The Distinctive Features of Ancient Greek[1])

By Jean Aitchison, London

An attempt to assess the extent to which the universal set of distinctive features proposed by Chomsky and Halle in *The Sound Pattern of English* (1968) provides a satisfactory framework for describing the phonological structure of Ancient Greek.

The general conclusion reached is that the SPE features are reasonably satisfactory, though certain amendments and additions need to be made. The main flaw is the classification of *h* as a glide: it should possibly be treated as an obstruent. An additional feature [labial] is needed for the description of the labio-velars, and a new feature [mid] for vowels. The feature [strident] should perhaps be replaced by [sibilant].

A basic assumption of modern phonology is that segments of sound are decomposable into sets of properties or features. These features enable the relationship of one segment to another to be stated explicitly. For example, *p, t, k, b, d, g, m, n, ŋ,* do not differ randomly from each other: *p, t, k* share the property of being voiceless, while *m, n, ŋ* share the property of nasality. These features serve to distinguish *p, t, k* and *m, n, ŋ* from *b, d, g* which are voiced and non-nasal. In other words, they are *distinctive* features.

One important consequence of using distinctive features is that phonological rules may be expressed more simply, since they can apply to a 'natural class' of segments rather than to a number of seemingly isolated phonemes[2]). For example, a metathesis rule in which *r, l, m, n* and *j, w,* change place can be expressed simply as:

$$\begin{bmatrix} +\text{ consonantal} \\ +\text{ sonorant} \end{bmatrix}_1 \quad \begin{bmatrix} -\text{ consonantal} \\ -\text{ syllabic} \end{bmatrix}_2 \quad \Rightarrow 2\ 1$$

But the usefulness of such formalisations depends on the extent to which the set of features used reflects genuine natural classes. If the feature system is at fault, what may be captured are figments of the linguist's imagination rather than true generalisations.

It has been queried whether a universal set of features exists (Sampson, 1974)—and the universality of natural classes is also in

[1]) I am most grateful to Professor A. Morpurgo Davies and Dr. J. Wells for their helpful comments on an earlier draft of this article.

[2]) Cf. Halle, 1964: 328. "A set of speech sounds forms a natural class if fewer features are required to designate the class than to designate any individual sound in the class."

doubt (Lass, 1973). But for most linguists, one important goal of phonology is "to obtain a single set of features, capable of adequately representing the phonological generalisations of all languages in a natural, direct manner." Accordingly, "the basic set of features can be viewed as a hypothesis about language, subject to empirical validation. Arguments for adding new features to the list or for altering the basic features must demonstrate the inadequacy of the basic hypothesis". Such arguments must be based on a claim that the new solution "provides a more reasonable hypothesis of the phonological structure of the language in question." (Harms, 1968 : 38).

This article is an attempt to assess the extent to which the set of distinctive features proposed by Chomsky and Halle (1968, henceforth SPE) provides a satisfactory framework for describing the phonological structure of ancient Greek. But it is not only an exercise in linguistic theory. It is also an attempt to eliminate some of the confusion which faces those who wish to describe Greek phonology, since recent publications on the subject differ considerably in the set of features used (e.g. Kiparsky, 1967; Lupaș, 1972; Sommerstein, 1973).

The arguments for feature changes are based primarily on the natural classes suggested by the historical phonology of the language[3]). However, it is a tenet of modern generative phonology that synchrony and diachrony go hand in hand (Kiparsky, 1968). Sommerstein (1973) notes in several places that his synchronic rules for Attic Greek parallel the presumed historical development. Consequently, the conclusions are likely to have validity for Greek phonology as a whole.

This paper follows Vennemann and Ladefoged (1973) in distinguishing between two types of feature, phonetic 'prime' features and phonological 'cover' features. Such a procedure is merely a formalisation of the long-established idea that phonetics deals with physical measurements and phonology with sound patterns. Prime features are definable in terms of the acoustic or physiological properties of sounds, e.g. 'nasality' which is a single measurable property which all sounds can have to a greater or lesser extent. Cover features are cover terms for certain values or combinations of values of prime features which play a role in defining natural

[3]) Throughout the article diachronic changes are referred to, unless otherwise stated. These are often, but not necessarily, paralleled by synchronic rules.

classes and forming lexical contrasts, e.g. [nasal], [consonantal]. The two types of features frequently coincide. In SPE it is assumed (possibly wrongly) that they always do. Here it is the phonological cover features which are under discussion. Accordingly, the traditional principle of describing sound systems in the widest terms available can be followed. In Vennemann and Ladefoged's words, "segments are classified in terms of the broadest (cover) features sufficient to establish all the contrasts of the language described" (1973 : 69). So, for example, *p, b, f, v, m* can all be classified as [labial] in languages such as English where there is no contrast between bilabial and labiodental fricatives.

The segments[4]) to be discussed are:

(i) the phonemes reconstructible for Early Common Greek[5]):
p b ph t d th k g kh k^w g^w k^wh *s*
l r m n $\underset{\cdot}{l}$ $\underset{\cdot}{r}$ $\underset{\cdot}{m}$ $\underset{\cdot}{n}$ *j w h*
i: *i u*: *u e*: *e o*: *o a*: *a*

(ii) the phonemes of pre-Classical and Classical Attic Greek[6]):
p b ph t d th k g kh s
l r m n j w h
i: *i u*: *u e*: *e* ɛ: *o*: *o* ɔ: *a*: *a y*: *y*

(iii) some additional intermediate and dialectal phones:
t^v d^v t^s d^s *f v* ϑ ð *z* χ *γ* ŋ

Diagrams 1 and 2 show the SPE specification of these segments. They will be discussed under the sub-headings of A. Consonants (pp. 177 ff.) B. Glides (pp. 184 ff.) C. Vowels (pp. 191 ff.). Within these categories, the SPE subdivision of features into major class, cavity, manner of articulation, and source features will be followed.

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[4]) The transcription system used is that of the International Phonetic Association (IPA). It differs only in that k^w g^w g^wh t^v d^v t^s d^z = IPA *kgw gwh ty dy ts dz*, since it is sometimes necessary to distinguish between simultaneous articulation as in k^w and a sequence *kw*.

[5]) Following Lejeune (1972). The phrase 'Early Common Greek' is a blanket term used to refer to a stage of Greek at which the labio-velars and syllabic liquids and nasals still existed. It cannot be firmly dated, since dialects lost these phonemes at different times, and in any case the Greek language is unlikely to have ever been a unitary whole.

[6]) Following Allen (1968). Throughout this paper Allen's reconstructions of the phonetic values of ancient Greek have been followed, unless otherwise stated.

	p	*b*	*ph*	*t*	*d*	*th*	*k*	*g*	*kh*	k^w	g^w	k^wh	t^y	d^y	t^s	d^z	*s*	*z*	*f*	*v*	*ϑ*	*ð*	*x*	*γ*	*l*	*r*	*m*	*n*	*ŋ*	*l̩*	*r̩*	*m̩*	*n̩*
Consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Syllabic	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+
Sonorant	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+
Anterior	+	+	+	+	+	+	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	+	−	−	+	−	+	+	−	+	−	+	+
Coronal	−	−	−	+	+	+	−	−	−	−	−	−	+	+	+	+	+	+	−	−	+	+	−	−	+	+	−	+	−	+	+	−	+
High	−	−	−	−	−	−	+	+	+	+	+	+	+	+	−	−	−	−	−	−	−	−	+	+	−	−	−	−	+	−	−	−	−
Low	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−
Back	−	−	−	−	−	−	+	+	+	+	+	+	−	−	−	−	−	−	−	−	−	−	+	+	−	−	−	−	+	−	−	−	−
Rounded	−	−	−	−	−	−	−	−	−	+	+	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−
Nasal	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	−	−	+	+
Lateral	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	−	−	−	+	−	−	−
Distributed*)	+	+	+	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	−	−	−	−	−	−	−	+	+	−	+	+	+	+	+
Continuant	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	+	−	−	−	+	+	+	+
Delayed Rel.	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	+	+	+	+	−	−	−	−	−	−	−	−	−
Voiced	−	+	−	−	+	−	−	+	−	−	+	−	−	+	−	+	−	+	−	+	−	+	−	+	+	+	+	+	+	+	+	+	+
H.S.P.	−	−	+	−	−	+	−	−	+	−	−	+	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−
Strident	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	+	+	+	+	+	−	−	−	−	−	−	−	−	−	−	−	−	−

