

Phonological Theories

From the Phoneme to Distinctive Features

Session 2

Origin of the phoneme concept

- Ancient forerunners of modern descriptive linguistics (PĀṆINI, PATAÑJALI (India), the Greeks & “Anon” (Iceland, 12th C.)) clearly recognised the *systematic nature between distinctive sound properties and the identity of words* in their languages.
- DE SAUSSURE (1857-1913) used “phonème”, first as a term for speech sounds, later as a purely functional entity.
- BAUDOIN DE COURTENAY (1845-1929) and KRUSZEWSKI (1850-87) used the term *phoneme* for linguistic units *underlying sound alternations between related forms*.
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The phoneme develops

- The Prague School (1926 ff.) was the first group to formulate an explicit phonological theory (in The Hague 1928)
- *Sprachgebilde/Sprechakt* reflected the strong influence of DE SAUSSURE.
- Likewise the principle of *phonological opposition* (“a difference of sound in a given language that may serve to distinguish intellectual meaning”).
- A *phonological unit* manifests an opposition, and the *phoneme* is the *minimal phonological unit*.
- Since the phoneme consists of only the *phonologically relevant properties*, a (realised) speech sound *cannot* be a phoneme.

Types of opposition

- Originally (1929) only *correlative*, e.g. p/b; t/d or i/i: o/o: (i.e., presence vs. absence). All others are *disjunctive*.
- 1936/1939 opposition classification was elaborated to cover:
 - Their *relation* to the overall *system*
 - bilateral or multilateral
 - isolated or proportional
 - The *relation* between the *members of the opposition*
 - privative, gradual or equipollent
 - Their *distinctive validity*
 - constant or suspendable

Neutralisation

- *Context-determined* vs. *structure-determined* neutralisation:
Context: voiced-voiceless consonants preceding stops or fricatives in Russian.
Structure: voiced-voiceless in in syllable-final position in German.
- Only *minimal oppositions* (1 feature) can be involved in neutralisation.
- In neutralisation, only common features are relevant. The neutralised sound is the *archiphoneme*
- Except when *context-determined* the form of the archiphoneme corresponds to the *unmarked* member of the opposition
- When *different forms* of the neutralised opposition are found in *different positions*, the position where the greater number of phonemes are distinguished has the *unmarked* member.

- Theoretical developments in USA were less coordinated (less centralised) than in Europe.
- Several different standpoints were represented by different linguists or groups: SAPIR; PIKE & NIDA.
- “Descriptive” linguistics strove for clearly defined *methods*.
No unobservable facts could be considered.
- *Procedures* needed to be so explicit that they were completely *replicable*.
- Typical reply to a (palpably true) statement:
I don't care if it is true. How do you justify having found it?

ANDERSON p. 184

BLOOMFIELD's Phoneme

- “The smallest units which make a difference in meaning”, “A minimum unit of distinctive sound feature” (p. 77). I.e. an externally defined, non-mentalistic unit.
Phonology is “the study of significant speech sounds” (p. 78)
- He identifies “*primary*” (segmental sounds) and “*secondary*” (stress and tone) phonemes according to their function in language (primary: syllable forming; secondary: structuring larger units).
- Phonemes are defined by their participation in *structural sets*.
(syllabic, open-syllable, closed syllable, non-syllabic, initial, medial, final, initial cluster, final cluster, etc.)

Underlying Forms

- Bloomfield recognised the need for *underlying forms* to simplify the description of morphophonemic alternations.
- Only later (1939) did he call for a separate discipline called morphophonemics whose basic units were morphophonemes.
- He chose the forms and used ordered rules to achieve the *simplest* possible description.
- He even set up “*artificial*” underlying forms to achieve a simpler description.
- Post-Bloomfieldians were strictly insistent on the separation of levels (morphophonemics from phonology) and did not accept ordered rules.

Post-Bloomfieldian Phonemes

- BERNARD BLOCH & GEORGE TRAGER saw the phoneme as a *class of sounds* (physical definition, cf. BLOOMFIELD). “A phoneme is a class of phonetically similar sounds, contrasting and mutually exclusive with all similar classes in the language.”
- ZELLIG HARRIS, on the hand, saw the phoneme as a “*purely logical symbol*” (cf. TWADDELL half a generation earlier).
- Part of the problem underlying these fundamental disagree-ments is the amount of variation to be catered for by the description (*idiolect, dialect, pan-dialectal language*).
Non-uniqueness of the phonetic-phonemic relationship; the non-determinability of the phoneme from the phonetic properties and the non-prediction of the phonetic properties from the phoneme (lack of *bi-uniqueness*) was a problem.

