APPENDIX

SPECTROGRAMS

The spectrograms presented here were produced with WINCECIL 2.1 software from the Summer Institute of Linguistics, International Computer Services. The settings were all on default except for the following spectrographic display settings: shading 4x4, whiteness 2, blackness 20. The utterances were recorded directly into an Award computer equipped with a Pentium-S processor, MS-DOS 6.22, and Windows 95 through a Radio Shack unidirectional cardioid dynamic microphone (600 ohm impedance, -76dB sensitivity, 50-15,000 c/s response).

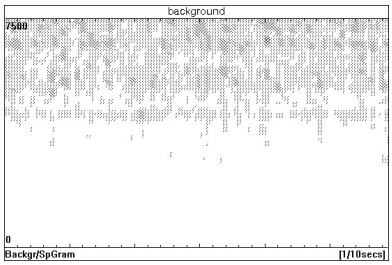
The background noise both from the computer and from the ambient environment is represented on the spectrogram marked "background noise." In analyzing the spectrograms, we can thus disregard this amount of upper-frequency noise. To be sure, however, such noise does occur in normal speech communication.

The syllables all represent the three mutable positions of obstruction for Welsh: labial, dental, and velar. The velar susurrata

[γ] is included for purposes of patterning and to show the historical development. The vowels constrained include the seven tense vowels of Welsh – [i], [e], [a], [o], [u], [ɨ] and [ə]. The physiological positioning of these vowels is shown in the vowel chart below.

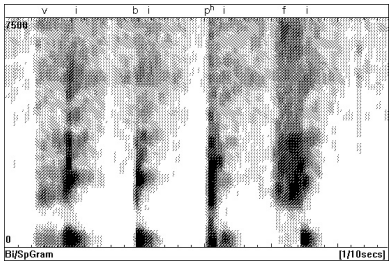
	Front	Central	Back
High	i	ɨ	u
Mid	e	ə	o
Low		a	

Vowel Chart for Standard (North) Welsh

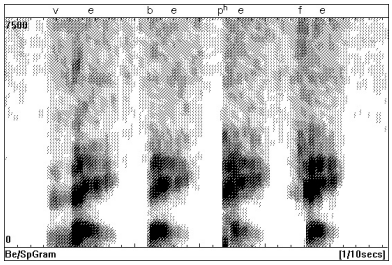


Background Noise

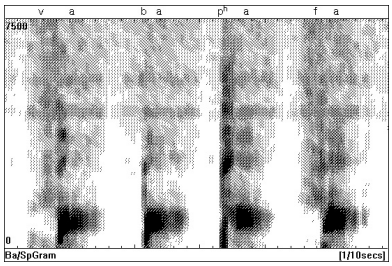
INITIAL LABIAL OBSTRUCTIONS



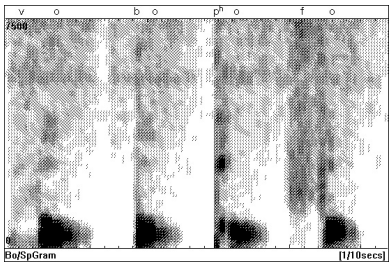
Spectrogram 1a: [vi] - [bi] - [pʰi] - [fi]



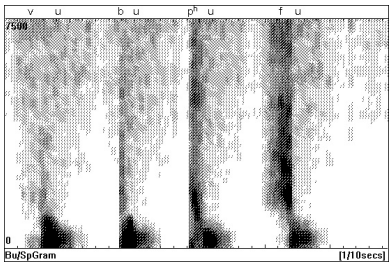
Spectrogram 1b: [ve] - [be] - [pʰe] - [fe]



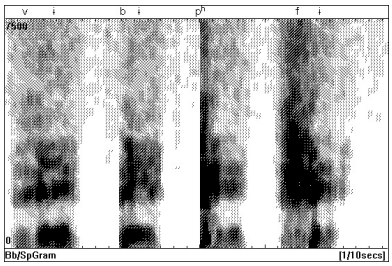
Spectrogram 1c: [va] - [ba] - [p^{h}a] - [fa]



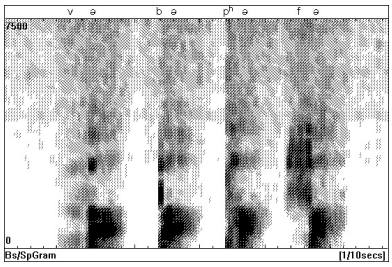
Spectrogram 1d: [vo] - [bo] - [p^{h}o] - [fo]



Spectrogram 1e: [vu] - [bu] - [pʰu] - [fu]

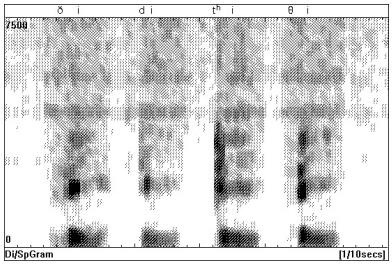


Spectrogram 1f: [vɨ] - [bɨ] - [pʰɨ] - [fɨ]

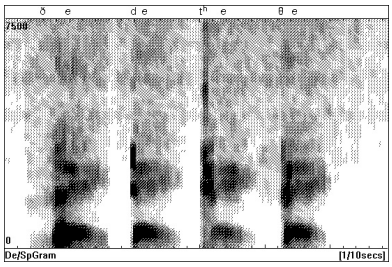


Spectrogram 1g: [və] - [bə] - [p^{h}ə] - [fə]

