

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

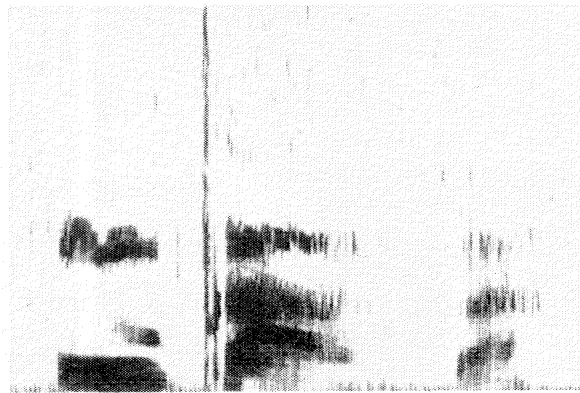


Fig. 2. Dental click. Xhosa: inkcaza "comb." The spectrogram clearly shows the two successive explosions (dental and velar).

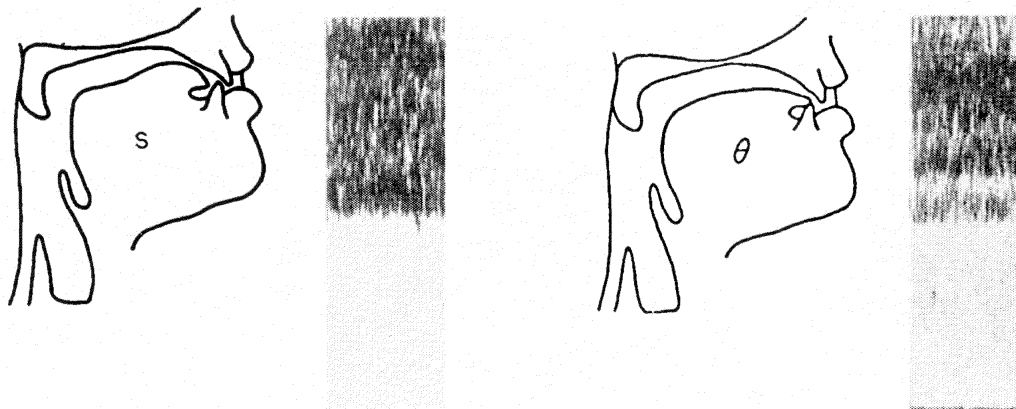


Fig. 3. Strident vs. mellow constrictives. English /s/ - /θ/. The spectrograms show the separation of formant regions in the mellow /θ/ which is not apparent in the spectrogram of the strident /s/. In the articulation profiles we can see the more complicated obstacle of strident /s/ where the air flow breaks against the edges of the lower teeth, while in the production of /θ/ the lower teeth are covered by the tongue.