Diagram 1: Consonants (including syllabic liquids and nasals)

*) There is no general agreement as to which sounds are [+ distributed].

	i:	*i*	*e*:	*e*	*ɛ*:	*a*:	*a*	*ɔ*:	*o*	*o*:	*u*	*u*:	*y*	*y*:	*j*	*w*	*h*
Consonantal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Syllabic	+	+	+	+	+	+	+	+	+	+	+	+	+	+	—	—	—
Sonorant	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
High	+	+	—	—	—	—	—	—	—	—	+	+	+	+	+	+	—
Low	—	—	—	—	+	+	+	+	—	—	—	—	—	—	—	—	+
Back	—	—	—	—	—	+	+	+	+	+	+	+	—	—	—	+	+
Round	—	—	—	—	—	—	—	+	+	+	+	+	+	+	—	+	—
Tense	+	—	+	—	+	+	—	+	—	+	—	+	—	+	—	—	—
H.S.P.															—	—	+

Diagram 2: True Vowels and Glides

A. Consonants

(i) *Major Class Features* (consonantal, syllabic, sonorant)

In SPE consonants are distinguished from vowels and glides (*j*, *w*, *h*, ʔ) by the feature [consonantal] which characterises sounds "produced with a radical obstruction in the midsagittal region of the vocal tract" (302). 'True' consonants share with glides the specification [– syllabic], as opposed to "all segments constituting a syllabic peak" (394), namely vowels and syllabic liquids and nasals. Consequently, the four-fold opposition found in Early Common Greek can be characterised as follows:

	True Consonants	Syllabic Liquids and Nasals	Glides	Vowels
Consonantal	+	+	—	—
Syllabic	—	+	—	+

This characterisation is neat and useful. Two problems arise, though these problems are not specifically Greek ones. The first arises from SPE's 'phonetic' definition of [consonantal]. This means that *h* cannot be regarded as a consonant, but has to be perhaps mis-classified as a glide. Ladefoged argues convincingly that [consonantal] should be purely a 'cover' feature, since "no single measurable feature has ever been discovered which would set aside all consonantal segments from all non-consonantal segments" (Vennemann and Ladefoged, 1973 : 62, cf. Ladefoged, 1971 : 91). A phonological definition, in which [consonantal] is defined in terms of the intersection of classes already defined by other features might

be a step towards solving the thorny problem of Greek *h*, since *h* might then rank as a consonant (p. 190).

The second problem is less serious. It concerns the specification of non-syllabic liquids, for which an extra feature [vocalic] may be needed. This feature was used in place of [syllabic] in the early chapters of SPE (303), and included the liquids *l* and *r* as well as vowels. This seemed to be useful, since in several languages (though not Greek) liquids and vowels share the property of being the only segment which can follow a stop at the beginning of a syllable. But it had the disadvantage that liquids were opposed to 'true' consonants, and the set of sounds normally regarded as consonantal could not be expressed as a natural class. The replacement of [vocalic] by [syllabic] seems to have been generally accepted. But the amendment raises one difficulty: it is no longer possible to characterise the natural class of non-syllabic liquids (previously [+ consonantal, + vocalic]) in a simple way. It has therefore been argued by some linguists that the feature [vocalic] should be retained as well as [syllabic] (Wheeler, 1972 : 96; Smith, 1973 : 193).

[Sonorant] is a further major class feature. According to SPE, "sonorants are sounds produced with a vocal tract cavity configuration in which spontaneous voicing is possible" (302). Glides, liquids, nasals and vowels are [+ sonorant], whereas obstruents (stops, affricates and fricatives) are [– sonorant].

In the SPE definition, sonorants do not have to be voiced, a loophole which allows *h* which is normally unvoiced to be regarded as a sonorant. Ladefoged (1971 : 58) (among others) has criticised the SPE definition, and put forward an alternative which makes voicing essential. This implies that *h* should be regarded as [– sonorant]—which would (undoubtedly correctly) separate it from the glides *j* and *w* (Schane, 1973 : 27). But leaving *h* aside[7]), the SPE major class features are reasonably satisfactory, as far as Greek is concerned.

	Obstruents	Liquids and Nasals	Syllabic Liquids and Nasals	Glides	Vowels
Consonantal	+	+	+	—	—
Syllabic	—	—	+	—	+
Sonorant	—	+	+	+	+

(ii) *Cavity Features*

SPE divides cavity features into primary strictures [coronal], [anterior], features relating to the body of the tongue [high], [low], [back], and secondary apertures [nasal], [lateral]. In addition, there are a number of features which do not fit into any of the above

[7]) On Greek *h* see p. 184f.

categories, of which [rounded] and [distributed] are the only ones of possible relevance to Greek.

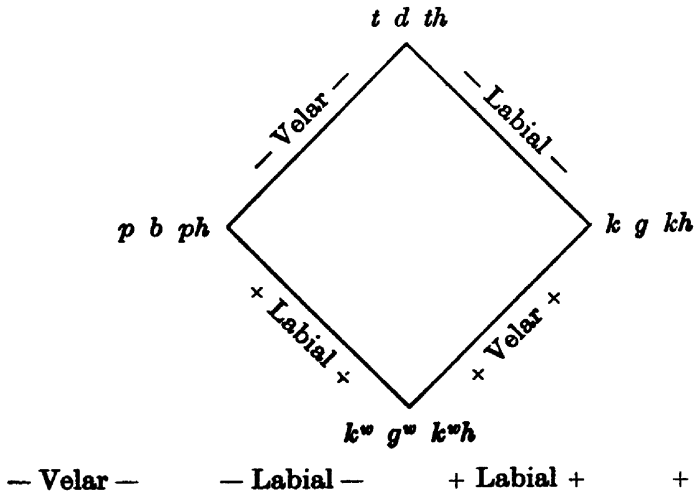
Place of articulation is defined primarily by the features [anterior] and [coronal]. [anterior] characterises sounds "produced with an obstruction that is located in front of the palato-alveolar region of the mouth" (304) and [coronal] describes sounds "produced with the blade of the tongue raised from its neutral position" (304).

	Labials	Dentals	Velars
	p b ph	*t d th*	*k g kh*
Anterior	+	(+)	—
Coronal	—	+	(—)

(Redundant features in brackets.)

This specification is reasonably satisfactory for classical Greek (above)—though, as has been frequently noted, (e.g. by Smith, 1973 : 198) there seems no reason for the class of labials to be more difficult to specify than that of dentals or velars. A further (much noted) disadvantage is the fact that velars and dentals appear to have less in common than labials and dentals. There seems to be no solution, as long as only two features are used. As Ladefoged notes, "with the exceptions of labials and velars, which are linked by the auditory feature gravity, there seems to be little motivation for combining places of articulation in any particular way" (1971 : 91). He proposes reverting to a more traditional system, where a number of different places of articulation are specified.

However, this defect is minor compared with the difficulty of characterising the four-way contrast of Early Common Greek, and the changes connected with the loss of the labio-velars.



This seemingly clearcut state of affairs cannot be captured in any simple way by the SPE system. The specification of labio-velars requires the introduction of three more features [high] [back] [rounded] which relate to the position of the body of the tongue and lip rounding. High sounds are produced "by raising the body of the tongue above the level it occupies in the neutral position" (304). Back sounds are produced "by retracting the body of the tongue from the neutral position" (305), and rounded sounds are formed "with a narrowing of the lip orifice" (309). Using these features, labio-velars can either be characterised as velarised labials ("labials with extreme velarisation" 311) specified as [+ anterior, − coronal, + back, + high] or as labialised velars ("velars with extreme lip rounding" 311) specified as [− anterior, − coronal, + back, + high, + round]. Chomsky and Halle say that the correct representation cannot be determined by observation, because the two configurations result in phonetically identical segments. They suggest that a decision can sometimes be made "on the basis of the facts of the language" (311). Comparative historical evidence suggests that Indo-European had labialised velars (velar stops with concomitant lip rounding), and this was possibly the state of affairs in Early Common Greek.

