Sound Structure of Old Greek*
Ján Horecký

The phonological research of Old Greek faces the problem of the lack of reliable data on the phonetic character of sounds. That is why it is more convenient to rely on more recent phonological methods. A good starting point can be the correspondence between the phoneme and the grapheme, i.e. the investigation what phonemes correspond to the Old Greek graphemes. The most reliable from among phonetic data is the one stating that within sound articulation a stream of air passes through the articulatory organs and in a certain way it overcomes some obstacles. In articulating vowels, this concerns a smaller or larger narrowing of the oral cavity; in the case of consonants it is a smaller or larger obstacle. The principle, however, is the same. Consequently, our classification of Old Greek phonemes is based on the extent of the obstacle.

Brandenstein (1954) was a pioneer in the phonological conception of the sound structure of Old Greek. He actually described the phonological system or the inventory of phonemes on the basis of the phonological notions of Prague phonology, using notions and terms like phoneme, distinctive quality, opposition, and neutralization. He speaks about correlations. He mentions neutralization, for example, in connection with the */m/ – /n/* opposition. However, this is not neutralization because the */m/ – /n/* opposition is not privative; it is rather the case of assimilation. Nowhere does he speak about equipollent, i.e., non-neutralizable oppositions of the type */p/ – /t/* and nowhere does he give a neutralization example of privative oppositions of the type */p/ – /b/* that are common in Slovak. Actually, this is not possible because Old Greek does not provide any example of a neutralization position of the voiced-voiceless opposition. The phonemes of the */p/, /t/, /k/* localization rows do not occur at all at the end of words, which is a typical place of the voiced-voiceless neutralization (e.g. in Slovak), and their distribution inside words is very straightforward: these phonemes (with the exception of */k/*) cannot stand next to each other.

Brandenstein's failure to understand neutralization and the related notion of archiphoneme also follows from the fact that he conceives of the phoneme */s/* as an archiphoneme in opposition to the voiced variant */z/*. On the other hand, however, Brandenstein presents a reliable and detailed picture of the distribution of phonemes and gives a complete list of consonantal clusters. Nevertheless, he relatively scarcely uses these distributional qualities as a starting point for evaluating the functional validity of phonemes (in contrast to Horecký 1973).

On the whole, Brandenstein, like other researchers dealing with the sound structure of ancient languages, does not rely on phonetic data. Instead, he extensively draws on dialectal phenomena, pointing out the historical development (of course, only as a postulated development). What is surprising is the fact that he does not in the least base his research on the evaluations provided by Greek grammarians.

Our evaluation is primarily based on the graphical system. We start from the hypothesis of a direct connection between the grapheme and the phoneme, and that the graphical system of Old Greek quite truly reflects the relationships among phonemes. This is supported, for example, by the existence of separate phonemes for the long vowels */e:/* and */o:/* (omicron and omega), as well as by separate graphemes for aspirated */p^h/, /t^h/, /k^h/*.

As to the consonants of the three basic localization rows, Brandenstein adopts Trubetzkoy's idea that the phonemes of these rows form triangular systems (Trubetzkoy 1973):

(1)
$$
\begin{array}{ccc}
\text{p} & \text{t} & \text{k} \\
\diagdown & \diagdown & \diagdown \\
\end{array}
$$

b   ph   d   th   g   kh
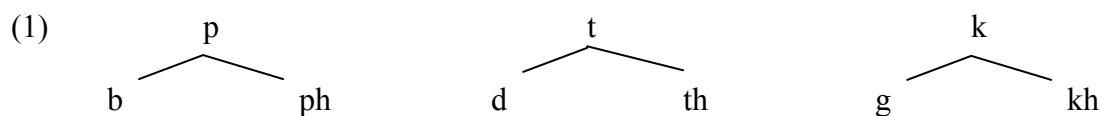
However, neither N. S. Trubetzkoy nor other researchers specify the concrete oppositions in these triangles. They usually merely refer to aspirates versus voiceless consonants, and silently, also the opposition of voiced-voiceless */p/ – /b/* is presupposed. Interesting enough, while Trubetzkoy links */p – b/* and */p – ph/* Brandenstein does not mention these relationships. Neither does he present a single example of the voiced-voiceless neutralization nor any single remark is given concerning the fact that there may be the lenis – fortis opposition.

