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Vowel reduction and stress in Russian.

Some considerations on behalf of Avanesov's concept of strong and weak phonemes

The reduction of unstressed vowels is one of the most salient characteristics of the Russian phonological system. It is so intimately connected with stress that neither vowel reduction, nor stress can be studied properly, unless both phenomena are taken into full and unbiassed account. Phonetic stress is *prima facie* a matter of highlighting one syllable within the word. Phonologically, however, it is not a property of the syllable but rather of the word as such, as Đurovič (1963, 188) following Kuznecov (1970) rightly points out. Stress in Russian, then, is signalled on one syllable of the word by means of a combination of pitch, intensity, quality (timbre), duration and, to a certain extent, diphthongization. True, intensity is usually held to be the decisive feature. I myself adhered once to the opinion that quality would be a more appropriate alternative. However, as should become clear from the present paper, there is no point in giving any of the dimensions primacy over the other. They are all sufficient cues for signalling stress.

In addition, stress is signalled by a reduction of the above mentioned parameters on unstressed syllables. That is to say, vowel quality not only becomes less distinct, but intensity and duration also decrease considerably, and diphthongization is absent. This was pointed out already by Bogorodickij (1930, 205), but his remark has for some reason remained neglected by most later scholars. Stress is thus achieved phonetically both by using all available means to make one single syllable more prominent, and by weakening all other syllables in the word. In observing and elaborating this fact, Avanesov (1956) made his main contribution to a better understanding of the phonology of Russian. The word as a whole forms a звуковая оболочка, a sound shell, where stressed and unstressed syllables together carry the functional load of phonological stress. Russian stress is therefore a true suprasegmental phenomenon and vowel reduction is both a part and a consequence of stress.

Vowel reduction in Russian, accordingly, has a functional role reminiscent of that of Bulgarian (Pettersson & Wood 1987a; 1987b). But whereas Bulgarian exhibits a tendency to merge unstressed /i/ - /e/, /u/ - /o/ and /ɤ/ - /a/ into a three-vowel system /i/ - /u/ - /ɤ/, all Russian

unstressed vowels except /u/ strive towards [ə] or [ɪ]. It is also worth noting that the Bulgarian reduction is considered substandard, while in Russian the norm actually requires reduction. This - mainly as a result of Avanesov's interest in normative matters - has led to a standard or normative pronunciation of unstressed vowels which does not in all respects fit the phonetic and phonological mechanisms that we might suspect basically trigger vowel reduction in Russian.

For the sake of convenience, I will stick to the distribution of positional reduced vowel variants presented in Avanesov (1956) and Panov (1967). It should, however, be kept in mind that this distribution is highly idealized, and that there is a considerable degree of overlapping between the different variants, some considered substandard, others not. Isačenko (1947, 188), for example, points out that the connexions *ma*, *ʁa* and *ʉa* are realized regularly as two variants, viz. [šə], [ʒə], [cə] or [ši], [ʒi], [ci] respectively. Thus the word *шарлатан* may be pronounced either [šərlata'n] or [šiɾlata'n]. Consequently, there is free variation after *m*, *ʁ* and *ʉ*, which is neither reported by Avanesov nor by Panov (1967; 1979). Nevertheless, the idealized system will be taken as a point of departure for the discussion, and it is presented here as summarized in Ćurovič (1963) but in a somewhat condensed form.

- | | | |
|---|----------------|----------------|
| 1. a) Word initially [i u ʌ] | I | U |
| b) After paired nonpalatal obstruents [ɪ u ʌ (ə)] | | A ₁ |
| 2. After <i>ʁ</i> , <i>m</i> , <i>ʉ</i> in a non-initial preictal syllable
and not at a morphemic boundary [ɪ u ə] | I | U |
| | | A ₂ |
| 3. a) After velars [i u ʌ (ə)] | | |
| b) After palatals at a morphemic boundary [i u ə] | I ₁ | U |
| c) After <i>ʁ</i> , <i>m</i> , <i>ʉ</i> at a morphemic boundary [ɪ u ə] | | A ₁ |
| 4. After <i>ʁ</i> , <i>m</i> , <i>ʉ</i> in the first preictal syllable [ɪ u ʌ] | I ₂ | U |
| | | A |
| 5. After palatals not at a morphemic boundary [i u] | I ₃ | U |

Given non-reduced Russian vowels in strong (stressed) position, mergers will take place in weak (unstressed) position according to the rules below, where square brackets enclose prototypical phonetic outputs of the

mergers, capitals symbolize the phonological units (phonemes) in strong and/or weak position, and subscripts indicate the neutralized phonological units corresponding to Avanesov's weak phonemes (i.e. $A_1 = A+O$, $A_2 = A+E+O$, $I_1 = I+E$, $I_2 = I+E+O$, $I_3 = I+E+O+A$).