But the characterisation of labio-velars as [− anterior, − coronal, + back, + high, + round] presents problems (Anderson, 1971; Lass, 1973; Vennemann and Ladefoged, 1973; Campbell, 1974). It does not capture the fact that lip-based sounds such as *p*, *b* and rounded sounds such as *w*, *u*, k^w form a natural class, which they clearly do. Consequently, the change of Greek $k^w > k$ (in contact with *u*, e.g. **luk^{w}os* > *lukos*, *λύκος*) appears under the SPE system to be more natural than a change of $k^w > p$ (before *a*, *o*, e.g. **sek^{w}omai* > *hepomai*, *ἕπομαι*).

$$k^w > k \qquad \begin{bmatrix} -\text{anterior} \\ -\text{coronal} \\ +\text{rounded} \end{bmatrix} \rightarrow [-\text{rounded}]$$

$$k^w > p \qquad \begin{bmatrix} -\text{anterior} \\ -\text{coronal} \\ +\text{rounded} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{anterior} \\ -\text{rounded} \end{bmatrix}$$

Yet the changes are clearly complementary: in one case the labial element is lost, in the other the velar.

The simplest way to deal with the problem is to recognise a feature [labial]. Such a feature has been independently proposed by a number of linguists (e.g. Anderson, 1971; Reighard, 1972; Wheeler, 1972; Vennemann and Ladefoged, 1973). Vennemann and

Ladefoged's feature [labial] characterises both lip-based and round segments. This is a useful addition as far as Greek is concerned, since the change of $k^w > k$ now seems as natural as that of $k^w > p$.

$k^w > k$

$$\begin{bmatrix} -\text{anterior} \\ -\text{coronal} \\ +\text{labial} \end{bmatrix} \rightarrow [-\text{labial}]$$

$k^w > p$

$$\begin{bmatrix} -\text{anterior} \\ -\text{coronal} \\ +\text{labial} \end{bmatrix} \rightarrow [+\text{anterior}]$$

The feature [labial] proposed by Anderson (1971) covers only primary labial segments, and so excludes labialised velars, since he considers it important to maintain the SPE distinction between primary and secondary labialisation. The changes of $k^w > k$ and $k^w > p$ would then be described as follows.

$k^w > k$

$$\begin{bmatrix} -\text{anterior} \\ -\text{coronal} \\ +\text{rounded} \end{bmatrix} \rightarrow [-\text{rounded}]$$

$k^w > p$

$$\begin{bmatrix} -\text{anterior} \\ -\text{coronal} \\ +\text{rounded} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{labial} \\ -\text{rounded} \end{bmatrix}$$

This indicates that in $k^w > p$ the labial articulation was re-analysed as basic, and the secondary articulation lost. But this added nicety complicates the $k^w > p$ statement, and seems unnecessary, since the distinction between labialised velars and velarised labials can easily be dealt with by means of language specific redundancy rules.

The specification of palatalised sounds also presents problems, but not serious ones for Greek. Greek never had stable palatalised phonemes, though *r* may have been palatalised (Sommerstein, 1973: 52): this perhaps accounts for the retention of Attic *a*: after this sound. In addition, it may be necessary to postulate an intermediate t^j in the change of Arcadian *tis* > *sis*. SPE uses the feature [high] to denote palatalisation, so t^j would be specified as:

$$\begin{bmatrix} +\text{anterior} \\ +\text{coronal} \\ +\text{high} \\ (-\text{back}) \end{bmatrix}$$

This captures the generalisation that the secondary palatal articulation has a close relationship with *j* and *i*. But it also means that velars cannot be palatalised, as they are already [+ high]. In some languages $k^j : k$ contrasts are required (Campbell, 1974: 56), and in Greek k^j may be a necessary intermediate stage in the change **phulakjo*: > *phulatto*:, *φυλάττω* or *phulasso*:, *φυλάσσω* (Allen, 1957–8). In this case, the only thing which distinguishes k^j from *k* is the characterisation of the former as [— back] and the latter as [+ back]. This makes it impossible to distinguish *k* from *c* (a plain palatal stop). Such a distinction is not needed in Greek itself, though it is probably necessary for describing the changes which took place between Indo-European and Early Common Greek.

There is no simple solution, unless one choses to add a feature [palatal], akin to the old Jakobson, Fant and Halle feature [sharp] (1951). The continual addition of extra features augments the power of the feature system

perhaps undesirably—though as Ladefoged (1972: 8) notes. "There is really no reason to believe that we would be able to make adequate explanations of linguistic phenomena if we were to use a minimal set of distinctive features."

Perhaps mention should be made of one further ingenious solution to the problem of velarised and palatalised sounds. Campbell (1974) suggests using complex symbols—an almost direct translation of the common transcription in which the primary articulation is followed immediately by a superscript indicating a secondary articulation.

$$k^w \quad \begin{bmatrix} -\text{anterior} & +\text{labial} \\ -\text{coronal} & \end{bmatrix} \qquad k^y \quad \begin{bmatrix} -\text{anterior} & +\text{high} \\ -\text{coronal} & -\text{labial} \end{bmatrix}$$

But it has the disadvantage that the complex symbol appears to indicate a sequence of sounds for what was possibly simultaneous articulation—so that the rule which changed $k^w > k$ after a preceding *u* as in **luk^{w}os—lukos, λύκος* would seem most odd. So the idea should possibly be rejected.

So far, then, it seems that the features [coronal] and [anterior] are mildly, but not seriously, unsatisfactory, and the same applies to the features [high] and [back] for the specification of palatalisation. But it is essential to add a feature [labial] in order to characterise labio-velars adequately.

	p b ph	*t d th*	*k g gh*	*k^w g^w g^{w}h*	*t^j d^j*	*k^j g^j*
Anterior	+	+	—	—	+	—
Coronal	—	+	—	—	+	—
Labial	+	—	—	+	—	—
High	—	—	—	+	+	+
Back	—	—	+	+	—	—

The features [nasal] and [lateral] cause no problems, since Chomsky and Halle follow the standard definitions of these sounds. Nasals "are produced with a lowered velum which allows the air to escape through the nose" (316) and laterals "are produced by lowering the mid-section of the tongue at both sides, or at only one side, thereby allowing the air to flow out of the mouth in the vicinity of the molar teeth" (317).

The feature [distributed] is of marginal relevance to Greek. It was introduced in to SPE to deal with languages which distinguished more than three points of articulation in the pre-palatal region (e.g. labio-dental, as well as labial, dental and palato-alveolar). Distributed sounds "are produced with a constriction that extends for a considerable distance along the direction of the air flow" (312). It has been queried whether distributed (or non-distributed) sounds in fact constitute a true natural class (Wheeler, 1972: 98), though Harris (1969: 192, 198) has cogently argued the need for such a feature in Spanish. Moreover, there seems to be no general agreement over which sounds are [+distributed] and which are not. But in Greek, all sounds distinguished by [distributed] habe other differences also.

(iii) *Manner of Articulation Features*

In SPE, the traditional manner of articulation distinction between stops, affricates and fricatives is captured by means of the features [continuant] and [delayed release].

Continuants are defined as sounds in which "the primary constriction in the vocal tract is not narrowed to the point where the air flow past the constriction is blocked" (317). This characterises fricatives (and vowels and glides) as opposed to stops, affricates and nasals which are [— continuant]. Nasals are (perhaps surprisingly) regarded as non-continuant because the oral passage is blocked. Liquids are normally [+ continuant]—though according to SPE may be [— continuant] in certain languages.

Affricates (and fricatives!) are distinguished from stops by the feature [delayed release]: "There are basically two ways in which a closure in the vocal tract may be released, either instantaneously as in the plosives or with a delay as in the affricates" (318).

	Stops	Affricates	Fricatives	Nasals	Liquids
Continuant	—	—	+	—	+
Del. Rel.	—	+	+	—	—

As far as Greek is concerned, this characterisation presents no special problems—though, as Ladefoged (1971 : 106) notes, the features [continuant] and [delayed release] are not particularly satisfactory, since fricatives as well as affricates are characterised counter-intuitively as [+ delayed release]. If fricatives were [— delayed release] as expected, they would appear to bear no relation to affricates. There seems to be no real reason why traditional features such as [stop] [affricate] were not used, which would solve these problems. (Ladefoged, 1971 : 106, Campbell, 1974 : 59).

(iv) *Source Features*

The relevant source features for Greek are [voiced], [heightened subglottal pressure] (usually referred to as [hsp]) and [strident].

The feature [voiced] does not require any comment, as it is used in the traditional way.