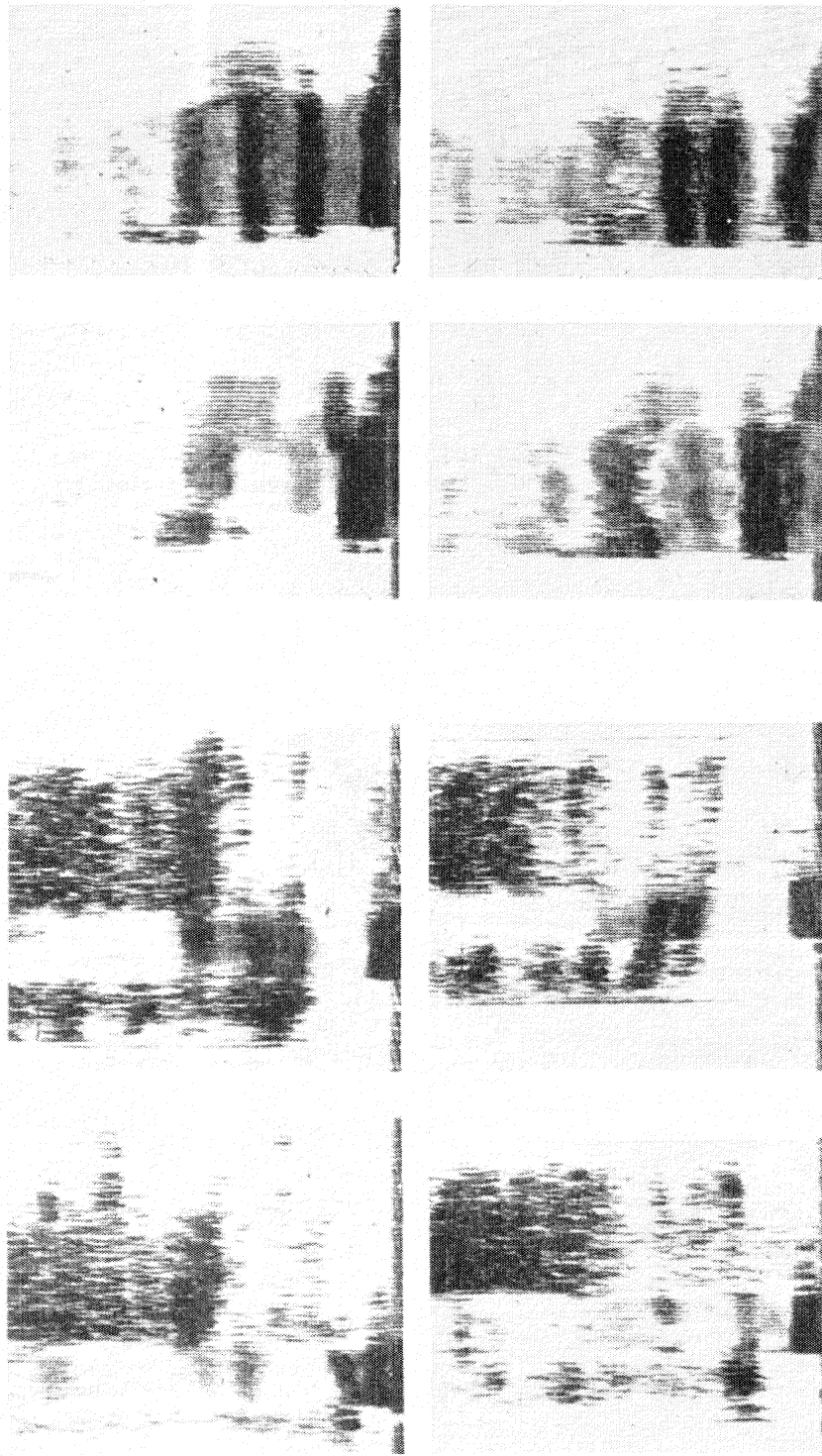


Fig. 4. The tonality features in vowels, Turkish:

/on/ "ten" - /on/ "front"
 /an/ "moment" - /en/ "width"
 /kus/ "vomit" - /kys/ "reduce!"
 /kʰs/ "malevolent" - /kis/ "tumor"

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.

