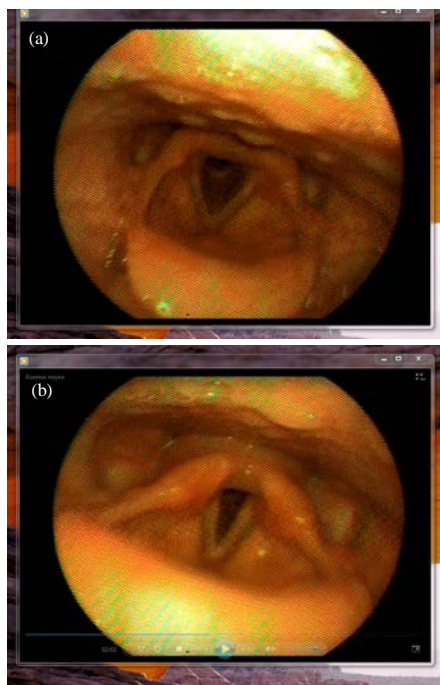


Fig. 1: Laringograms of Tuvan vowels: a) central-back u and b) front ü

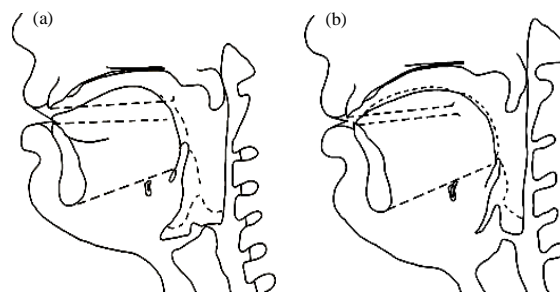


Fig. 2: X-ray images of the Tuvan vowel sounds: a) non-pharyngealized /e:/ in the word-form ee 'the owner' and b) pharyngealized /e:/ in the word-form eet 'meat'

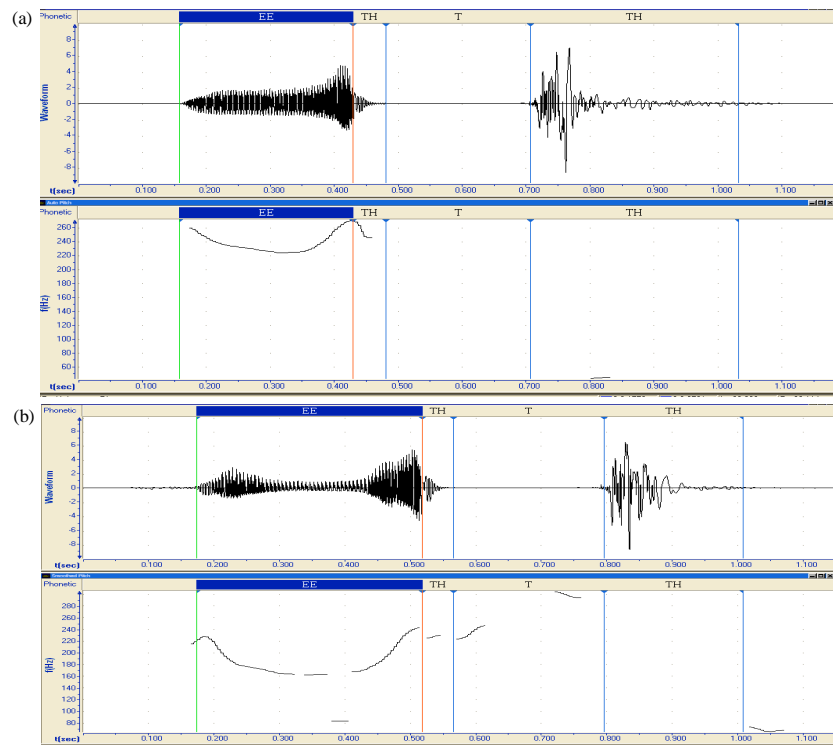


Fig. 3: Waveforms and pitch movements in the Tuvan vowel sounds: a) non-pharyngealized /e:/ in the word-form ee ‘the owner’ and b) pharyngealized /e:/ in the word-form eet ‘meat’

Structural and functional characteristics of systems of vowel phonemes allow us attribute Turkic languages of Southern-Siberian area to different branches of Circle-Baikal language union: in Altai-Sayan branch vocalic systems exclude pharyngealization from the set of constitutive-differential features and to Baikal-Sayan one with opposition of vowels in accordance with pharyngealization/non-pharyngealization (Nadelyaev, 1986).

The consonant systems typology classification: On the territory of Siberia there function two types of the consonantal phonological systems structured in accordance with the degree of articulatory tenseness: systems with binary oppositions of weak and super-weak consonants (Enets, Nenets, Nganasan, Selkup, Khanty); systems with triple opposition of strong, weak and super-weak consonants (Tuvan, Tofa, Shor, Baraba-Tartars’, Khalha-Mongol, Kalmyk languages).

In Siberian region, there also function systems structured by quantitative opposition of short, long and length-unidentified phoneme realizations (the Altai literary language, Telengit, Bachatsko-Teleutskiy, Kumandy, Chalkan dialects of Altai, Sagai dialect of Khakass). They appeared as a result of articulatory-acoustic base adaptation of Ugrian-Samoyedic peoples of Altai-Sayan

region to the superstrate Turkic phonological system with strong, weak and super-weak consonant sounds (Chumakaeva, 1978; Kirsanova, 2003; Subrakova, 2007).

Consonantal opposition of voiced and voiceless units (Tukic Yakut and Dolgan and the Tungus-Manchu languages) characterizes the Northern-Siberian languages. In Southern-Siberian region analogous models are formed in the Kalmak language and in the Sagay subdialect of Khakass.