Morphemes and Phonemes

- HOCKETT addressed the unclear relationship between morphemes and phonemes. It is clearly illogical to say:
On the one hand, Morphemes *consist* of phonemes
On the other hand, Morphemes have *alternants* (morphs)
... and *morphs* have *differing phonemic structure!*
- Following HJELMSLEV, HOCKETT distinguishes *content* units (morphemes) and *expression* units (phonemes). He also makes a distinction between *representation* and *composition*.
- Morphemes are *represented* by morphs.
- Morphs *are composed* of phonemes.
- The indirect relation between morphemes and phonemes is one of “*programming*” (i.e. encoding).

US-Structuralism vs. Prague Phonology

- Prague *dichotomy* (Phonology vs. Phonetics) vs. US *hierarchy* (from Phonetics to Phonology).
- Prague allowed *meaning* to be considered, US (theoretically) excluded meaning from consideration (though not BLOOMFIELD himself, and the others not in practice!)
- Prague focussed on *paradigmatic* oppositions (and employed commutation tests), US focussed on *syntagmatic* structures (combinatory possibilities).
- Prague considered the phoneme to be analysable as a *bundle of distinctive features*, US regarded the phoneme as *the smallest unit of analysis* and refrained from decomposition (except HOCKETT & HARRIS).
- Prague does not “phonemicize” prosodic phenomena, US has a system of stress, intonational and junctural phonemes.

Status of the Distinctive Feature

- Distinctive *property* of a phoneme or distinctively used *dimension*?
- Distinctive feature as the defining property of *a natural class of sounds*?
- Are distinctive features *permanent* or *variable* properties of a sound(class) depending on the opposition?
- Are feature oppositions always *binary* or can they be *unary* or *multilateral*?
- *How many* different distinctive features are there?
- *How* should the distinctive features be *defined*?

What is your standpoint regarding the restriction to binary feature oppositions? Are there advantages in strictly binary features ...

- a ... as a formal framework for classifying the sound inventory of a language?

or is there any validity in the assumption of binary features ...

- b ... as an explanatory framework of the way the human speech-perception and/or production mechanism works?

The formal development of distinctive feature theory is due primarily to ROMAN JAKOBSON.

- a DFs are the minimal linguistic units (not just classificatory dimensions).
- b Only binary oppositions are accepted.
- c Descriptions should be based on a minimum number of DFs.
- d These are selected from a limited set of universal DFs.
- e The phonetic description of the DFs is important.
- f The DF values for the sounds of a language are arranged as a matrix with +, – and 0 (not relevant) values.

Inherent Features 1

Sonority

vocalic/non-vocalic glottal source; free vocal tract; formants

conson/non-cons low F1, low intensity; obstruction in v. tract

nasal/oral nasal formant, low intensity; oral + nasal resonator

compact/diffuse narrow, central frequency energy; horn-shape resonator

abrupt/contin no energy above voice-bar; burst or fast transition

strident/mellow high intensity in high frequency, supplementary obstruction

checked/unchecked higher energy discharge in shorter time; stoppage of pulmonic participation

voiced/voiceless periodic low-frequency excitation

Inherent Features 2

Protensity

tense/lax longer duration of steady state; greater deviation of vocal tract from neutral configuration

Tonality

grave/acute predominance of energy in lower part of spectrum; peripheral artic./less compartmentalized oral resonator

flat/non-flat lowering (and weakening) of higher frequency energy; narrowing at front or back of resonator

sharp/non-sharp raising and strengthening of higher frequency energy; dilation of back resonator with palatal stricture

Problems with (JAKOBSON'S) features

- The use of [+flat] to cover 3 different articulatory modifications presupposes that they don't co-occur in any one language.
- Applying the same features to vowels and consonants stretches the plausibility of the phonetic basis.
- The same feature can be manifested very differently in different positions.
- Allophonic variants may have opposing feature specifications.

