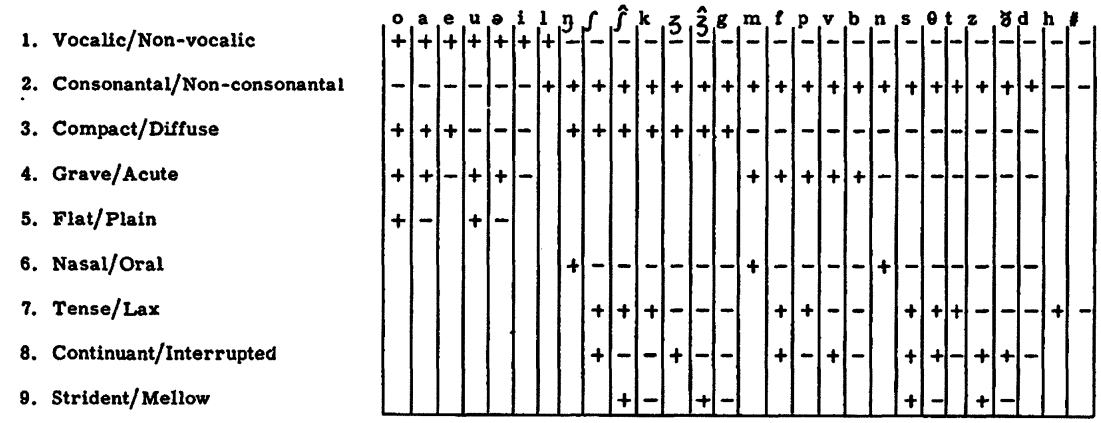
APPENDIX

Analytic Transcription

The phonemes may be broken down into the inherent distinctive features which are the ultimate discrete signals. Were this operation reduced to yes-or-no situations, the phoneme pattern of English (Received Pronunciation) could be presented as follows:



Key to phonemic transcription: /o/ - p<u>o</u>t, /a/ - p<u>a</u>t; /e/ - p<u>e</u>t, /u/ - p<u>u</u>t, /ə/ - p<u>u</u>tt, /i/ - p<u>i</u>t, /l/ - <u>l</u>ull, /ŋ/ - lun<u>g</u>, /ʃ/ - <u>sh</u>ip, /ʧ/ - <u>ch</u>ip, /k/ - <u>k</u>ip, /ʒ/ - a<u>z</u>ure, /ʤ/ - <u>j</u>uice, /g/ - <u>g</u>oose, /m/ - <u>m</u>ill, /f/ - <u>f</u>ill, /p/ - <u>p</u>ill, /v/ - <u>v</u>im, /b/ - <u>b</u>ill, /n/ - <u>n</u>il, /s/ - <u>s</u>ill, /θ/ - <u>th</u>ill, /t/, - <u>t</u>ill, /z/ - <u>z</u>ip, /ð/ - <u>th</u>is, /d/ - <u>d</u>ill, /h/ - <u>h</u>ill, /#/ - <u></u>ill. The prosodic opposition stressed vs. unstressed, splits each of the vowel phonemes into two.

The superposition of the distinctive features in the given language - in this instance English - determines their order in our analytic transcription.

I) The identification of the fundamental source features (1,2) divides the components of the message into vowels, consonants, glides and a liquid, whereby the latter does not demand further analysis.

II) The superposition of resonance features in vowels and consonants presents the following order: A) the compactness feature (3) encompasses all vowels and consonants; B) the gravity feature (4) concerns all vowels and compact consonants whereby the analysis of the acute vowels is exhausted; C) the flattening feature (5) is confined to grave vowels and terminates their analysis, while D) the nasality feature (6) affects uniquely the consonants and concludes the identification of the nasals; finally the tenseness feature (7) concerns all phonemes without a vocalic and nasal feature, i.e. the oral consonants and the glides.

Jakobson, Roman. *Preliminaries to Speech Analysis: the Distinctive Features and Their Correlates.*
E-book, Cambridge, Mass.: The MIT Press, 1963, https://hdl.handle.net/2027/heb08432.0001.001.
Downloaded on behalf of 3.131.38.22

III) The secondary source features (8, 9) characterize the oral consonants alone.*