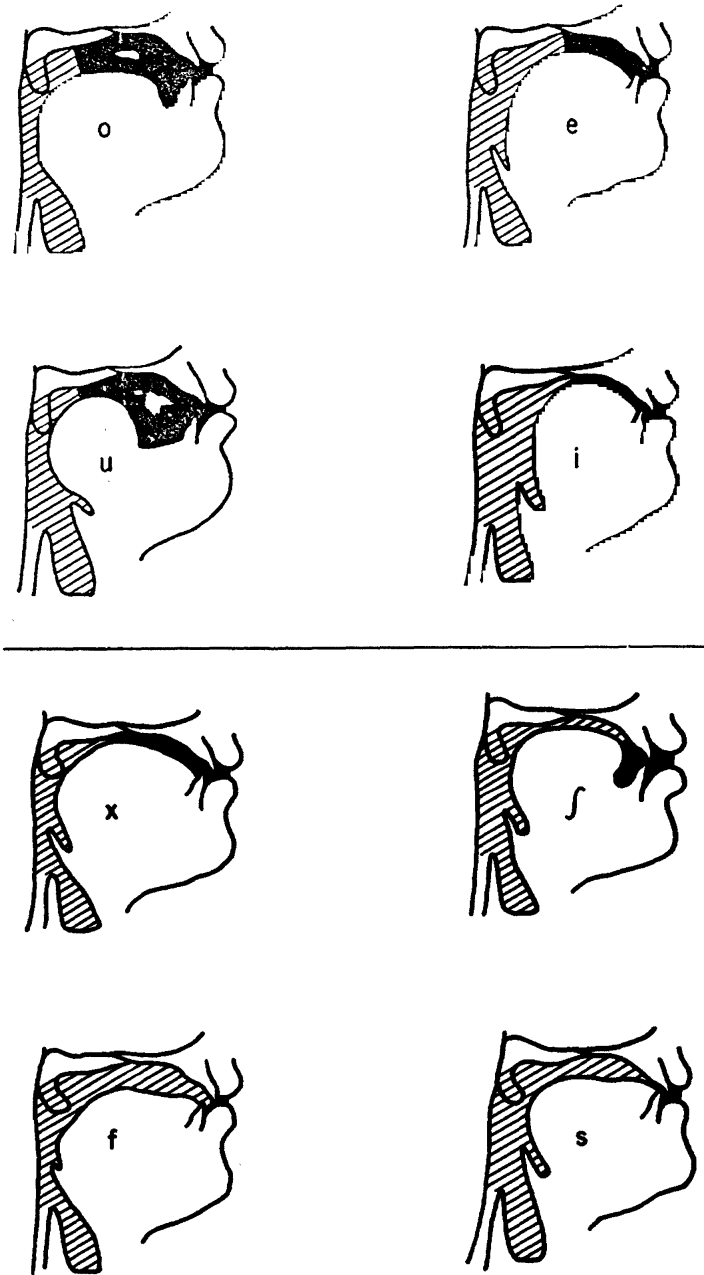


Fig. 5. Grave vs. acute and compact vs. diffuse phonemes. X-ray photographs of the production of Czech vowels and constrictives: Horizontal pairs illustrate the articulatory correlates of the opposition grave vs. acute. In the articulation of the grave member of the opposition (left), the front cavity (black area) is larger while the pharynx and lips are more contracted than in the corresponding acute (right). Vertical pairs illustrate the articulatory correlates of the opposition compact vs. diffuse. In the production of the compact phonemes (above) the ratio of the volume of the front cavity (black area) to that of the back cavity (shaded area) is higher than in the corresponding diffuse (below).



Fig. 6. Flat (rounded) consonants. Circassian: /p̣a/ "shell". The comparison with the corresponding plain (unrounded) consonant in /p'a/ (see Fig. 1) shows the decrease in the intensity of the high frequencies and the concomitant lowering of the second formant in the following vowel despite the intervening silence.