In SPE [hsp] characterises *h* and aspirated consonants such as *ph th kh*, since Chomsky and Halle claim that "heightened subglottal pressure is a necessary, but not a sufficient condition for aspiration" (326). Ladefoged (1971 : 96) disputes this claim—and there seems no real reason why the feature should not have the traditional name [aspirated].

Strident sounds "are marked acoustically by greater noisiness than their non-strident counterparts" (329) so that *f*, *v*, *s*, *z*, t^s, d^z are all [+ strident]. But whether or not such a feature is needed is a controversial issue. Various writers have argued that if full use is made of other features such as [distributed] [delayed release] [coronal] [anterior], the feature [strident] may be redundant (McCawley, 1967 : 114; Harris, 1969 : 200, 201n; Wheeler, 1972 : 100). But in Greek it would be difficult to do without a feature which defined t^s, d^z, *s*, *z* as a natural class. And if *h* is to be treated as an obstruent rather than a glide (see p. 191), then it may be useful to describe a change of $s > h$ as

$$\begin{bmatrix} + \text{ continuant} \\ - \text{ sonorant} \\ + \text{ strident} \end{bmatrix} \rightarrow \begin{bmatrix} - \text{ strident} \\ (+ \text{ hsp}) \end{bmatrix}^{8)}$$

However, there seems no evidence that *f* and *v* should be included with *s* and the affricates, so perhaps [strident] should be replaced by Ladefoged's suggestion of [sibilant] (1971 : 57).

B. Glides

Glides are characterised as [– consonantal] [– syllabic]. This specification is satisfactory for *j* and *w*. But there are various indications that *h* should perhaps be regarded as an obstruent rather than a glide.

Excursus: Greek h

The problem of Greek *h* is a tricky one. Historically, *h* is the reflex of IE **s* and IE initial **j*. (Buck, 1933; Lejeune, 1972). Phonetically, it seems to be a glottal fricative in Classical Greek (Allen, 1968). As already noted, Chomsky and Halle treat *h* as a glide, a position to which they are forced by their phonetic definition of [consonantal], and which they maintain by means of their controversial definition of [sonorant] (p. 177f.). However, the question to be decided is whether *phonologically h* behaves in the same way as *j* and *w* in Greek. The evidence is by no means clear cut—but may be summarised as follows:

Differences between *h* and *j*, *w*

(a) *h* has no vocalic counterpart
(b) *h* has close connections with the voiceless aspirates.
(c) *h* is normally voiceless.
(d) *h* has close connections with *s*.

[8]) [+ hsp] is redundant as long as the Greek matrix contains no other fricative.

Apparent similarities between *h* and *j*, *w*

(e) *h*, *j*, *w* are deleted intervocalically.
(f) **j* > *h* initially.
(g) *h*, *j*, *w* behave similarly in sonorant clusters.
(h) *h*, *j*, *w* may all be involved in a rule of glide assimilation.

Differences between *h* and *j*, *w*

(a) Both diachronically and synchronically *j* and *i*, *w* and *u* are in complementary distribution. The appearance of a segment as *j* or *w* rather than *i* or *u* is to a large extent due to the surrounding sounds. For example, intervocalically, *j* and *w* occur (before disappearing) as in the development of (**swe*:*dewos*) > *he*:*dewos* > *he*:*deos*, ἡδέος. Between consonants, *i* and *u* are found, e.g. (**swe*:*dus*) > *he*:*dus*, ἡδύς. But *h* has no vocalic counterpart, and is deleted between consonants where *j* and *w* are automatically vocalised.
e.g. **ptersna*: > *pterhna*: > *pterna*:, Att. πτέρνη.
Sommerstein, (1973 : 18), who is using SPE features, allows the synchronic rule which deletes *h* between consonants to apply vacuously to high glides between consonants, since *j* and *w* are not found in this position. But the reason they do not occur is that they have already been vocalised by a rule formalised as 'glide vocalisation'. *h* escapes this rule because glide vocalisation is ordered before 'fricative weakening' by which *s* becomes *h*. So it seems that Sommerstein has captured an apparent generalisation in an artificial way: by ingenious rule ordering he has formulated a rule of 'glide deletion' which gives the superficial impression that *h*, *j* and *w* all behave similarly between consonants (Aitchison, 1975).

(b) *h* is involved diachronically and synchronically in Grassmann's Law (dissimilation of aspirates), a rule which is unrelated to *j* and *w*.

e.g. (**sekho*:) > *hekho*: > *ekho*:, ἔχω.

In addition, a sequence of voiceless stop + *h* is treated as the corresponding voiceless aspirate, as in *aphiste*: *mi*, ἀφίστημι. But a sequence of voiceless stop + *j* or *w* normally changed to a dental:

krupjo: > *krupto*:, κρύπτω
twos > *sos*, σός.

(c) The fact that *h* is normally voiceless is shown by its connections with the voiceless aspirates, and the fact that the 'breathing' used orthographically for initial *h* was also sometimes used to denote voicelessness, e.g. ῥόος = [roos], possibly with voiceless *r* (Allen, 1968). But *j* and *w* are normally voiced. This is shown partly by their relationship with the vowels *i* and *u*, partly by later developments. For example, in classical dialects where *w* remained, it became a voiced fricative *v* represented by *β*: e.g. *woikia*:*s* > Elean *voikia*:*r*, *βοικίαρ*.

(d) *h* was the normal reflex of IE **s*, and the link of *h* and *s* is still seen in some dialects: in Laconian secondary *s* becomes *h*, e.g. *νικάhας* = Att. *νικήσας*. Synchronically, underlying *s* must be set up to account for a number of otherwise puzzling alternations between *h* and *s* (Sommerstein, 1973 : 8).

If *h* is regarded as a glide, the change from *s* to *h* (which is by no means rare in other languages, Sommerstein, 1973 : 95) appears extremely complex:

$$\begin{bmatrix} -\text{ sonorant} \\ +\text{ continuant} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{ strident} \\ -\text{ anterior} \\ -\text{ coronal} \\ +\text{ back} \\ +\text{ low} \\ +\text{ sonorant} \\ -\text{ consonantal} \end{bmatrix}$$

As Sommerstein (1973 : 95) notes: "If this were really how the rule ought to be stated, one would expect the probability of such changes as these to be vanishingly small." But if *h* is classified as an obstruent, then this change can be expressed considerably more simply.

Apparent similarities between *h* and *j*, *w*

(e) Intervocalic *h*, *j*, *w* disappear.

e.g. **genesos* > *genehos* > *geneos* Att. *γένους*
**philejo:* > *phileo:*, Att. *φιλῶ*.
**newos* > *neos*, *νέος*.

(Intervocalic *j* was often reinforced rather than deleted, as in *tithejε:n* > *tithejjε:n*, *τιθείην*.)

However, the fact that different sounds are deleted does not necessarily mean that they are phonologically parallel: the deletion in French of final *-t*, final *-r* and final *-z* does not necessarily imply similarity between the deleted sounds.

(f) *h* is a reflex of IE initial **j*
e.g. **jos* > *hos*, *ὅς*.

Although at first sight this seems to indicate a close relationship between *h* and *j*, some rather strange developments occur initially in Greek. *h* is found unexpectedly in a number of words which originally began with a vowel or *w*. And initial *j* sometimes becomes *zd*. So it would be unwise to draw any strong conclusions from this change.

Lejeune (1972 : 168), and Kiparsky (1967 : 621) suggest that intersvocalic *j* became *h* before it disappeared. This is inferred from words such as *ἧκα* for which a development **ejε:ka* > *ehε:ka* *heε:ka* > *hε:ka* is assumed. But, as Lejeune points out, there are at least two other equally plausible explanations for the aspirate in *hε:ka*. So internal *j* > *h* is by no means substantiated.

(g) Exactly what happened in so-called 'sonorant clusters' (combinations of *l*, *r*, *m*, *n*, *j*, *w*, with *j*, *w*, *s*) is unclear: "Undoubtedly one of the thorniest single areas of a historical grammar of Classical Greek lies in the field of 'sonorant clusters'" (Adams, 1972). Recently, the problem has received a certain amount of attention. (Kiparsky, 1967; Adams, 1972; Hutcheson, 1973; Sommerstein, 1973; Aitchison, 1974.)

