Conveying information through articulate speech presupposes the ability of the native speaker to analyse quickly and effectively heterogeneous sounds. This ability is developed by man because sound differences are used for discriminating meaningful units, i.e. words. Taking this function of speech sounds into consideration, we can understand why the native speaker does very well in the process of perception in spite of a number of variations of sound properties. From the linguistic point of view it can be assumed that there exist a number of levels ensuring optimum processing of sound signals. The first one consists in the ability of man to generate and perceive articulate sounds. Though this ability is universal by itself, it cannot be observed directly because it is realized on the basis of a certain concrete language. However, some of the phonetic universals (Greenberg, 1966) deduced on the basis of comparing various languages, can be also related to the peculiar properties of man's verbal behaviour. The second level is concerned with the system of phonemes in a given language. The native speaker disposes of the information of the system of phonemes which he acquires in the process of learning his native language. The main points of this information are as follows: the inventory of the phonemes in the language, the ways the distinctive features of the phonemes are realized, the rules of usage which include the probability of the occurrence of phonemes within the minimal meaningful unit - within a word.1

The third level deals with the information of the rules about possible sound combinations in shaping the words. One can assume that the perception of the word is the recognition of its phonemic composition. Evidently a clear-cut differentiation of all the three levels is impossible, because practically they overlap to a great extent. But one may hope that the systematic research on the process of perception will enable the scientists to describe these levels in a more detailed way.

(1) It is possible that in a number of cases a morpheme may be treated as this minimal unit. This may take place in languages where phonemic alternations are regular and are governed by the existing rules, Russian being an example.
Let us consider some facts dealing with each of these levels which testify to the reality of the language consciousness of the speakers. The opposition of consonants with regard to "absence - presence of voice" is one of the most widespread (Zhivov, 1976). In fact, it can be connected not only with the function of the vocal cords alone, but also with properties like tenseness - laxness, delay in the onset of voice after the opening of the occlusion, the duration of the preceding vowel, and so on. One may assume that "absence - presence of voice" can be treated as a universal feature. For the native speaker of the Russian language, where the correlation "presence versus absence of voice" is one of the characteristic features, each consonant he hears must be described either as a voiceless or as a voiced one. But the consonants /c/, /ö/, /x/ do not have voiced correlates, i.e., the opposition of voiceless consonants to voiced ones is not possible for them in the positions before vowels and consonants. Compare [tu'gôj] - [du'gôj], [s'îplîj] - [gîbjîj] and [tsôj], [ťôj], [xôt], and so on. However, in accordance with the rules of alternations which are known to be regular in the Russian language, in the combination of words ending in the consonants /c/, /ö/, /x/ ([t's, t'), x]) with words in which initial consonants are voiced obstruents, there appear voice allophones of these voiceless consonants: [ka'neò ʒî'mÎ], [sêd'z drâ'va], [moy ɡa'git], phonologically: /kan'êc zî'mÎ/, /leç dravâ/, /mox gar'Ît/.

The voiced character of these phonologically voiceless consonants can be treated in various ways from the linguistic point of view. We are especially interested in how the voiced character is treated by the Russian native speaker who is expected to discriminate between voiceless and voiced consonants and who does not have at his disposal the voiced correlates of phonemes which possess /ë/, /x/.

Russian subjects when presented with the consonants from phrases of the type /kan'êc zî'mÎ/, /leç dravâ/, /mox gar'Ît/, cut out from the magnetic tape, recognized these consonants as voiced ones; other properties of the consonants could be perceived incorrectly in this case. If the phonetic context is enlarged and the subjects are presented with combinations - 1: including the following consonant (CC); 2: including also the preceding vowel (VCC); 3: including the vowel in the succeeding syllable as well, - the recognition of the consonants under consideration as voice ones occurs less frequently, though in these cases the consonants /c/, /ö/ and /x/ are not interpreted 100% correctly.

Figure 1 presents data on how separate properties of the consonants /c/, /ö/ and /x/ are perceived if they are presented in various contexts, such as C, CC, VCC and VCCV. The influence of the phonetic features proper increases with the narrowing of the phonetic context, although even if there is a complete phonetic context - the following consonant bringing about voicing, or vowels, ensuring as a rule good recognition of the neighbouring consonant - this is not sufficient for the recognition of such phonemes as /c/, /ö/ or /x/. The sounds may be perceived as /c/, /ö/ or /x/ only if the native speaker hears the whole phrase, i.e. if he makes use of both the phonetic and the semantic contexts (Bondarko, 1975). This means that the predominant influence of the first, universally phonetic level is removed only if both the second level including rules of alternations, and the third level concerned with the...
analysis of the phonemic composition of words can be made use of.