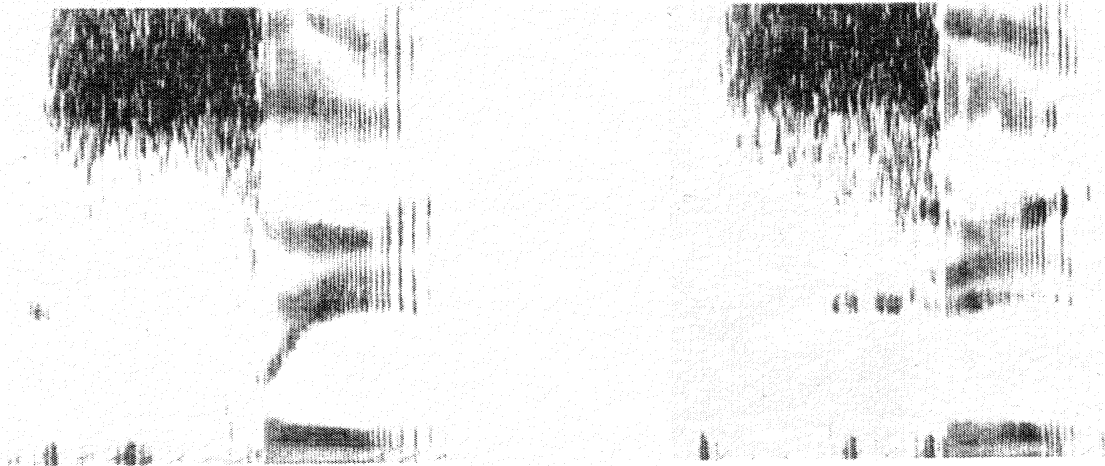


Fig. 7: Flat (pharyngealized) vs. plain consonants. Arabic /ʕi:n/ "China" -- /si:n/ "spelling name of letter s". The pharyngealized consonant displays energy in a lower frequency region and affects the second formant of the following vowel in a downward direction.

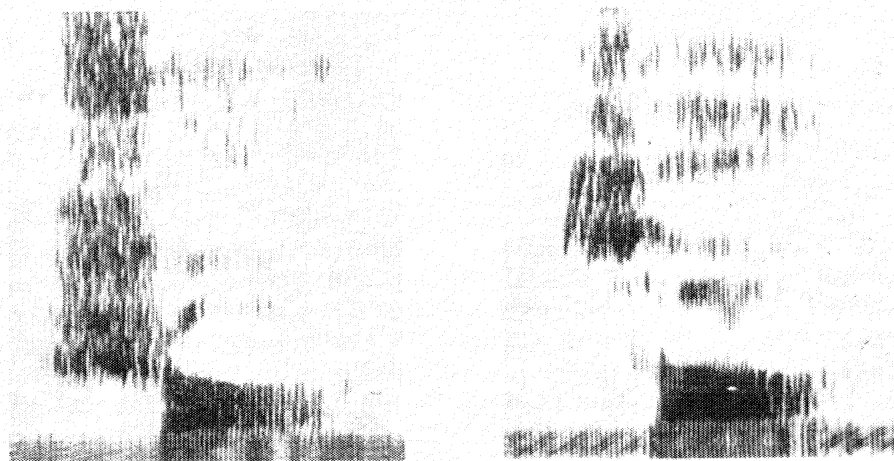


Fig. 8. Flat (retroflex) vs. plain consonants. Bengali: /ʂa/ - /sa/ "spelling names of letters." The retroflex consonant has energy in a lower frequency region and affects the third formant of the following vowel in a downward direction.