The outline facts are clearest in the cases where *r* or *n* is combined with *s*, *j* or *w*. (*m* + *s*, *j*, *w* do not occur; in places where *m* is expected, *n* is always found, e.g. *g^{w}ṃjo:* > *baino:*, *βαίνω*. *lj* always becomes *ll*, e.g. *aljos* > *allos*,

ἄλλος). Using *R* to stand for 'sonorant', in this case *r* or *n*, the following results are found in Aeolic (Lesbian and Thessalian) and Attic[9]).

1. *R* + *w* results in simple loss of *w*. (The occasional doubling of the sonorant in grammarians and late Aeolic inscriptions is thought to be hypercorrection, due to the frequency of *nn* from *ns* and *nj*).

e.g. **ksenwos* > Lesb., Att. *ksenos*, ξένος.
(Ionic, however, had **ksenwos* > *kse:nos*, ξεῖνος.)

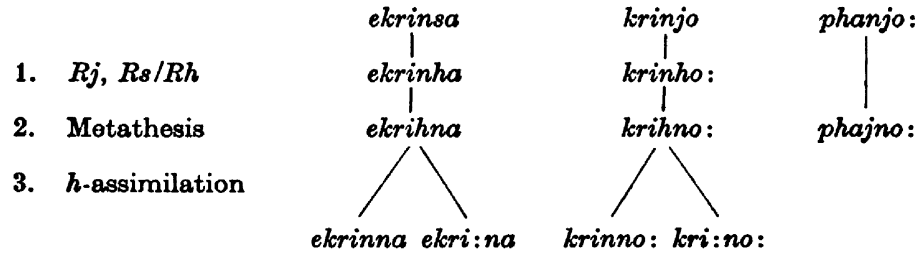
2. *R* + *s* results in loss of *s* with doubling of the sonorant in Aeolic, and lengthening of the preceding vowel in Attic. This cluster produces the same results as original *s* + *R*.

e.g. **ekrinsa* > Lesb. *ekrinna*, ἔκρινα
> Att. *ekri:na*, ἔκρινα
cf. **selasna:* > Lesb. *selanna:*, σελάννα
> Att. *sela:na:* > *selɛ:nɛ:*, σελήνη

3. *R* + *j* results in simple metathesis if the sonorant is preceded by *a* or *o*. But if the sonorant is preceded by *e*, *i* or *u*, then *j* is lost with doubling of the sonorant in Aeolic, and lengthening of the preceding vowel in Attic.

e.g. **phanjo:* > Lesb., Att. *phajno:*, φαίνω
**krinjo:* > Lesb. *krinno*, κρίννω
> Att. *kri:no:*, κρίνω

R + *w* can be left aside. It is the partially parallel treatment of *R* + *s* and *R* + *j* which is of interest. Kiparsky, who regards *h* as a glide, conflates the changes ingeniously (1967). He assumes that *Rs* and *Rj* became *Rh*, except when *Rj* was preceded by *a*, *o*. This is followed by sonorant-glide metathesis, and subsequent assimilation of *h* to a preceding vowel or following sonorant.

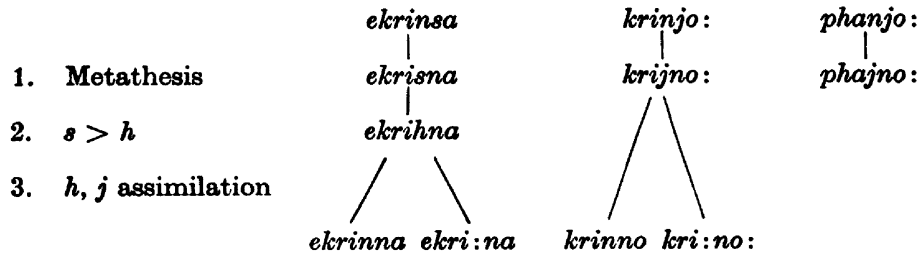


But this account of events is unlikely. Firstly, it does not explain why *j* fails to change to *h* if the sonorant is preceded by *a*, *o*. In fact, it is hard to see how *j* could 'look back' at the vowel preceding the sonorant in order to decide whether to change into *h* or not. It seems more likely that *Rj* simply metathesised without changing to *h* at all. Secondly, a change *Rs* > *Rh* 'bleeds' the rule which changes *sR* > *hR*. It is more probable that *Rs* metathesised and joined an original *sR* before changing to *hR*.

A more plausible account of the sonorant cluster changes is as follows: *s* and *j* metathesise with a preceding sonorant, then *s* changes to *h*. If the

[9]) Outline facts are described by Buck, 1933; Buck, 1955; Lejeune, 1972; Thumb-Scherer, 1959.

resulting sequence fits in with the surface canonical patterns of Greek, it remains, as in the case of *ajR* and *ojR*[10]). If not, the *h* or *j* is assimilated to a preceding vowel or following sonorant.



If this account is correct, the similarities between *h* and *j* are not particularly strong. The most that can be said is that they are both 'weak' sounds which, when occurring in a sequence which does not conform to the surface canonical patterns of Greek, tend to be assimilated to adjacent sounds.

(h) Glide assimilation—if such a rule exists, either diachronically or synchronically—is an extension of the changes involving sonorant clusters, since it only occurs when *j-w* and perhaps *h* come into contact with one another.

Assuming (hypothetically) that *h* is a glide, there are six possible combinations of unlike adjacent glides:

wj jw wh
hj hw jh.

Of these, examples of *wh*, *jh* and *jw* are rare and problematical. Examples of *wj*, *hj* and *hw* abound, and the results are as follows:

1. *hw* (from *s* + *w*) seems to behave in the same way as *h* + *r* or *n*. *h* is assimilated to a preceding vowel in Attic, and a following sonorant in Aeolic.
e.g. **naswos* > Aeol. *nawwos*, *ναῦος*
> Att. *na:wos* (> *na:os* > *nε:os* > *neo:s*, *νεώς*)

2. *hj* (from *s* + *j*) results in *jj* in both Aeolic and Attic.
e.g. **alε:thehja* > *alε:thejja*, *ἀλήθεια*

3. *wj* results in *jj* in both Aeolic and Attic
e.g. **kawjo:* > *kajjo:*, *καίω*[11]).

The crucial question is the route by which *hj* and *wj* became *jj*. Is it a simple case of glide assimilation? Or is this merely a convenient shorthand way of describing the end result of a more complex process? Opinions vary.

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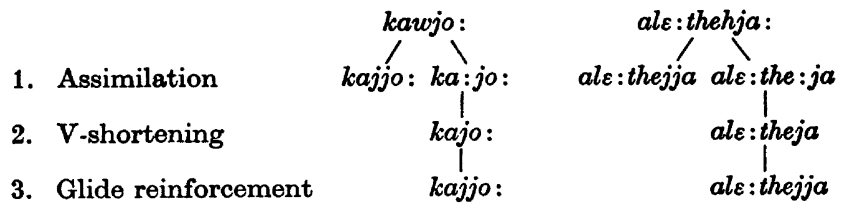
[10]) This account assumes that pre-consonantal *ei* was monophthongised at a very early date.

[11]) Synchronically, Sommerstein sets up an underlying *wj* to account for forms such as *politewwomai πολιτεύομαι*. This means he has to assume *wj* > *ww* in some present tenses, as opposed to 'normal' *wj* > *jj*.

Sommerstein (1973 : 38), who is accounting for synchronic phonology (which may recapitulate historical development) assumes that simple regressive assimilation takes place in both clusters[12]). Kiparsky (1967 : 620) proposes metathesis and progressive assimilation in the historical treatment of *wj*. He admits to being baffled by Attic *hj* > *jj*,—an apparently Aeolic development judging by other sonorant clusters—but suggests that the unexpected regressive assimilation is due to the effects of a morpheme boundary (1967 : 633). Lejeune (1973 : 132) assumes *hj* > *jj* by regressive assimilation. For *wj*, he puts forward two explanations which he regards as "également possibles" (172). Either regressive assimilation, or metathesis followed by loss of *w* (and presumably 'glide reinforcement' *j* > *jj*).

e.g. *kawjo*: > *kajwo*: > *kajo*: > *kajjo*:, *καίω*.