By arranging the system of reduced phonological units in this way, Āurovič overcomes one of the main difficulties in Avanesov's treatment of the Russian phonological system, viz. his division of the phonemic inventory into "strong" and "weak" phonemes. Avanesov's approach leads to disturbing consequences in that one and the same phonetic instantiation will be taken now for a phoneme, now for an allophone (разновидность), now for a variation (вариант) of one single phoneme (Āurovič 1963, 189). True, Avanesov never subscribed to the principle 'Once a phoneme, always a phoneme', but as Zett (1982) points out, there still remains the problem that the number of phonemes (invariants) exceeds that of the allophones (variants). This is what actually happens in the AG (1980), where the Avanesovian teaching on Russian phonology is driven to its ultimate consequences. The only reasonable way to avoid such a situation is, according to Zett, to follow Āurovič (1963) and take neutralization into proper account.

This is absolutely true. The approach gives prominence to the functional connexion between weak allophones and the corresponding phonemes in strong position without adding any complexity to the grammar. Furthermore, it is consistent not only with the Prague school's concern with questions of linguistic function but also with the Moscow school's phoneme concept - which is, by and large, the same thing as Trubetzkoy's (1934) morphoneme, at least as it is used by Panov - and with Halle's (1959) considerations of the phonemic set-up of Russian. It does not even contradict the assumptions of underlying forms in American structuralism and generative grammar. As a matter of fact, there is no difficulty in converting Āurovič's schemata into the standard format of generative phonology, e.g. 1 above:

$$[+pharyngeal] \longrightarrow \begin{bmatrix} -\text{velar} \\ -\text{open} \\ -\text{round} \end{bmatrix} / \left\{ \begin{array}{l} \# \text{ —} \\ \begin{bmatrix} -\text{son} \\ -\text{pal} \end{bmatrix} \text{ —} \end{array} \right\}$$

Why then did Avanesov not consider the neutralization solution himself? Possibly because he was influenced by Trubetzkoy (1934), but the most immediate reason seems to be that he firmly propounded the intimate

connexion between the phoneme and the morpheme at the same time as he was convinced of the distinctive function of the phoneme as such quite apart from its functional load as regards morphology. Every weak phoneme, just as every strong one, had for Avanesov, not very differently from Ščerba (1912), its principle implementation, its *типичный оттенок* as Ščerba called it, distinct from all other phonemes. In word-forms such as вода, воду, вод, воде, водовоз, the paradigmatically identifiable root morpheme {vod} secures the parallelism between the strong phoneme /o/ and the weak phonemes /a/ and /ъ/. Similarly, in the flexional endings, the strong phoneme /o/ in the instrumental ending of стеной controls, so to speak, the weak phoneme /ъ/ of коровой, enabling them to establish one phonemic group (фонемный ряд). In other cases, however, there is no parallelism to be found, and the weak phonemes occur as independent units without support from any strong phoneme whatsoever. As an example Avanesov gives the series татарин, татар, татарский, татарченоч, where the /a/ and /ъ/ of the first syllable constitute a phonemic group on their own. Somehow this reminds one of Trubetzkoy's (1939, 71ff.) archiphoneme concept.

As can be seen, Avanesov certainly recognized underlying forms, and one would therefore have expected him to rely on the principle of neutralization. He refused, however, to accept absolute neutralization. In this respect he reasoned in a way very similar to Paul Kiparsky (1982, 118ff.), who insisted that no underlying forms should be postulated that are not confirmed by forms surfacing in other contexts. Since Avanesov was bound to remain faithful to his concept of "sound shells" (звуковые оболочки), there was no way out. The principle of phonemic neutralization and the concept of sound shells of words are not compatible, so long as the phoneme is taken to be a linguistic unit differentiating on the one hand word-forms from other word-forms and, on the other, constituting the phonetic material which differentiates one morpheme from other morphemes. Therefore he had to conclude as follows (Avanesov 1956, 33): фонема является элементом звуковой оболочки словоформы, а фонемный ряд - элементом звуковой оболочки морфемы, охватывающим все звуковое многообразие морфемы в пределах, обусловленных позицией (the phoneme is an element of the sound shell of the word-form, whereas the phonemic group is an element of the sound shell of the morpheme, which comprises all variation of the morpheme within limits set by the positions).