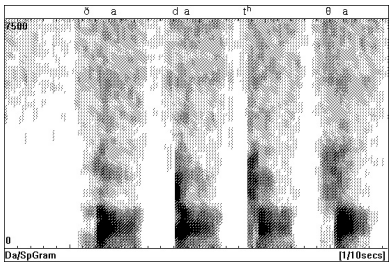
INITIAL DENTAL OBSTRUCTIONS



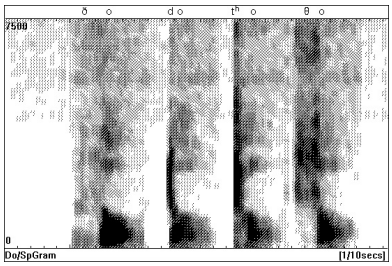
Spectrogram 2a: [ði] - [di] - [t^{h}i] - [θi]



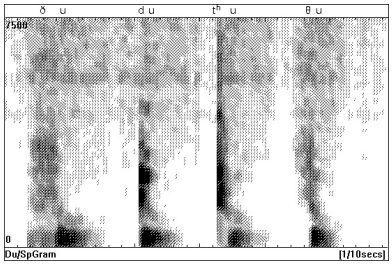
Spectrogram 2b: [ðe] - [de] - [t^he] - [θe]



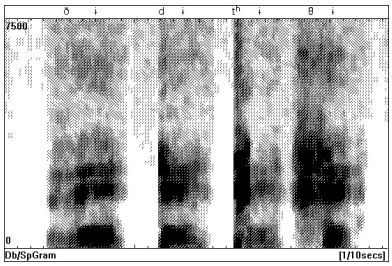
Spectrogram 2c: [ða] - [da] - [t^ha] - [θa]



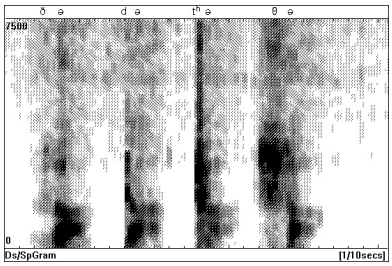
Spectrogram 2d: [ðo] - [do] - [t^ho] - [θo]



Spectrogram 2e: [ðu] - [du] - [t^hu] - [θu]

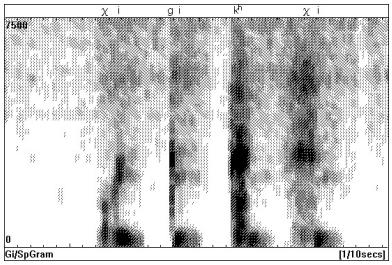


Spectrogram 2f: [ðɨ] - [dɨ] - [tʰɨ] - [θɨ]

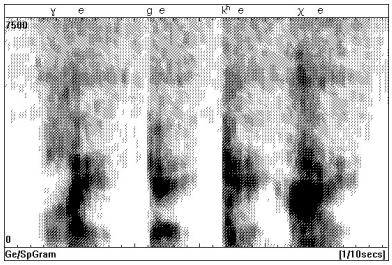


Spectrogram 2g: [ðə] - [də] - [tʰə] - [θə]

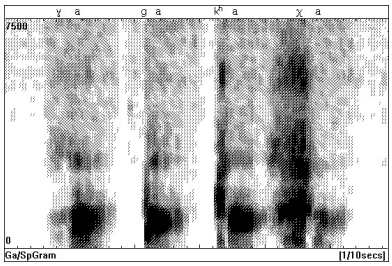
INITIAL VELAR OBSTRUCTIONS



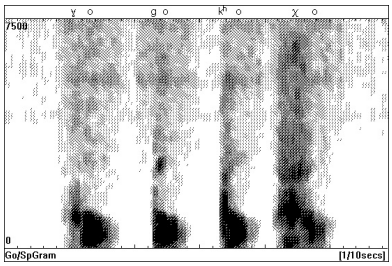
Spectrogram 3a: [γi] - [gi] - [k^hi] - [χi]



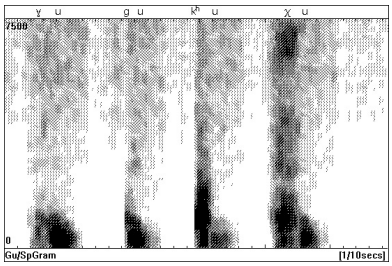
Spectrogram 3b: [γe] - [ge] - [k^he] - [χe]



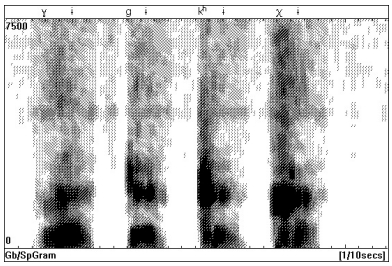
Spectrogram 3c: [ɣa] - [ga] - [k^ha] - [χa]



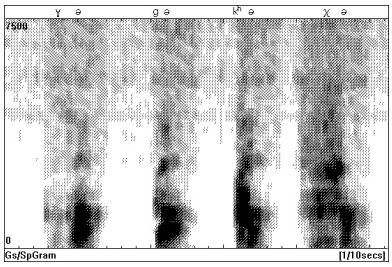
Spectrogram 3d: [ɣo] - [go] - [k^ho] - [χo]



Spectrogram 3e: [ɣu] - [gu] - [kʰu] - [χu]



Spectrogram 3f: [ɣɨ] - [gɨ] - [kʰɨ] - [χɨ]



Spectrogram 3g: [ɣə] - [gə] - [k^hə] - [χə]