Another possibility is to assume that *wj* and *hj* behave parallel to other sonorant clusters: assimilation to a preceding vowel in Attic, but a following sonorant in Aeolic. Attic would then undergo vowel shortening and glide reinforcement (cf. *athɛ*:*na*:*jos* > *athɛ*:*najos* > *athɛ*:*najjos*, *Ἀθηναῖος*).



Unfortunately, Mycenaean evidence does not help in choosing between these accounts. The cluster *wj* occurs in words such as *di-wi-jo* = *diwjos* later *δῖος* and *me-wi-jo*/*me-u-jo* = *mewjo*:*n* later *μείων*. But instead of the expected agent feminines in *-ewija* to match nouns in *-eus*, only feminines in *-eja* are found, e.g. *i-je-re-a* = *hierej*(*j*)*a*, *ἱερεῖα*, whose development is obscure. As Lejeune notes (1972 : 173) "à dire vrai la question reste ouverte".

Although regressive assimilation is the simplest explanation, it is strange that it should occur in Attic, a dialect which does not normally solve sonorant cluster problems by sonorant doubling. It is more plausible to assume that Attic followed the same development as in other sonorant clusters—compensatory lengthening of the preceding vowel. The advantage of this explanation is that it accounts for Attic doublets of the type *ἐλάα* ~ *ἐλαίη*—the first of the pair being a 'petrified' older form which occurred before vowel shortening and glide reinforcement. Similarly, *τέλεος* (Attic inscription) ~ *τέλειος* with the former occurring without glide reinforcement. In the genitive singular of the article **tosjo* > *tohjo* > *to*:*jo* > *too* > *to*:, *τοῦ* presumably *j* was deleted rather than reinforced because of its proclitic behaviour (Sommerstein, 1973 : 136).

It seems, then, that there is no certain evidence that there ever was a straight 'glide assimilation' rule—at least in Attic. And Aeolic glide assimilation was merely part of a more general tendency to double sonorants. *j*, *w*, *h* have no special attraction for each other—they are simply all 'weak' sounds which tended to be assimilated to surrounding sounds.

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[12]) However, this is not an independently motivated rule.

General Conclusions on Greek *h*

Qualitatively, Greek *h* appears to differ considerably from *j* and *w*. It has no vocalic counterpart, it is voiceless, and shares features with the obstruents *ph th kh* and *s*. Its similarities with *j* and *w* are mostly quantitative ones: like them it is a weak sound which disappears intervocalically, and tends to be assimilated to neighbouring sounds in clusters.

Clearly *h* must be separated from *j* and *w*. At the very least, the class of glides must be subdivided into [+ sonorant] (*j w*) and [– sonorant] (*h*). (Schane 1973 : 27; Smith, 1973 : 194). But this is only a half-way remedy. Greek appears to fit best into the system proposed by Ladefoged in which *h* is treated as a true consonant (1971 : 111)[13]). This means that the SPE phonetic description of [consonantal] should be replaced by Ladefoged's definition in which [consonantal] is "defined only in terms of the intersection of classes already defined by other features" (1971 : 91). In this case, non-sonorants such as *h* would automatically be [+ consonantal][14]). This Greek classification of *h* need not be applicable to all languages: there is some evidence that natural classes may not be universal (Lass, 1973).

One problem remains, that of the 'quantitative' similarity of *h* and *j w h j w* seem to be comparable in strength (or lack of strength) in spite of qualitative differences. It may be that an additional parameter is needed in the discussion of sound change: it is perhaps necessary to classify sounds in terms of their relative strength. The suggestion that sound change must take account of a hierarchy of strength which may not correspond to the feature properties of the sounds in question has been put forward by Foley (1968, 1972)— and has aroused much criticism (e.g. Cohen, 1971). Unfortunately, both Foley and his opponents regard their points of view as mutually exclusive—though there are signs of a more moderate bridging attitude in some writers (e.g. Zwicky, 1972; and more importantly. Lass and Anderson, 1975, Lass, 1976). In Greek, at least, it seems that some such compromise is needed. The paradoxes inherent in the behaviour of Greek *h* might be considerably less puzzling if *h* was assigned not only a set of properties, but also a relative strength measure.

[13]) The prosodic irrelevance of *h* (it does not hinder elision, for example), merely confirms its lack of strength. It does not debar it from being a consonant.

[14]) This assumes that the SPE definition of [sonorant] is also rejected, and replaced by one which makes voicing essential (see p. 178).

In conclusion, *h* cannot be justified as a glide in terms of phonological features. Rather, it should be characterised as [+ consonantal, − syllabic, − sonorant, + continuant, − sibilant[15]), + hsp]. In other words, it should possibly revert to its traditional role as a fricative. But there is a need for additional machinary which assigns a relative strength measure to sounds. If such a scale existed, *j*, *w*, *h* would clearly be adjacent.

C. Vowels

In SPE, vowels are distinguished from consonants and glides by the presence of the feature [syllabic] (p. 177). They are distinguished from each other by the cavity features [high] [low] [back] and [rounded] and by the manner of articulation feature [tense].

The feature [tense] "specifies the manner in which the entire articulatory gesture of a given sound is executed by the supraglottal musculature. Tense sounds are produced with a deliberate, accurate, maximally distinct gesture that involves considerable muscular effort . . . One of the differences between tense and lax vowels is that the former are executed with a greater deviation from the neutral or rest position of the vocal tract than are the latter" (SPE 324). This feature characterises what are popularly known as 'long' vowels. Sommerstein (1973 : 86) has suggested that the feature [tense] should be replaced by [long] in Greek. Allen (1973 : 64) argues in favour of [tense], pointing out (as do Chomsky and Halle, 352) that duration is simply an incidental feature of vowel 'length'. This is not necessarily true of all languages[16]). But in Greek, the name of the feature is irrelevant, since the vowels labelled [long] by Sommerstein are the same as those labelled [tense] by Allen or Chomsky and Halle.

These SPE features are best suited to an 'ideal' system with five tense and five lax vowels, as perhaps existed in Early Common Greek. This can be characterised as follows:

	i:	*i*	*e:*	*e*	*a:*	*a*	*o:*	*o*	*u:*	*u*
High	+	+	−	−	−	−	−	−	+	+
Low	−	−	−	−	+	+	−	−	−	−
Back	−	−	−	−	+	+	+	+	+	+
(Round)	−	−	−	−	−	−	+	+	+	+
Tense	+	−	+	−	+	−	+	−	+	−

[15]) [sibilant] instead of [strident] (p. 184).

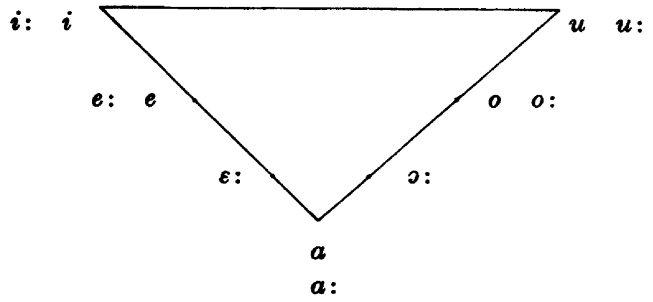
[16]) John Wells has pointed out that one variety of Scots English distinguishes short, long, and long-tense vowels.

This presents no problems—apart from the point that it seems somewhat arbitrary to classify *a* and *a:* as back vowels.

But this 'ideal' vowel system did not last long in Greek. By classical times Attic and most other dialects had seven long vowels. Two new tense vowels, closer than the original tense mid vowels, were formed from the results of vowel contraction, compensatory lengthening and monophthongisation.

The results of vowel contraction (*e* + *e* > *e*:, *o* + *o* > *o*:) and compensatory lengthening (e.g. **esmi* > *e*:*mi*, *εἰμί*, **philons* > *philo*:*s*, *φίλους*) indicate that the lax mid vowels *e*, *o* were phonologically more closely related to close *e*:, *o*: than to inherited open *ɛ*:, *ɔ*: (Lejeune, 1972 : 236). It should be noted that the phonological relationship between *e*, *o* and *e*:, *o*: does not necessarily correspond to their phonetic relationship. The two may coincide, but there are many cases in which sounds phonetically some way apart are treated as being phonologically closer than sounds which are physically nearer together (e.g. Fouquet, 1952). As far as Greek is concerned, Allen (1968 : 60) may well be right when he suggests that phonetically *e*, *o* were midway between *e*:, *o*: and *ɛ*:, *ɔ*:.