This is consistent, maybe even clever, but it is hardly beautiful. For what kind of entity can be considered to constitute the sound shell of a

morpheme? Word-forms are pronounceable entities and thus objects open to empirical investigation. They may be read aloud from a Russian text or dictionary, pronunciations can be recorded and analyzed in various ways. But morphemes are not tangible objects in the same way. It is to be observed that also when the morpheme consists of a single word-form, it is not the morpheme *per se* but rather the word-form carrying the morphological content of the morpheme in question that is expressed in sounds and letters. The same holds true of any grammatical morpheme, realized as a single phoneme. Flexional word-forms like *nepo*, *nepa*, *nepy* and so on can admittedly be analyzed as being composed of a stem (root) and a grammatical morpheme. In reality, however, neither the stem, nor the ending, can be separated from each other or from the word-form as such. Both morphemes are, as it were, capsulated in the sound shell of the word-form. Consequently, it is impossible to verify the existence of morphemic sound shells. Therefore, it is to better to avoid the notion of morphemic sound shell altogether. If one does this, however, one has to dispense with weak phonemes as independent linguistic signs as well.

Accordingly, phonemes, taken as segmentable sound units, do not function as elements differentiating morphemes. Their function is to distinguish different word-forms from each other. This fact was stated explicitly by Avanesov himself. As was pointed out above, it is not the properties correlated to segmentable sound units as such that have this differentiating function but rather the phonetic gestalt of the whole word. Therefore it does not seem quite appropriate to define phonemes as elements of sound shells of word-forms either, provided we are thinking of phonemes as segmentable discrete units. At least the definition does not make sense as far as Russian vowels are concerned, no matter whether they occur in strong or weak positions. Rather, the elements Avanesov is talking about are distinctive features which are distributed non-discretely throughout the actual word-form to create its sound shell. There is no point in describing the Russian vowel system, notably the reduced vowels in weak positions, in terms of phonemes. Observe that this holds true of strong vowels as well. Assimilation phenomena such as palatalization and velarization of strong vowels contribute considerably to the perception of word-forms and are therefore distinctive elements at the level of sound shells, although they are redundant if the word-form is regarded as a string of discrete phonemes.

Of course, nobody can ban the phoneme, but one cannot simultaneously believe in phonemes and recognize the intimate and uninterruptable connexion between phonetics and phonology, which was defended so convincingly

by Ščerba. Otherwise one is forced to refrain from any psychological motivation for postulating linguistic concepts and adhere to the doctrine of autonomous linguistics, which means that phonemes and distinctive features alike are taken to be totally abstract notions without any correlation to the observable reality whatsoever. Very much of contemporary linguistics is in fact characterized by the autonomy approach, although lip-service is often paid to the demand that postulated linguistic concepts should somehow be possible to confirm empirically. In actual practice, however, you are not told anything about how the connexion to reality can be established or verified.

It might very well be the case that the phoneme concept has some significance for some languages or even for Russian at some level. On the other hand, the traditional phoneme is of course of no use as far as the main theme of this paper is concerned, viz. the Russian vowel system with its characteristic alternations between strong (stressed) and weak (unstressed) syllables. Stress is a suprasegmental phenomenon and cannot be explained in terms of acoustic events in discrete segments. No matter whether the segment is taken as a primitive (as in traditional phonology) or a derived concept (as in autosegmental phonology), one cannot use it to describe Russian stress. Avanesov's sound shell concept is worth retaining but it should be stripped from any phoneme associations and redefined accordingly: a sound shell is a morphonological unit corresponding to an isolatable word-form. That is to say, one should be able to ask a native informant either metalinguistically (e.g. 'What is the dative singular form of *непо*?') or linguistically (e.g. 'Who is the president of the Soviet Union?' or 'Do you want coffee or tea?') and thus get access to the sought word-form (*непы*, *Горбачев*, *кофе* or *чай* respectively). The recorded word-form is then analyzed as the realization of a sound gestalt formed from a sequence of overlapping articulatory gestures, each with its specific acoustic properties.

More specifically I would claim — with reference to Koževnikov & Čistović (1965) — that the sound shell of a word-form is to be described as a vocalic flow with superimposed consonantal distortions. The vocalic flow is, from an acoustic point of view, the formant pattern. The consonantal distortions consist of acoustic noise and cuts in the flow. The sound shell of a monosyllabic word-form is then a vocalic flow with or without a superimposed consonantal onset and/or offset. The sound shell of a typical polysyllabic word-form is a vocalic flow with a consonantal onset and interrupted by one or more consonantal distortions. Every such interruption

in the vocalic flow constitutes the onset of a syllable in such a way that, no matter whether traces of the vocalic flow are left in the consonantal section or not, the very obstruction signals the beginning of a new syllable. This means that the syllable is present phonologically, even in such cases where there is a total obliteration of the vocalic flow due to consonantal noise. Russian vowel reduction can and often does reach zero.