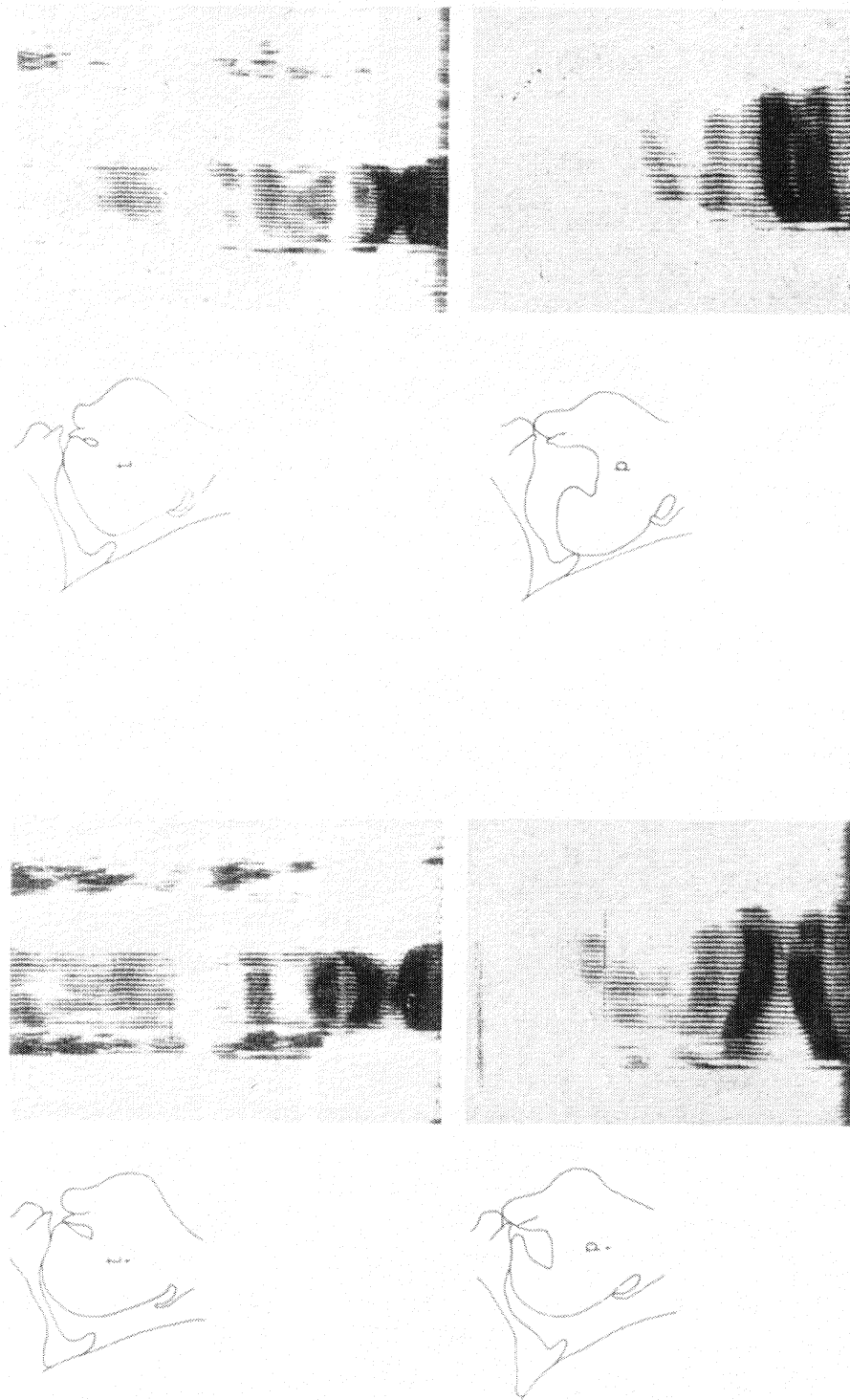


Fig. 9. Sharpened vs. plain consonants: Russian syllables /tot/ - /tot/; /pa/ - /pa/. The articulatory correlate of sharpened vs. plain consonants is a narrowing of the mouth cavity in conjunction with a widening of the pharyngeal cavity. The latter is particularly striking in the case of the grave stop /p/. The spectrograms show the higher concentration of energy in the upper frequency region of the sharpened vs. the plain consonant, as well as the characteristic rise in the second and/or third formants of the adjacent vowel.