Acoustic properties: Flat (retroflex) / Plain

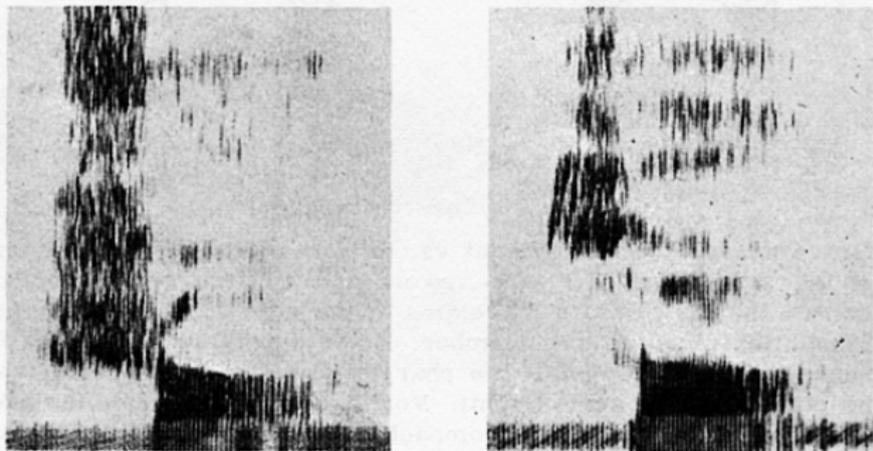


Fig. 8. Flat (retroflex) vs. plain consonants. Bengali: /ṣa/ - /sa/ "spelling names of letters." The retroflex consonant has energy in a lower frequency region and affects the third formant of the following vowel in a downward direction.

Acoustic properties: Flat (*pharyngealized*) / Plain

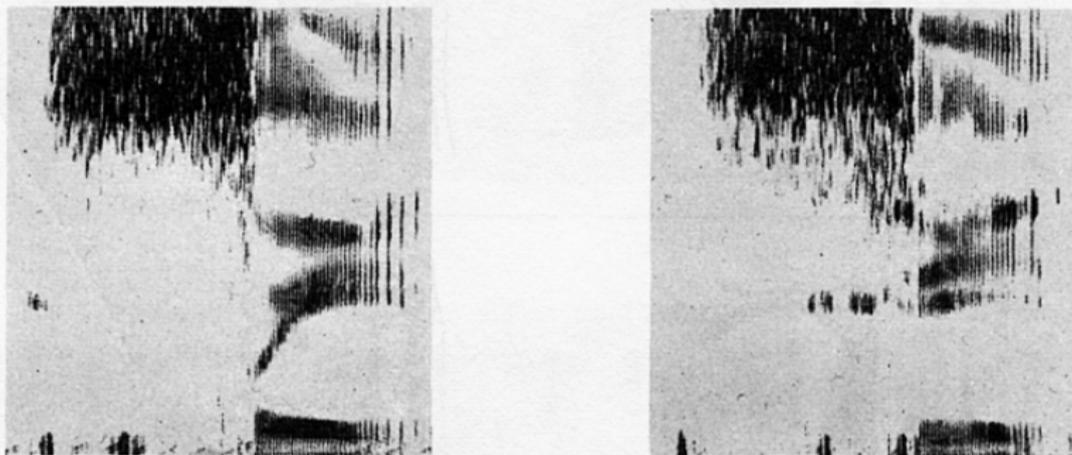


Fig. 7: Flat (pharyngealized) vs. plain consonants. Arabic /ʕi:n/ "China" -- /si:n/ "spelling name of letter s". The pharyngealized consonant displays energy in a lower frequency region and affects the second formant of the following vowel in a downward direction.

Acoustic properties: Checked / Plain

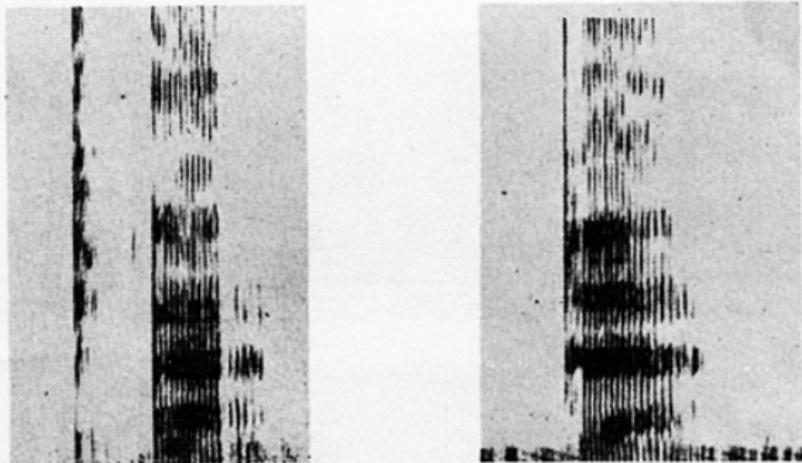


Fig. 1: Checked (glottalized) vs. unchecked consonant. Circassian: /p^ʰa/ "place" - /pa/ "be out of breath!" In the checked consonants the closure is abrupt and is followed by a period of silence.