Nevertheless, the existence of the aspirated row suggests this possibility. In addition, the non-existence of the voiced – aspirate opposition indicates that the triangle is not closed, thus leading to gradual oppositions rather than to the privative ones.

The basic member in such gradual row would be a consonant. When produced the stream of air overcomes a common, regular obstacle at the particular place. This is a consonant which in classical grammars is denoted as 'media'. If, in some way, the overcoming of the obstacle is more difficult, that is, if the articulation is less free, a consonant denoted as 'tenuis' is produced. Finally, if the basic obstacle is followed by another one, an aspirated consonant is produced. Hence, gradualness stems from the manner, intensity and strength of overcoming the obstacle.

There is a clear analogy with the vocalic gradual opposition in the */a e i/* or */e o u/* rows.

In connection with the aspirates a question may be posed whether the quality of aspiration is not separate and whether, then, the */ph/* type represents a biphonematic connection in which a separate phoneme, denoted as aspiration (spiritus) or 'Hauchlaut', occurs in the second position. This can be indicated by the dissimilation in the *thriks – trichos* type where aspiration as if freely passes and is transferred from the phoneme */t/* at the beginning to the phoneme */k/* before the ending *-os*. However, this contradicts the fact, which is stressed also by Brandenstein, that Hauchlaut was the feature of the aspirational onset of the initial vowel (at the beginning of the word or morpheme), as indicated by the change or by the word-formation of the *apo – hairein →* *af-airein* type. Hence, it did not function with consonants or at the end of the articulation of a consonant. The main counter-argument relies on the phonotactic rules precluding a four-member group of consonants in Old Greek, also including the *s + p + h + r* group in the *sfragis* type. In addition, according to another rule, only such three-member consonantal group is permitted at the beginning of a word which starts with */s/*. Hence the *p + h + l* group in the *phlego (flego)* type is not permitted.

Another argument, in our opinion a decisive one, stems from our hypothesis on the correspondence between the grapheme and the phoneme: If in Old Greek there is a separate grapheme for each of the aspirated consonants */p^h/*, */t^h/*, */k^h/*, we have to presuppose that it was used to denote a monophoneme with the quality of aspiration.

The same assumption has to be applied to the graphemes *ps* and *ks*. It is probable that here, too, we do not have a connection of two phonemes but rather a way of representing monophonemes with a certain feature. The Latin grapheme *s* in the particular transcriptions cannot denote the phoneme /s/. It is true that in cases like *syrinks – syringos* we could expect the phoneme */-s/* at the end of a word attached to the root. But this also is a digram. It should be noted that the end of an Old Greek word is an individual grapheme, the final *s*, which can have a quality different from the ordinary *s* (cf. further below). Transcription with the help of *s* is probably supported by the *t*-row where actually a special grapheme is absent. Sometimes it is denoted as *T* which already signalizes a certain deviation from *t* (tau). Symptomatic, though, are

representations in the form *tt* or *ss*. However, they do not represent geminates; they don't indicate an ordinary *t* but rather a *t* with a certain feature.