In Shor, there functions a consonant system based on triple opposition in accordance with the position of the larynx and the tongue: injective/static/ejective articulations. The system of such type can be considered as a heritage of the Ket substrate or if wider as a reflection of a paleosiberian condition. Pharyngealization is an additional phonemic characteristic accompanying the ejectivity (Fig. 4 and 5).

Investigation of the Baraba-Tartars consonant system has proved that consonant phonemes are divided into three classes: noise pharyngealized tense/noise non-pharyngealized non-tense/less-noise non-pharyngealized weakly tense ones. In Baraba-Tartar, pharyngealization is the main differential feature of phonemes (opposite to Shor) (Ryzhikova, 2005).

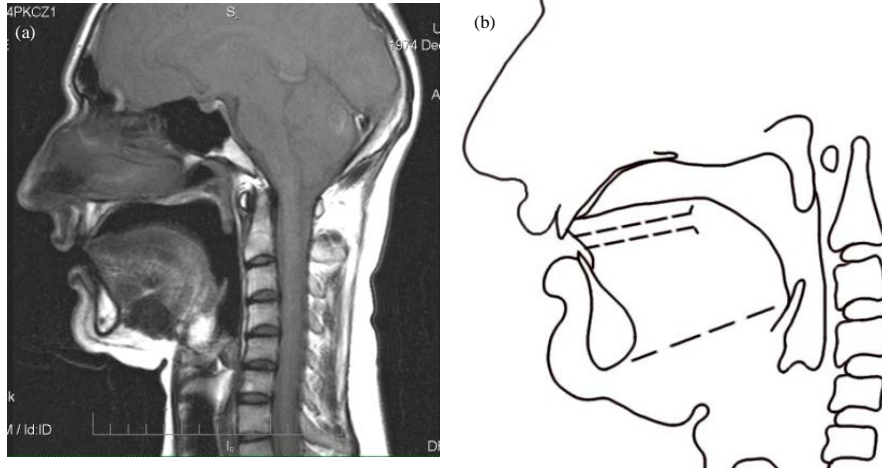


Fig. 4: a) MRI image and b) scheme of the Shor non-pharyngeal sound /t/ in the word-form at 'a name'

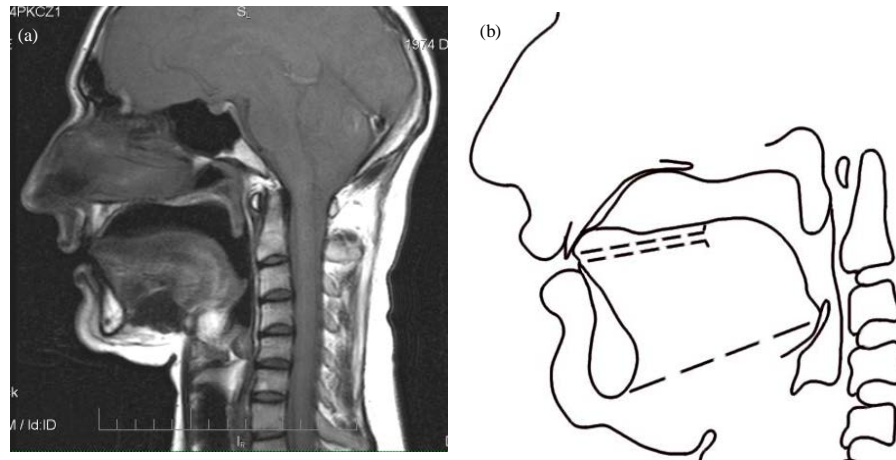


Fig. 5: a) MRI image and b) scheme of the Shor pharyngeal sound /ʔ/ in the word-form katy 'his wife'

In Tuvan phonemes oppose as strong/weak/super-week. The peculiarity of the Tuvan phonetics is that not only vowels but consonants as well are pharyngealized in the pharyngealized word-forms. Glottalization of vowels is a phonemic feature, glottalization of consonants is an allophonic one (Dambyra, 2005).

Thus, the results of instrumental researches witness the presence of certain correlation between the degree of tenseness and pharyngealization.

CONCLUSION

The results of the experimental research of the Buryat, Mongol and some Turkic languages practically support the existence of the central vowel row that was theoretically predicted by Sherba (1937). Objective data on Turkish (the Eastern dialect, Kazakhstan), Mongol and

some other language vocalisms witness the necessity of distinguishing one more vowel row-central-back. There have been added some corrections into an articulatory classification of consonants: there have been singled out additional consonant classes (medio-interlingual, interlingual, pharyngeal occlusive), specified some groups of compound items, introduced obligatory characteristic of consonants in accordance with the passive organs of speech.

In LEPR the theory of Articulatory-Acoustic Base (AAB) has actively been worked out. AAB is a system of pronunciation habits with their acoustic effects which historically developed on the early stages of an ethnos not a language formation. In a historical course of the development, an ethnic group can adopt other languages as a result of diverse contacts with other ethnoses, even to merge with them. But if this or that ethnic unity

preserves the compactness of its settlements does not territorially disperse, than it saves its AAB because of the relative autonomy of a sound system. It is interesting to note that when transferring to other language, AAB initially typical for the ethnos principally changes the sound system of any adopted language. Having acquired a new language but having preserved its AAB the ethnos engenders a new dialect of the language with new sound system. AAB is a dynamic stereotype which though changing, passes from generation to generation in its dominant features (Nadelyaev, 1986). This peculiarity of AAB allows it to be used as a source for reconstruction of a language retrospective and for solving the problem of ethnogenesis. It is especially important for the Siberian peoples without written memorials.

Developing the concept of possible usage of experimental phonetic data for historical reconstruction of languages and ethnic groups, the Siberian phoneticians have obtained new theoretical results that allow corrections of typological classification of phonological systems.

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