When, however, the analytic transcription of the English phonemes is intended to determine the amount of significant information the phonemes actually carry in linguistic communication, it is expedient to distinguish the unpredictable from the predictable, consequently, redundant features by bracketing the latter. Furthermore, the entire list of features can be reduced, if we acknowledge the joint presence of two opposite features (±) in one phoneme. Then the same pattern of English may be compressed as follows:

	o	a	e	u	ə	i	l	ŋ	ʃ	ʧ	k	ʒ	ʤ	g	m	f	p	v	b	n	s	θ	t	z	ð	d	h	(#)
Vocalic/Consonantal	+	+	+	+	+	+	±	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)		
Compact/Diffuse	+	+	+	–	–	–		+	+	+	+	+	+	+	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)	(–)		
Grave/Acute	+	±	–	+	±	–									+	+	+	+	+	–	–	–	–	–	–	–		
Nasal/Oral								+	(–)	(–)	(–)	(–)	(–)	(–)	+	(–)	(–)	(–)	(–)	+	(–)	(–)	(–)	(–)	(–)	(–)		
Tense/Lax									+	+	+	–	–	–		+	+	–	–		+	+	+	–	–	–	+	(–)
Optimal Constrictive/ Opt. Stop									+	±	–	+	±	–		+	–	+	–		+	±	–	+	±	–		

The phonemes of the famous test sentence, "Joe took father's shoe bench out; she was waiting at my lawn", will be analytically transcribed as follows:

	ʤ	ˈo	u	t	ˈu	k	f	ˈa	ə	ð	ə	z	ʃ	ˈu	u	b	ˈe	n	ʧ	#	ˈa	u	t
Vocalic	(–)	+	+	(–)	+	(–)	(–)	+	+	(–)	+	(–)	(–)	+	+	(–)	+	(–)	(–)		+	+	(–)
Compact	+	+	–	(–)	–	+	(–)	+	–	(–)	–	(–)	+	–	–	(–)	+	(–)	+		+	–	(–)
Grave		+	+	–	+		+	±	±	–	±	–		+	+	+	–	–			±	+	–
Nasal	(–)			(–)		(–)	(–)			(–)		(–)	(–)			(–)		+	(–)				(–)
Tense	–			+		+	+			–		–	+			–			+	(–)			+
Optimal Constrictive	±			–		–	+			±		+	+			–			±				–
Stressed		+	–		+			+	–		–			+	–		+				+	–	

	ʃ	ˈi	i	u	ˈə	z	u	ˈe	i	t	i	ŋ	#	ə	t	m	ˈa	i	l	ˈo	ə	n
Vocalic	(–)	+	+	+	+	(–)	+	+	+	(–)	+	(–)		+	(–)	(–)	+	+	±	+	+	(–)
Compact	+	–	–	–	–	(–)	–	+	–	(–)	–	+		–	(–)	(–)	+	–		+	–	(–)
Grave		–	–	+	±	–	+	–	–	–	–			±	–	+	±	–		+	±	–
Nasal	(–)					(–)				(–)		+			(–)	+						+
Tense	+					–				+					+							
Optimal Constrictive	+					+				–					–							
Stressed		+	–	–	+		–	+	–		–			–			+	–		+	–	

By omitting the features fully predictable from the phonemic environment, we could further reduce the amount of redundancy in our analytic transcription. For example, in English, /ˈa/ cannot be followed by a compact vowel, and the second component in the sequences /ˈau/ or /ˈai/ is distinctly characterized by the opposition grave vs. acute. Consequently the diffuseness of /u/ and /i/

*For mechanical detection the procedural sequence should be modified as follows: features 6, 8 and 9 must be determined before features 3, 4, 5.

Jakobson, Roman. *Preliminaries to Speech Analysis: the Distinctive Features and Their Correlates.*
E-book, Cambridge, Mass.: The MIT Press, 1963, https://hdl.handle.net/2027/heb08432.0001.001.
Downloaded on behalf of 3.131.38.22

in these combinations is redundant and can be omitted in the transcription. If we consistently follow this principle by bracketing any feature predictable from other features of the same phoneme or from other phonemes of the same sequence, the amount of actually distinctive features in a sequence proves to be very restricted. For instance, in the Russian word velosiped "velocipede, bicycle," if analyzed in this way almost half the features present appear as redundant, so that the average amount of non-redundant features approximates 3 per phoneme.