It is difficult to say anything concrete about the phonetic character of this feature. It is an element which occurs in concluding articulation, after overcoming a certain obstacle. This conclusion could be manifested as assibilation (probably it is for this reason that it is transcribed as *ps, ks*), as affrication, and very probably there could be a certain rounding. That is why we propose, without any more detailed phonetic specification, to speak about labialization. Thus, in addition to the gradual row of aspiration *(b p ph)*, we postulate a new, labialised, row (pursuant to Trubetzkoy's term 'Schwesterreihe' we could denote it as a 'sister row'):

(2)   b   b   d   d   g   g
       p   p   t   t   k   k
       p^h p^s t^h t^s k^h k^s

Less distinct is the situation in the neo-occlusive row represented at first sight only by the phoneme */s/* which, in addition, does not have the basic medial phoneme */z/*. In general, it is admitted that the grapheme *dz* represents neither the phoneme */z/* (in spite of the common pronunciation [Zeus]) nor */ʒ/*. Attempts at deriving */ʒ/* from the cluster *sd* (as also made by Brandenstein) only indicate that there can be some similar feature as in the case of the graphemes *psí* and *ksí*. There perhaps might be a spirantic feature. Therefore, it would be more appropriate to transcribe this phoneme as */ss/* or */s^s/*.

Furthermore, in the system of Old Greek there are two graphemes: the common *s* and the final *s*. Since no consonantal phonemes of the basic localization rows occur at the end of Greek words this final *s* may be conceived as an *s*-phoneme with the feature of aspiration. By implication, two sister rows can be assumed here:

(3)   (z)   (z)
       s   s
       s^h s^s

Old Greek sonants do not cause any phonological problems. However, it is necessary to explain why also sonants are recorded with aspiration. While for */r/* aspiration is regular in the complete Attic period, for */l/*, and mainly for the nasals, only some hints can be found (Brandenstein 1954).

Special attention has to be paid to Old Greek geminates. The problem is quite adequately discussed by Brandenstein (1954). In his view, the original form of Old Greek did not use geminates. The documented records have to be interpreted above all in such a manner that geminated graphemes (i.e. not the phonemes with a distinctive function) emerged at the morphemic boundary in cases like *genes-si, eteles-sa, leipo – leleim-mai, en-nea*. In addition, geminates occur in expressive words like *atta, kikka* 'duck', *Strattis*. Spellings like *tettares, tessares* can be interpreted as attempts to represent the phoneme */T/*.

After all, geminates are known to signalize syllabic length. However, that is a makeshift solution or an attempt at indicating the situation on the suprasegmental level by means of the segmental level.

All in all, geminates in Old Greek did not have any distinctive value. Consequently, there was no opposition of gemination, or any correlation of gemination.

Although the vocalic system of Old Greek is considerably developed and structured, it is less complicated than the consonantal system. The existence of special graphemes for long /é/ and /ó/ implies the existence of long /á/, /í/ and /ú/ (recorded as *ou*). Hence, completely parallel systems co-existed: short vowels and long vowels.

Not quite distinct is the situation in aspirated vowels. Both vowels and diphthongs have distinctive value at the beginning of words. They can be aspirated and non-aspirated. Inside words this quality is absent. However, *spiritus asper* can hardly be considered a separate phoneme (Hauchlaut) in the group /ha/, /hai/..., analogically to the aspirated consonants of the /p^h/ type. Aspiration as if passes from the word-onset position of the vowel to the preceding consonantal position (cf. the above type *apo-hairo → afairo*). The assumption that it is a feature of the vocalic phoneme at the beginning of the word or a morpheme could be supported by postulating a parallel feature of labialization, similar to the case of consonants. This feature seems to be present in what is spelled as *F* (digamma). According to Brandenstein it is a suprasegmental feature which in the Attic type disappeared in the 8th – 7th centuries B.C. but, supposedly, it remained vivid in dialects for many centuries. However, according to the Attic situation, it does not have a distinctive function as a suprasegmental feature. Documents like *FisFos → isos* show that the digamma also occurred before prefixes at the morphematic boundary. Its phonetic character is perhaps indicated by spellings of the type *aFtos* and *autos* or *rhabdous* and *rhaudous*.