Acoustic properties: Grave / Acute

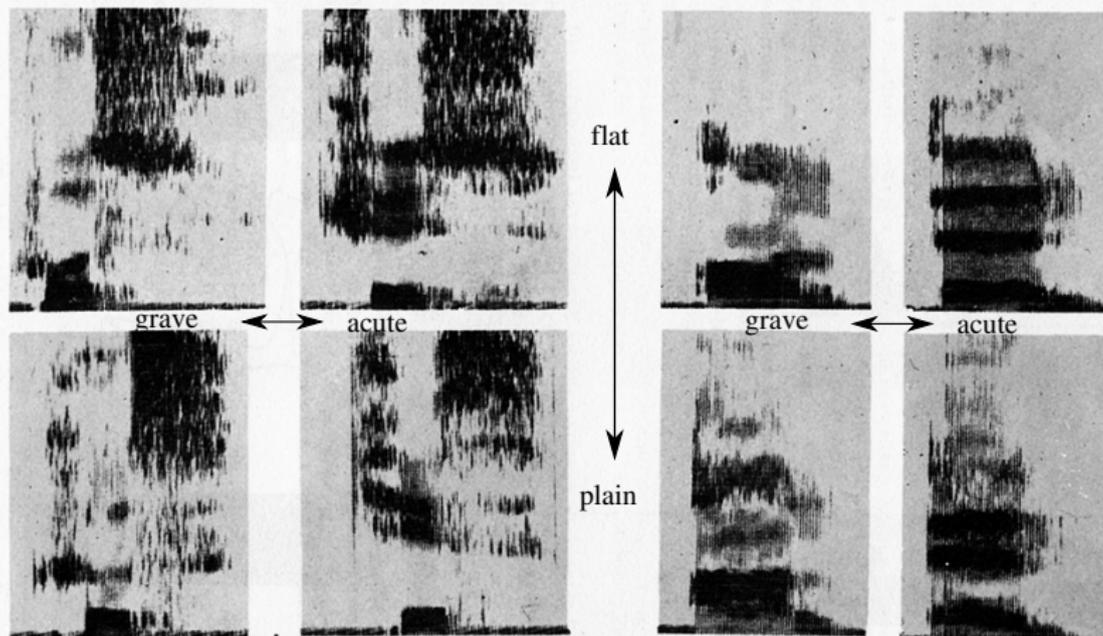


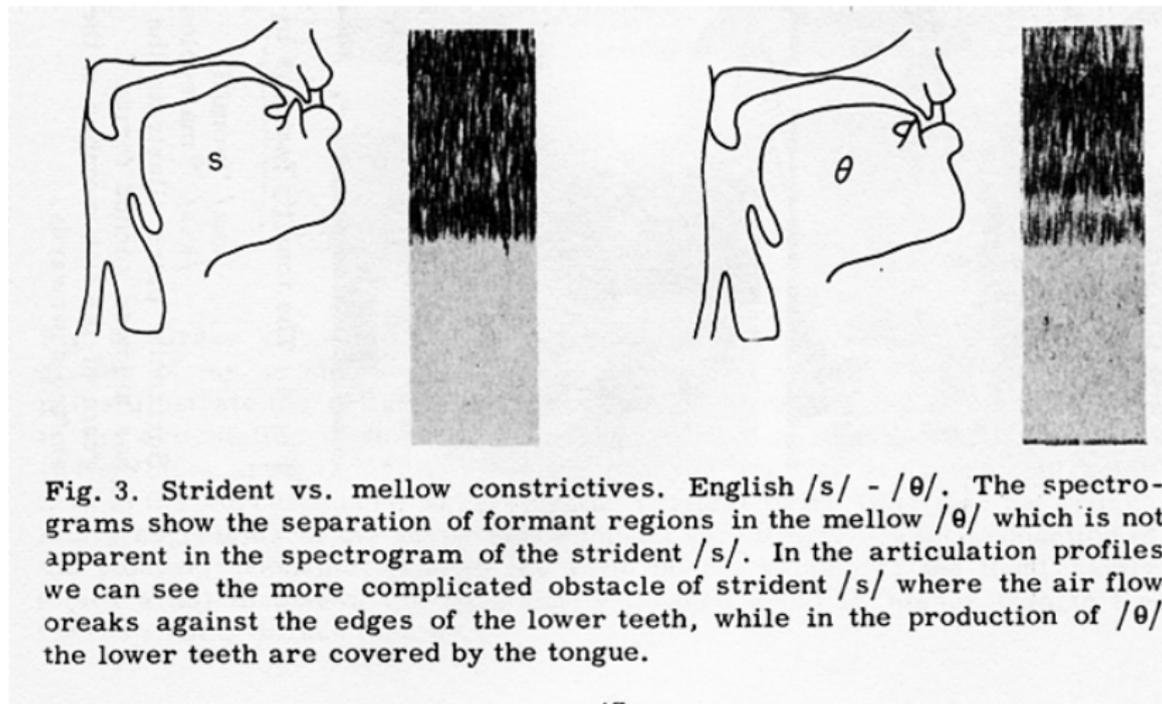
Fig. 4. The tonality features in vowels. Turkish:

/kus/ "vomit!" - /kys/ "reduce!"
/kis/ "malevolent" - /kis/ "tumor"

/on/ "ten" - /ɔn/ "front"
/an/ "moment" - /en/ "width"

Horizontal pairs illustrate the opposition grave vs. acute. The grave member of the opposition (left) has a lower second formant. Vertical pairs illustrate the opposition of flat vs. plain. In the spectrogram of the flat member of the opposition (above), the second and third (and some higher) formants are shifted downwards.

Acoustic properties: strident / mellow



Feature Matrix for English (JAKOBSON, FANT & HALLE p. 43)

	o	a	e	u	ə	i	l	ŋ	f	tʃ	k	ʒ	dʒ	g	m	f	p	v	b	n	s	θ	t	z	ð	d	h	ʔ
Vocalic / Non-vocalic	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Consonantal / Non-Consonantal	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-
Compact / Diffuse	+	+	+	-	-	-	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grave / Acute	+	+	-	+	+	-									+	+	+	+	+	-	-	-	-	-	-	-	-	-
Flat / Plain	+	-		+	-																							
Nasal / Oral								+	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-
Tense / Lax									+	+	+	-	-	-	+	+	-	-		+	+	+	-	-	-	-	+	-
Continuant / Interrupted									+	-	-	+	-	-	+	-	+	-		+	+	-	+	+	-	+	+	-
Strident / Mellow									+	+	-	+	+	+						+	-	-	+	-	-	-	-	-