The reason why one would prefer to regard the prototypical open syllable as a vocalic flow with a superimposed consonantal onset as opposed to the traditional CV analysis is twofold. First, the approach proposed here allows for a phonological description without segmental entities at any level of representation, and, secondly, it makes it possible to model assimilation and suprasegmental phenomena in a non-arbitrary and naturalistic fashion. Observe, that this description is not intended to be taken as a definition of the syllable. It must be regarded as a primitive so long as no conclusive procedure for determining syllable boundaries has been found. But this acknowledgement does not make the syllable an entirely abstract notion. In a way, the syllable takes a mediating position between the word-form and the segment. The word-form is distinguishable and it is always delimitable. The syllable is also distinguishable but it is only partly or fuzzily delimitable. The segment is neither. Thus, unlike the segment, the syllable is not a totally arbitrary concept. It has its manifest articulatory and acoustic correlates that warrant the use of distinctive features.

Word-forms as well as syllables thus exhibit properties that lend themselves to an analysis in terms of distinctive phonological features. The features adopted here will be used to represent both variations in the vocalic flow and consonantal noise. It is a great advantage to be able to use the same features for vowels and consonants, but it leads to complications since the two dimensions, the vocalic and the consonantal ones, are principally independent of each other. The vocalic dimension is, so to speak, the flesh of the word-form, whereas the consonantal dimension is the skeleton. And yet they are intimately connected in that most of the vocalic features can take consonantal function and a considerable part of the consonantal features also contribute to the vocalic flow of the word-form. Features belonging to the intersection of the vocalic and the consonantal dimensions are sonorant. The traditional terms *vocalic*, *consonantal* and *sonorant* are then used here for distinct sets of properties that together make up the sound shell of a word-form and its syllables. They are features that in addition to the traditional definitions in acoustic and articulatory terms demand specification with respect to their function.

As for non-sonorant features, I will accept, at least for the time being, traditional terminology and definitions found in the standard literature. Obstruents will, accordingly, be characterized as $\pm$ voice, $\pm$ continuant, $\pm$ strident and so on. The fact that obstruential sound properties do not contribute to the vocalic flow of the word-form explains why they are the best and most salient markers of syllabicity. Sonorants are in this respect indeterminate and can be used or interpreted as indicators of syllabicity as well as primary constituents of the vocalic dimension. It should finally be noticed that sonorant properties tend to spread from one syllable to another by way of quite natural assimilatory processes. Obstruents do not. Their scope is restricted to that syllable they indicate by their presence.

With respect to vocalic features, I have adopted Wood's (1982) model. Wood expresses the phonological processes involved in vowel production in terms of the manoeuvres that tune the vocal tract to the filter properties appropriate for the desired acoustic output. The vocal tract is narrowed by the tongue at one of four places: (a) along the hard palate for [i e]-like vowels, (b) along the soft palate (velum) for [u i]-like vowels, (c) in the upper pharynx for [o]-like vowels, and (d) in the lower pharynx for [æ a]-like vowels (Wood 1979). The model includes also jaw opening as a feature such that [i u i]-like vowels are non-open and [e o a] are open. The relationship between the different vowel classes can be demonstrated as follows (Figure 1):

	hard				
	palate	i	u	velum	
close					
.....		e	o	upper pharynx	 jaw opening
open		æ	a	lower pharynx	

Figure 1.
(From Pettersson & Wood 1987b, 271)

Using this articulatory model, I suggest that the Russian vowels be specified according to the matrix in Table 1. The feature *palatal* signifies the raising of the tongue towards the hard and soft palates, *velar* signifies retraction of the tongue towards the soft palate and upper pharynx, and *pharyngeal* retraction into the pharynx; *open* refers to the degree of mandibular depression — +open signifies a depressed and -open a close or elevated jaw position; *round* is the traditional feature (Wood 1979).

	hard palate		soft palate		upper pharynx	lower pharynx
	i	e	ɨ	u	o	a
palatal	+	+	+	+	—	—
velar	—	—	+	+	+	—
pharyngeal	—	—	—	—	+	+
open	—	+	—	—	+	+
round	—	—	—	+	+	—

Table 1.

Feature specifications of Russian vowels in terms of four places of articulation for vowels.