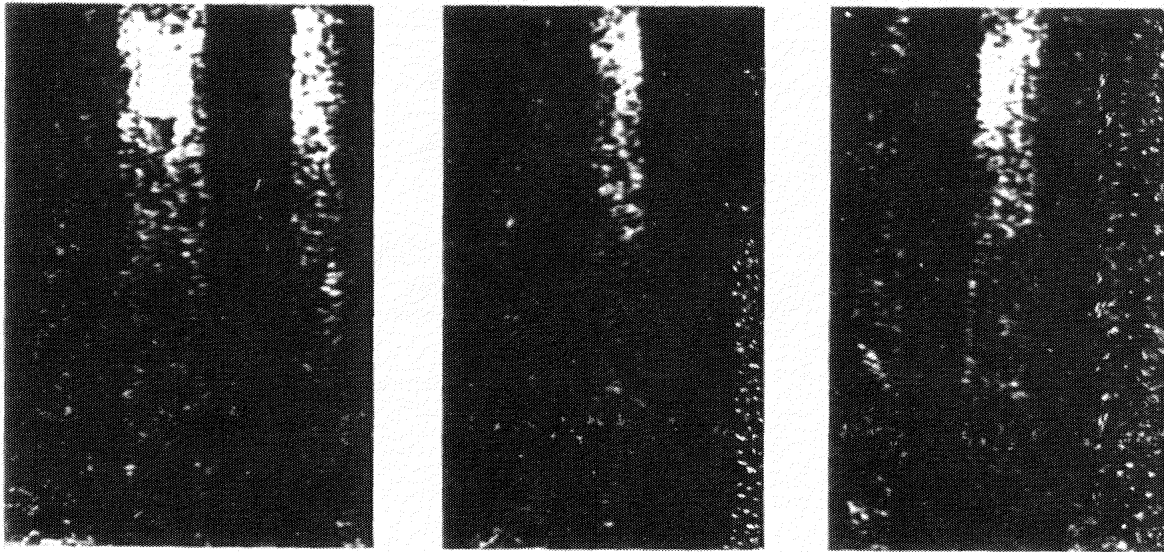


Fig. 10. Consonants in position not adjacent to vowels. Intervalgrams (33) of English whist - whisp - whisk. In /t/ the higher frequencies predominate; in /p/ the lower frequencies predominate; while in /k/ neither the upper nor the lower frequency regions predominate.

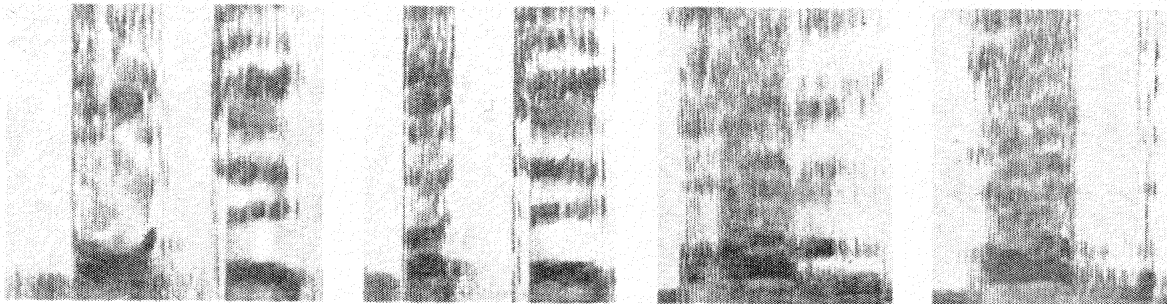


Fig. 11. Nasal and corresponding oral vowels and consonants. French bonté /bōtɛ/ "goodness" - botter /botɛ/ "put on boots", Rome /rom/ "Rome" - robe /rob/ "dress".

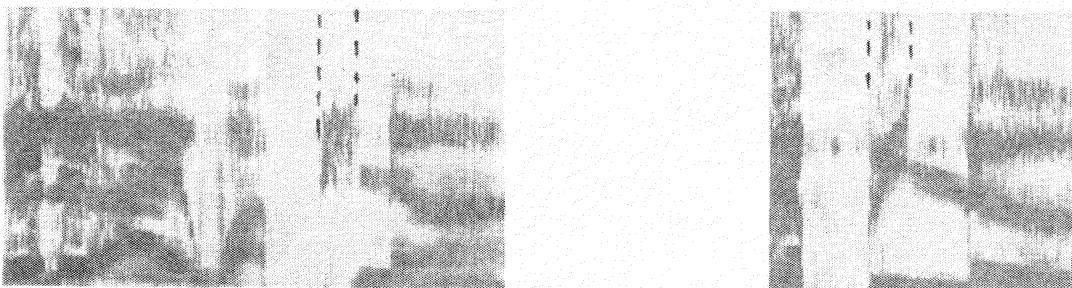


Fig. 12. Voiceless and voiced vowels. Comanche /t'iri[?]aiwapi[?]nii/ "hired hands" - /t'ipinii/ "stones".

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PREFACE

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CHAPTER I

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