The second level of analysing speech, as has already been men-
tioned, includes information about the inventory of phonemes in the
given language, the ways in which the distinctive features are
realized, and the rules of usage. It is this level that ensures
the transition from the phonetic variations of real sounds to eco-
nomic phonological interpretations. Let us consider this level of
perception using the examples concerning the perception of vowels
by Russian native speakers.

It is known that the system of vowels in the Russian language
is comparatively poor. There are three degrees of height and two
series. Vowels of the back series (with the exception of the lowest
vowel /a/ are necessarily rounded, whereas this connection does
not exist in the case of the front vowels. The six vowels /a/, /o/,
/o/, /e/, /i/, /i/² are realized differently in the stream of speech,
depending on their stressed or unstressed character, the quality of
the neighbouring consonants, and so on.

As was shown in an experiment (Bondarko et al., 1966), the
i-like transition, appearing in the vowel under the influence of
the soft neighbouring consonant, serves as a useful indication
which enables a person to differentiate hard and soft consonants.
The i-like transition (phonetically pushing forward the vowel into
the front zone) is perceived by all Russian native speakers as a
cue of the consonant. Nevertheless, the phonetic property itself
is realized in the vowel, and Russian native speakers discriminate
a greater number of vowels than could have been expected on the
basis of the inventory of vowel phonemes in the language.

We can assume that it is this peculiarity in the realization
of the feature of softness in consonants that enables Russian
speakers to describe vowels of the type [γ], [Ø], [α] at a uni-
versal, phonetic level. These are integrated in the inventory of vowel phonemes in the language.

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Things are different in the situation where vowels adjacent to
nasal sounds are presented.

In a special investigation (Belyakova, 1977) dealing with the
perception of nasal vowels of the French language and nasalized
Russian vowels by Russian and French subjects, it was shown that
French people recognize nasal vowels of their own language much
better than Russians do theirs, but that they are less sensitive
in the perception of Russian nasalized vowels. They perceive Rus-
sian nasalized vowels as non-nasalized. A comparatively low degree
of the recognition of the Russian vowels a and e by French listeners.
can be accounted for not by the influence of nasalisation but by
the influence of the neighbouring soft consonant, which leads to
the perception of this vowel as more front and less open, i.e. a
as ø, e as i. It is typical of Russians to make a lot of mistakes
in the recognition of the nasalized vowels (Fig. 2).

Finally, it is on the third level, dealing with the rules of
the formation of the sound shape of the word, that a phonological
interpretation of sounds is given, which has no unique phonetic
correlate. For example, the recognition of the unstrasted vowel

\[ \text{Figure 2} \]

The perception of French nasal and
Russian nasalized vowels.

French listeners ————
Russian listeners ————

For all the subjects, various iden-
tifications of the vowels are shown:
as the corresponding nasal vowel,
as non-nasal but having different
quality, and as a combination of
a non-nasal vowel with a nasal con-
sonant. Such identification is
indicated in the figure by: an, øn,
and so on, even in those cases
where the subjects wrote down the sounds
an, øn, etc.

(2) We do not consider here the question of the phonemic relevancy
of the opposition of /I/ - /l/, because it is widely discussed
from the linguistic point of view, and, practically, because in
the linguistic analysis it is not treated from the point of view
of the phonology of the native speaker, for whom these are differ-
ent vowels, and not on the lowest level alone.
in the words [sa'rok], [da'la] and so on, as /a/ is connected with the rules of reduction in the Russian word; the recognition of the voiced affricate as a voiceless one in the phrase "otec bolen" ([A'tedz lbol,m]) is connected with the rules of alternating voiceless and voiced consonants.

The recognition of morphologically loaded sounds or sound combinations represents a special case, particularly for such a language as Russian (Bondarko et al., 1966). In these cases the phonetic information about the sound is often insufficient, although the use of the rules of alternation and the use of semantic redundancy of the context enable the subject to correctly interpret the phonemic composition of the word (compare the realization of the phoneme /ɡ/ in the combination "brosj šumetj" ([broɡ ju'ɫe]) with a considerable assimilation of /ɡ/ to the following /ɡ/ and the realization of the phoneme /a/ in posttonic inflections after the soft consonant "njanja" (['njaŋ]), and so on.

All this proves that in oral communication, a person performs rather complicated operations the total of which can be called the phonology of the native speaker.

The reality of other purely linguistic phonological descriptions is proven by the extent to which this description is in accordance with these operations. The description of the phonology of the native speaker, based upon the description of different levels determining his verbal behaviour and upon the comparison with the linguistic phonology set up in linguistic descriptions, can be considered the main task in the experimental phonetic investigations dealing with speech perception.

References


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