By implication, we may assume the existence of two sister rows of vowels – the aspirated and the labialised rows:

(4)   a   e   o   i   u

          h_a F^a h_e F_e h_o F_o h_i

          F_i h_u F_u

Such sister rows are very distinct in diphthongs, denoted also graphically with the help of *i, u*:

(5)   ai   au

                ei   ou

This way of representation might suggest that Old Greek diphthongs were biphonematic. This could be supported by the moric character of Old Greek provided that diphthongs function as two mores in the prosodic system. However, their easy and quick monophthongizability does not support this assumption. The attempts to graphically represent the monophthongization changes, namely the spelling /au/ as *aF* or even as *aw* (as well as the Neo-Greek shift to *af*) show that the graphemes *u* and *i* represent only one feature. Hence, it would be more adequate to represent the Old Greek diphthongs as /a^i, a^u/ and interpret them as two sister rows (also in the case of long diphthongs):

(6) a^i a^u e^i e^u o^i o^u

          $a{:}^i$ $a{:}^u$ $e{:}^i$ $e{:}^u$ $o{:}^i$ $o{:}^u$

The idea of monophonematic character of Old Greek diphthongs is – seemingly quite paradoxically – supported by the moric character of Old Greek. It seems that the position of stress depends on the ordering of mores within the syllable. In particular, it can be on the first or on the second more of the stressed syllable. Nevertheless, attention should be paid to the fact that while

quantity is a distinctive feature of vowels, i.e. acoustic segments, both stress and more are suprasegmental features, and actually do not have a distinctive value. This also follows from boundness of the stress. Moric character as a suprasegmental feature is bound to the syllable, or the bearer of syllabicity, and that is why it cannot be decisive for the phonological qualities of phonemes.

On the whole, the vocalic system of Old Greek can be characterized as follows: If the freest passage of the stream of air exists in pronouncing the phoneme /a/, this phoneme can be characterized as open by the symbol APT – apertum. In the case of central vowels the oral cavity is less open, or more closed, but to a medium degree. That is why the feature of mediality – MEZ (mezon) is possible here. The phonemes /i, u/ are characterized by the feature CLF – closed, clausum. According to the place of articulation the vowels are front or back: ANT (anterior) or PST (posterior). The sister rows of vowels are characterized by the features ASP (aspiration) and LAB (labialization): in the case of aspiratation with the prefix *i-* (initialis) and in the case of diphthongicity with the prefix *f-* (finalis).

(7)

	ANT		PST	
APT	a			
IASP/LAB	h_a	F_a		
		$h_a i$	$h_a u$	
fASP/LAB	a^i	a^u		
MEZ	e		o	
IASP/LAB	h_e	F_e	h_o	F_o
		$h_e i$ $h_e u$	$h_o i$	$h_o u$
ASP/LAB	e^i	e^u	o^i	o^u
CLS	i		u	
IASP/LAB	h_i	F_i	h_u	F_u
FASP/LAB	-	-	-	-

According to the degree of openness, vowels are followed by liquids /r, l/ and nasals /m, n/. The phonemes /r, l/ are characterized by the feature iASP/LAB.

The consonantal system of Old Greek with the features MED, TEN and ASP/LAB (without prefixes) can schematically be represented in the following way:

(8)

MED	b		d		z		g	
TEN	p		t		s		k	
ASP/LAB	p^h	p^s	t^h	t^s	s^h	s^s	k^h	k^s

These three phonematic systems (vocalic, sonantic and consonantic) are mutually interlinked with the help of three basic features: sonority, vocalic nature and consonantal nature. This results in four main classes (Horecký 1975):

(9)   +SNR   +SNR   +SNR   -SNR
             +VOC   +VOC   -VOC   -VOC
             -CNS   +CNS   +CNS   +CNS
               a   r   l   p

From the analysis of the relationships between the phonemes and graphemes we could draw the conclusion that these relationships are very transparent and are mainly characterized by the occurrence of identical features in the main classes of phonemes (primarily in regard of aspiration and labialization), as well as by the occurrence of sister rows.

Note:

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