The pre-classical seven vowel system to be described is as follows (by classical times, Attic *u*:, *u* had been fronted to *y*:, *y*, and *o*: raised to *u*:):



SPE would characterise this as follows:

	i:	*i*	*e*:	*e*	*ɛ*:	*a*:	*a*	*ɔ*:	*o*	*o*:	*u*	*u*:
High	+	+	—	—	—	—	—	—	—	—	+	+
Low	—	—	—	—	+	+	+	+	—	—	—	—
Back	—	—	—	—	—	+	+	+	+	+	+	+
Round	—	—	—	—	—	—	—	+	+	+	+	+
Tense	+	—	+	—	+	+	—	+	—	+	—	+

Since the SPE features reflect three vowel heights only (*ɛ*:, *ɔ*:, *a*: are all [+ low]), the feature [back] is used to distinguish *ɛ*: from *a*:, and the feature [round] distinguishes *ɔ*: from *a*:. So, *a*: must be

specified as [+ low, + back, − round, + tense]. Although cumbersome, this does not at first sight seem to be a serious defect as far as Greek is concerned, since the features [back] and [round] are independently needed in a number of changes which involve *a*:.

e.g. Attic *a*: > *ε*: can be stated simply as:

$$\begin{bmatrix} +\text{ low} \\ +\text{ back} \\ +\text{ long} \end{bmatrix} \rightarrow [-\text{ back}]$$

And one way of dealing with the vowel contraction changes is to state that a non-high vowel in contact with a round vowel becomes round itself (before coalescing):

$$[-\text{ high}] \rightarrow [+\text{ round}] \quad / \quad \begin{bmatrix} -\text{ high} \\ \\ +\text{ round} \end{bmatrix} \text{\_\_\_\_} \quad \text{(mirror image)}^{17})$$

e.g. *timao:men* > *timɔo:men* > *timɔ:men*, *τιμῶμεν*

However, the problems of specifying four vowel heights within the SPE system have been pointed out by a number of linguists (e.g. Kiparsky, 1968; Wang, 1968; Contreras, 1969; Smith, 1970–1; Ladefoged, 1971). A major difficulty is that *e*:, *o*: are easier to specify than *ε*:, *ɔ*:, so a change in which *e*:, *o*: become *i*:, *u*: is easier to express than one in which *ε*:, *ɔ*: become *e*:, *o*:, yet both changes are equally likely:

e:, *o*: > *i*:, *u*:

$$\begin{bmatrix} -\text{ high} \\ -\text{ low} \\ +\text{ tense} \end{bmatrix} \rightarrow [+\text{ high}]$$

ε:, *ɔ*: > *e*:, *o*:

$$\begin{bmatrix} +\text{ low} \\ a\text{ back} \\ a\text{ round} \\ +\text{ tense} \end{bmatrix} \rightarrow \begin{bmatrix} -\text{ low} \\ -\text{ high} \end{bmatrix}$$

And since vowel raising is a characteristic of Boeotian in classical times, and all other dialects in the post-classical period, this is a serious flaw.

Various ways of coping with four vowel heights have been suggested. Kiparsky (1968) proposes a feature [mid] instead of [low]:

	i u	*e o*	*ε ɔ*	*a*
High	+	+	−	−
Mid	−	+	+	−

[17]) 'Mirror image' rules are discussed by Langacker (1969). In this case, it indicates that the dominating round vowel may either precede or follow the vowel it influences.

This solves the problem above, since *ε:*, *ɔ:* > *e:*, *o:* is as straightforward as *e:*, *o:* > *i:*, *u:*:

e:, *o:* > *i:*, *u:*	*ε:*, *ɔ:* > *e:*, *o:*
[+ high, + mid] → [− mid]	[− high, + mid] → [+ high]

But it raises a number of further difficulties: 'everything except *i u*' cannot be referred to except by means of a disjunction:

[+ high, + mid] or [+ mid, − high, − mid]

And such a class is needed in the vowel contraction rules.

Furthermore, as Smith (1970–1) notes, a class [+ mid] implies a class [− mid] comprising *a i u* which is never needed—and *a* can only be expressed as

[− high, − mid, − round, + back]

The feature [mid] seems somewhat more satisfactory if used as an additional feature, rather than a replacement feature for [low]:

	i u	*e o*	*ε ɔ*	*a*
High	+	−	−	−
Low	−	−	+	+
Mid	−	+	+	−

This solves some problems: *a* can be specified as [+ low, − mid], and changes where vowels are raised by a height can be described without difficulty. But the class [mid] still presupposes the problematical [− mid], and the use of an extra feature adds perhaps undesirably to the power of the system. However, this may in the long run be the best solution.

A further difficulty arises—the question of what to characterise as a high vowel. It is useful to regard *i, u* as the only high vowels in order to be able to specify 'everything except *i, u*' as [− high] (as in the standard SPE system). But this fails to capture a generalisation in connection with palatalisation[18]). Attic palatalised the labio-velar **k*^{w} before *i* and *e*. This perhaps indicates that *e* as well as *i* should be [+ high] (as in the Kiparsky system). Moreover, a high preceding sound may account for the blocking of Attic *a:* > *ε:* after

[18]) Palatalised sounds are characterised as [+ high] (p. 181).

e, *i* or *r*—if Sommerstein is correct in suggesting that Attic *r* was palatalised (1973 : 52). One solution is to leave *i* and *u* as the only high vowels, and to introduce a feature [palatal] for *e* and *i*. But this is rather *ad hoc*, even though [palatal] might be useful for palatalised consonants (see p. 181). However, the difficulty is perhaps not serious, since some languages have palatalisation phenomena even before low vowels—and in Greek, *e* and *i* can easily be characterised as [— low].

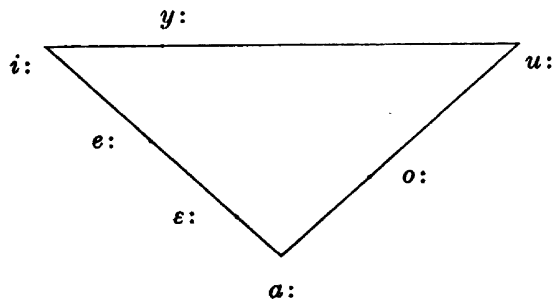
Another possibility which should be mentioned in connection with specifying four vowel heights is the use of *n*-ary features: vowels can be specified as Height 1, 2, 3, 4. (Contreras, 1969; Smith, 1970–1; Ladefoged, 1971).

i u	*e o*	*ɛ ɔ*	*a*
1	2	3	4

In some ways, this is the simplest solution, since changes involving vowel raising can be expressed simply as:

$$V_4 > V_3, \qquad V_3 > V_2, \quad \text{etc.}$$

But unfortunately, it presents insuperable problems for Greek. Thessalian retained a five vowel system in both the tense and lax vowels —so an *n*-ary system would make direct comparisons between dialects confusing or misleading. This may be trivial. But worse still, classical Attic had four heights for the front tense vowels —but only three for the back.

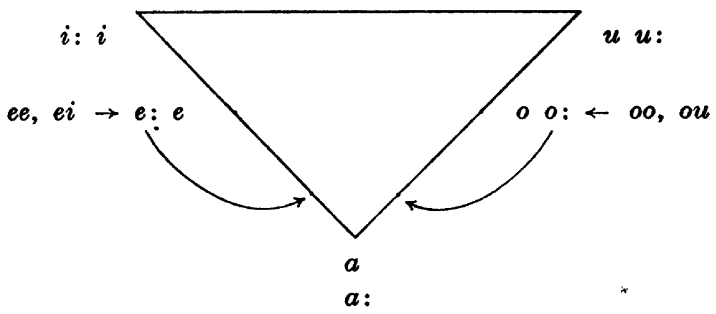


And the changeover from the five vowel system of Early Common Greek to the seven tense vowels of pre-classical times provides further difficulties. So an *n*-ary system must be abandonned in favour of the standard SPE system, perhaps augmented by the feature [mid].