Only 9 of the 12 features are needed. No [sharp], [\pm checked], [\pm voiced]

Feature Matrix for German (Halle 1954, f. FISCHER-JÖRGENSEN, p. 168)

	m	p	b	f	v	pf	n	t	d	s	z	ts	k	g	x	f	r	l	u	o	a	y	ø	i	e	ε	h	
Vocalic / Non-vocalic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	-
Consonantal / Non-Consonantal	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-
Compact / Diffuse	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+			-	±	+	-	±	-	±	+		
Grave / Actute	+	+	+	+	+	+	-	-	-	-	-	-	+	+	+	-			+	+	+	-	-	-	-	-	-	-
Flat / Plain																			+	+		+	+	-	-			
Nasal / Oral	+	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-												
Tense / Lax	+	-	+	-			+	-	+	-			+	-														
Continuant / Interrupted	-	-	+	+	-		-	-	+	+	-		-	-	+		-	+										
Strident / Mellow	-					+	-					+																

The same 9 of the 12 features are needed as for English, but. . .

- 1 Prepare notes on the “Discussion Point” (slide 14) in preparation for discussion in Übung (hand in notes with other answers)
- 2 Compare the distinctive-feature matrices for English and German (slides 24 & 25). Do the features cover all the sound distinctions in each language? What differences are there in the status and treatment of features in the two tables?
- 3 Try to construct trees for English and German that compare with the tree presented for Swedish (slide 26).