The matrix is not based on independent studies on Russian vowels but on data derived from various sources, mainly Fant (1970), Koneczna & Zawadowski (1956), Romportl (1953; 1962), and Halle (1959, Appendix). By and large, these X-ray profiles and formant values are consistent with what is reported on Russian vowel articulation in Bogorodickij (1930), Isačenko (1947), Avanesov (1956), Panov (1967) and Bulanin (1970). The problem is how the unstressed variants are to be specified, as there are numerous contradictory and dubious statements in the literature. I will touch on these difficulties below but first draw the attention to some peculiarities concerning the phonological function of the suggested features.

It is characteristic of the vocalic flow of a word-form that it spreads to the consonantal components. This is quite natural and it follows immediately from the present frame-work. For, if it is the case that the consonantal gestures are superimposed on the vocalic flow, then it would be remarkable indeed if the consonantal traits were not infected by the primary vocalic articulation. That is why a consonantal onset is rounded if the vowel is round, palatal if the vowel is palatal and so on. This type of coarticulation is restricted to the syllable and it is available to the listener as an additional cue for the identification of syllabicity. Now, notice the difference between roundness on the one hand and palatality on the other. If a consonantal gesture is accompanied by palatality, either inherent or due to coarticulation, the feature will be anticipated in such a way that the entire

vocalic flow of the word-form, including superimposed consonantal syllabic onsets preceding the triggering consonant, will be assigned an extra amount of palatality, unless there does not occur a consonantal obstacle inducing velarity or pharyngeality in its syllable (ж, ш, ч). This is assimilation as opposed to coarticulation.

Quite apart from speculations on a thought palatal articulatory basis of Russian (cf. e.g. Zinder 1984), I find it more satisfactory or at least safer to depict palatalization as a phonological process with the effect of increasing contrasts within paradigms (cf. место and вместе - [m'este] vs. [v'm'es't'ŋ]). Simultaneously, however, it leads to I₁ neutralization in weak syllables, which in turn means a loss as far as stress is concerned. The functional load of stress in the Russian grammatical system is so great that some kind of remedy is called for. One way to reinforce the weakened stress is then to use features that do not trigger assimilation so as to counteract the effects of palatalization in the opposite direction. Roundness and openness, if they occur reduced in weak syllables, are features that strengthen the prominence of the stressed syllable. If they do, a greater contrast between stressed and unstressed syllables is achieved. Accordingly, the *иканье* phenomenon of Russian is basically the result of an assimilatory process, whereas *аканье*, in fact, is to be characterized as dissimilation.

There is no doubt that roundness dissimilation really is an operative principle of the Russian phonological system. Nor is it unlikely that the degree of openness is also used for dissimilatory purposes. However, whether this is really the case or not is still undecided today, since the standard literature gives insufficient information on the acoustic and articulatory properties of Russian weak vowels. A further complication is that the X-ray profiles in e.g. Koneczna & Zawadowski (1956) only make articulatory sense when interpreted in terms of gestures as proposed above; their testimony is confusing in terms of the classical position of the upper surface of the tongue alone (Wood 1982, 9ff.; Wood 1987). Nevertheless, there are indications in the literature that might speak in favour of the hypothesis put forward here. Romportl (1962), for example, states explicitly that unstressed Russian pharyngeal and velar vowels are pronounced with a mandible posture higher than that of their stressed counterparts. He reports further that palatal vowels in unstressed position exhibit less lingual activity, resulting in a less bulged tongue body and an acoustic picture in the [ə] direction. Similarly, Avanesov (1956, 143ff.) asserts that [i] and [u] in weak positions are characterized by a lax articulation, less raising of the tongue and diminished duration; [A] on the other hand differs from [a] in

having a somewhat higher position (более высоким образованием). The explanation for this is, according to Avanesov, that the mouth is narrower and the mandible is less lowered in [A] than in [a]. It also seems to be unanimously accepted by all scholars that Russian unstressed vowels generally differ from their stressed counterparts in being closer and laxer. These observations might indicate that unstressed vowels in Russian are pronounced with weakened mandibular activity. The conspicuous perceptual similarity between Russian [ə] and Bulgarian weak [ɤ] - the result of reduced /ɤ/ or /a/ - points in the same direction.

When I and my colleague Sidney Wood studied the Bulgarian vowel system, we found that vowel reduction in Bulgarian was best described in terms of selected component gestures in weak syllables (Wood & Pettersson 1988). It is quite possible that something similar is going on in Russian, the difference being the gestures actually selected and the set of vowels affected. For example for A₁, the openness and roundness (and perhaps velarity) of open pharyngeal vowels are neutralized. To find out if this is the case, however, much further research is needed. A reliable phonological description must be based on empiric phonetic data.

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