The change from five to seven tense vowels

The change from five long vowels to seven provides problems, whatever feature system is used. There are three possible ways of dealing with the change:

(i) *Lower original tense vowels*: The original tense mid vowels can be regarded as changing from [— low] to [+ low]. The new [— low] vowels, formed by the monophthongisation of *ee*, *ei*, *oo*, *ou*, fill the space vacated,



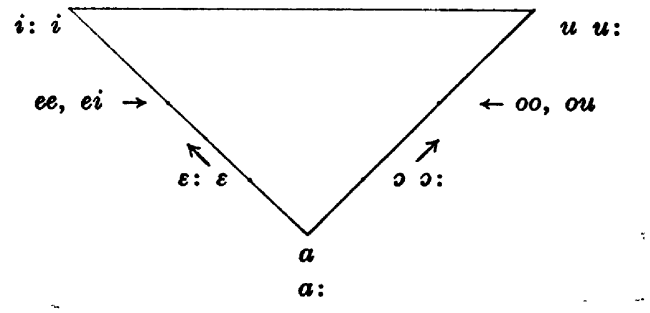
Using SPE features, this can be specified as

$$\begin{bmatrix} -\text{high} \\ -\text{low} \\ +\text{tense} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{low} \\ \alpha\ \text{back} \\ \alpha\ \text{round} \end{bmatrix}$$

But it is simpler to use an extra feature [mid]:

$$\begin{bmatrix} -\text{low} \\ +\text{mid} \\ +\text{tense} \end{bmatrix} \rightarrow [+\text{low}]$$

ii) *Raise lax vowels:* An alternative possibility is to assume that in the vowel system of Early Common Greek the mid vowels were *low*, ɛ, ɛ:, ɔ, ɔ:. Then the lax vowels can be raised, before being joined by the new tense vowels:



Sommerstein (1973 : 100) prefers this interpretation in his synchronic rules, since the lowering of tense mid vowels would automatically result in *a*: under the SPE linking conventions.

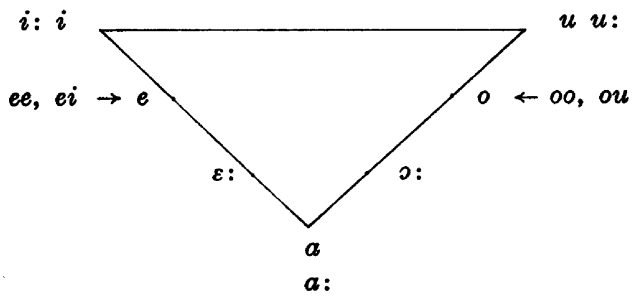
Using SPE features, this is:

$$\begin{bmatrix} +\text{low} \\ \alpha\ \text{round} \\ \alpha\ \text{back} \\ -\text{tense} \end{bmatrix} \rightarrow [-\text{low}]$$

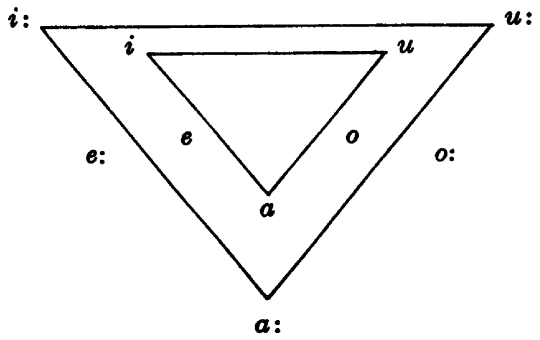
Or, with a feature mid:

$$\begin{bmatrix} +\text{ low} \\ +\text{ mid} \\ -\text{ tense} \end{bmatrix} \rightarrow [-\text{ low}]$$

(iii) *Assume that Early Common Greek already had four vowel heights:* If, in Early Common Greek, the lax mid vowels are assumed to be [– low] and the tense ones [+ low], then raising or lowering is unnecessary in most dialects.



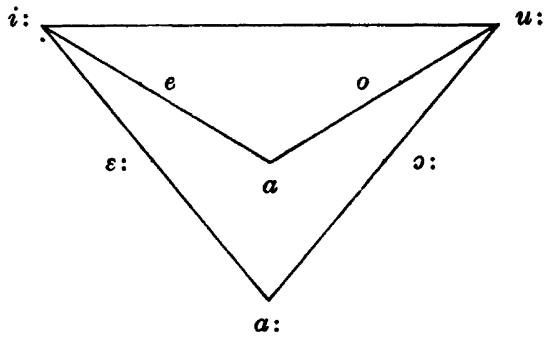
This is the 'traditional' diagram reconstructed by e.g. Buck, (1933 : 92). It has been queried by Allen (1959) who points out that it is abnormal for lax mid vowels to be closer than the tense ones in a vowel system. Allen also considers it useful in plotting vowels to follow two principles originally proposed by the Praguian, A.W. de Groot: the principle of equidistance (now generally followed at least in diagrams) and the separation of the tense and lax systems onto different triangles.



i: *u:* *i* *u* *e:* *e* *o* *o:* *a* *a:*

If both these principles are correct, then the 'traditional' view of a closer *e* than *ɛ:* cannot be supported, unless Greek can be shown

to have a lax *a* which was closer than tense *a*: (as in Sanskrit) (Allen, 1959 : 248):



i: *u*: *e* *o* *ɛ*: *a* *ɔ*: *a*:

However there is no evidence that Greek *a* and *a*: differed in this way.

But if the principle of separating the tense and lax vowels is dropped[19]), then the objections to the traditional diagram also fall. And the argument that it is unusual to have lax vowels closer than tense ones also fails. It may well be unusual—and this may be a contributory factor in the development of the new tense vowels, which can be partially viewed as a movement towards a less 'marked' system.

Setting up the 'traditional' vowel diagram for Early Common Greek clearly makes the historical changes simpler to specify. Thessalian will need an extra rule raising the tense vowels. And at a stage further removed in history, a decision will have to be taken as to whether the change from Indo-European to Greek involved raising the lax vowels or lowering the tense vowels (possibly the latter, judging by Indo-Iranian, where *e*: *o*: and *a*: coalesced).

Early Common and Classical Greek vowels can then be specified as follows, using an extra feature [mid]:

	i:	*i*	*e*:	*e*	*ɛ*:	*a*:	*a*	*ɔ*:	*o*	*o*:	*u*	*u*:	*y*	*y*:
High	+	+	—	—	—	—	—	—	—	—	+	+	+	+
Low	—	—	—	—	+	+	+	+	—	—	—	—	—	—
Mid	—	—	+	+	+	—	—	+	+	+	—	—	—	—
Back	—	—	—	—	—	+	+	+	+	+	+	+	—	—
Round	—	—	—	—	—	—	—	+	+	+	+	+	+	+
Tense	+	—	+	—	+	+	—	+	—	+	—	+	—	+

[19]) The separation of tense and lax vowels seems to be irrelevant in the description of English, for example.

Conclusion

The distinctive features proposed in SPE are reasonably satisfactory for the description of Ancient Greek.

The main flaw seems to be the classification of *h* as a glide. And an additional feature [labial] seems essential. Further difficulties would be solved if a feature [mid] were added for vowels, and [strident] replaced by [sibilant]. Otherwise, the problems are minor.

The addition of new features means that this is not the smallest set with which it is possible to describe Greek. But it seems more important to capture significant generalisations than to strive for a spurious impression of neatness, which may be false economy (cf. Ladefoged, 1972 : 8).

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Homeric Words and Homeric Metre: two doublets examined (λείβω/εἴβω, γαῖα/αἶα)

By M. W. Haslam, Los Angeles

Verse is the fit between language and metre. A convenient if rather lopsided view of the relationship is to regard the language as being superimposed on a particular metrical pattern, i.e. as having to meet certain rhythmical conditions; and the concern of metrics may then be said to be the definition and understanding of those conditions. Considerations of, say, word order or word choice are often put under the wider head of stylistics. But in Homer as in no other poet, it has been becoming increasingly apparent over the years, *no* aspect of the language can properly be considered without reference to the metre; this goes for vocabulary, diction, syntax, even morphology. When dealing with Homer, to treat of philological matters in isolation from metrics is absurd: one might as well discuss breathing without mentioning air.

As for the rhythmical conditions obtaining in the hexameter: the metrical scheme to which the language has to be accommodated is _ ⏑ _ ⏑ _ ⏑ _ ⏑ _ ⏑ _ _. (I say nothing here of the structure that the pattern acquires in actualization: caesurae, etc., the so-called inner metric.) Here there is a binary opposition between longum and biceps, and the biceps can take monosyllabic or disyllabic form. In this abstract schema every longum is equal in