	ɣ	i	l	a	ʂ	i	p	ʲe	t
Vocalic/Consonantal	(−)	+	±	+	(−)	+	(−)	(+)	(−)
Compact/Diffuse	(−)	(−)		+	(−)	(−)	−	±	−
Grave/Acute	+	(−)			−	−	+	−	−
Nasal/Oral	(−)				(−)		(−)		(−)
Sharp/Plain	+		(−)		+		(+)		−
Continuant/Interrupted	+		+		+		−		−
Voiced/Voiceless	+				−		−		(−)
Stressed/Unstressed		(−)		(−)		(−)		(+)	

A few remarks will suffice to expose the reasons for our bracketing. No unstressed /e/ exists in Russian, consequently here the stress feature turns out to be redundant. Since a Russian word carries not more than one stressed vowel, in our word all vowels other than /e/ must be unstressed (second degree of redundancy). After /ɣ/ the only possible unstressed vowel is /i/, so that the diffuseness and acuteness of this phoneme is a third degree of redundancy. Here the consonant cancels certain features of the vowel which follows. The subsequent syllable exemplifies the inverse process: The vowel cancels certain features of the consonant which precedes. After a plain /l/, the unstressed vowel may be either compact or diffuse, and, if diffuse, either grave or acute, but before the unstressed /a/ no sharp /lʲ/ is possible. Consequently in this case, the lack of sharpening is redundant, in the same way as its presence before /e/, e.g. the sharpened stop in the syllable /pʲet/.

A further extraction of redundancies can be achieved by taking account of probabilities less than one, which were disregarded in the preceding. The mathematical techniques for such an undertaking are in a very advanced stage of development owing to the researches of A. A. Markov, who also first applied them to linguistic material (1), and of C. E. Shannon, who made further fundamental contributions to the theory (2). The solution of this problem is obviously facilitated by parsing both the oral message and the language code that underlies it into discrete binary units of information as their ultimate components. As long as oral speech was assumed to be a continuum, the situation appeared "considerably more involved". (3)

Jakobson, Roman. *Preliminaries to Speech Analysis: the Distinctive Features and Their Correlates.*
E-book, Cambridge, Mass.: The MIT Press, 1963, https://hdl.handle.net/2027/heb08432.0001.001.
Downloaded on behalf of 3.131.38.22

ADDENDA ET CORRIGENDA

1.3 If, for instance, a language such as Turkish possesses the grave flat /u/, the grave plain /ɨ/, the acute flat /y/ and the acute plain /i/, the distinction of /u/ and /i/ is optimal, since grave and flat as well as acute and plain possess a common denominator - a downward or upward shift of the formants, respectively. The combination of grave and plain or of acute and flat has no common denominator and hence is not optimal.

2.2 Further experimental work is necessary before a conclusive solution of the problem of the vocalic and consonantal features can be given. The attempt to reduce these two features to a mere difference in their respective source functions appears to us now as somewhat of an oversimplification. We tentatively suggest the following definitions of the acoustical properties of these features:

Phonemes possessing the vocalic feature are acoustically characterized by the presence of formants with small damping and hence with a relatively narrow band width. Phonemes possessing the consonantal feature are acoustically characterized by a broadening, reduction and fusion of formants and formant regions due to zeros, high damping or transient variations of formant frequencies.

On the perceptual level Stumpf defined vowels as speech sounds with distinct chromaticity (ausgeprägte Färbung) and consonants as speech sounds without distinct chromaticity. In the diffuse vowels the chromaticity and in the compact consonants the achromaticity is attenuated (cf. 2.4233). Thus the optimal contrast is presented by a compact vowel and a diffuse consonant.

2.413 and 2.4233 Through the kindness of Dr. F. S. Cooper we have received the diagram of the experiment in Haskins Laboratories and thus we may give a more exact interpretation. The "schematic stop was judged by a large majority of the subjects," to be [k] when endowed with frequencies similar to the second formant of the following vowel. Otherwise, this stop was recognized as [p] or [t] depending upon whether or not its frequencies were lower than the second formant of [i].

2.431 The French syllabic [i] and non-syllabic [i] are phonemically opposed to each other as tense /i/ and lax /i/ (cf. Reference (34), Chapter 2). The sum of the deviations of the formants of the syllabic vowel is greater than that of the corresponding non-syllabic vowel.

	F_1	F_2	F_3	$\Sigma\Delta f$
Neutral Position (G. de Saussure)	520	1560	2600	
ai /ai/ "ai"	**270**	**2000**	**3200**	
Δf	**250**	**440**	**600**	1290
ail /ai/ "garlic"	**410**	**1930**	**3000**	
Δf	**110**	**370**	**400**	880

Jakobson, Roman. *Preliminaries to Speech Analysis: the Distinctive Features and Their Correlates.*
E-book, Cambridge, Mass.: The MIT Press, 1963, https://hdl.handle.net/2027/heb08432.0001.001.
Downloaded on behalf of 3.131.38.22