Contents

	List of tables	VIII
	List of figures	ix
	Acknowledgments	x
	Introduction	1
1	Perspectives on speaker recognition	5
	Speaker recognition	5
2	The bases of between-speaker differences	26
	The received model	26
	The inadequacies of the organic-learned dichotomy	27
2.3	Model of the sources of between-speaker differences	29
	Summary and discussion	71
3	Short term parameters: segments and coarticulation	74
	Introduction and survey	74
	The experiments: aims and structure	77
	Spectrograph analysis	85
	Computer analysis	102
	Conclusions	115
4	Long term quality	121
	Introduction	121
	The long term suprasegmental strand	122
1.2	The long term segmental strand	130
1.1	Acoustic correlates of supralaryngeal qualities	155
4.5	Long term properties: conclusions	192
5	Conclusions	197
	Summary	197
5.1	Criticism of principle and practice in speaker recognition	198
5.3	Directions for speaker recognition	206
	References	210
	Index	219

Tables

3.1	Frequency of occurrence of English consonant phonemes	81
3.2	Word inventory	83
3.3	Overall means (all speakers) of formants of initial /l/ and /r/, and their vowel environments	
3.4		90
3.5	Means of consonant formant frequencies for each speaker over 30 items Spearman coefficients of correlation between formants of /l/ or /r/ and of	91
3.6	the following vowel	98
3.0	Formant correlations as a measure of coarticulation for individual	
3.7	speakers	99
	F ratio values of formant parameters	102
3.0	Percentage correct identification using LP spectra	105
3.9	Percentage correct identification with test LP spectra computed from 1	
2 10	2, 3 of 10 test items	107
3.10	Values of the DISTANCE measure of coarticulation	110
3.11	Kank ordering of speakers by coarticulation as assessed by forment	
	correlations and by the DISTANCE measure	111
3.12	Spearman correlations of different measures of /l/ goorticulation	112
5,15	Spearman correlations of different measures of /r/ coertinal at a second	112
5.17	I ciccinage correct identification using coarticulation	113
7.1	Measures of characteristics of long term spectra of voice qualities	153
4.2	Wealls of Γ_1 , Γ_2 , Γ_3 for long term qualities: mn 1.16	160
4.3	Means of F ₁ , F ₂ , F ₃ for long term qualities – speaker H	169
4.4	Weals of F ₁ , F ₂ , F ₃ for long term qualities - speaker EN	178
4.5	rule frequencies of vowels produced with a change in lower being	186
	rechilication of voice qualities across speakers; six volue descriptor	189
4.7	Wican 12 and 11, and the ratio between them for point of versals	109
	representing three vowel categories, according to speaker type	190
4.8	Mean F ₂ :F ₁ ratios for vowels of three categories, for nine voice qualities	190
	realised by two speakers	100
4.9	Identification of voice qualities across speakers: three-value descriptor	190
	descriptor	191

Figures

1.1	'Voiceprint' of The Phonetic Bases of Speaker Recognition	19
2.1	Overview of model of sources of between-speaker differences	30
2.2	The segmental strand	39
2.3	The suprasegmental strand	47
2.4	Integration rules, phonetic representation, implementation rules and	
Z. 4	physical constraints	52
2.5	Schematic impression of part of a phonetic representation	57
2.6	Schematic representation of the use of a prestige value of a socio-	
2.0	linguistic variable according to class and style	64
3.1	Means (over 15 speakers) of formant frequencies of /l/ and the vowel	
J. 1	environments	88
3.2	Means (over 13 speakers) for formant frequencies of /r/ and the vowel	
3.2	environments	89
3.3	Mean formant frequencies of /l/ for each speaker	92
3.4	Mean formant frequencies of /r/ for each speaker	93
3.5	Means for speaker GRP of formant frequencies of /I/ and the follow-	
5.5	ing vowel environment	94
3.6	Means for speaker TL of formant frequencies of /l/ and the follow-	
5.0	ing vowel environment	94
3.7	Means for speaker JB of formant frequencies of /l/ and the follow-	
	ing vowel environment	95
3.8	Means for speaker NL of formant frequencies of /l/ and the follow-	
	ing vowel environment	93
3.9	Means for speaker JRC of formant frequencies of /r/ and the follow-	
	ing vowel environment	97
3.10	Means for speaker PVE of formant frequencies of /r/ and the follow-	07
	ing vowel environment	71
3.11	Rank ordered coefficients of correlation (r _s) for 13 speakers	100
3.12	Identification rates averaging items to form test sample	108
3.13	Rank ordering of speakers by /l/ coarticulation	109
3.14	Rank orderings of speakers by /r/ coarticulation	112
3.15	Coarticulatory implementation strategies	119 137
4.1	Summary of Laver's descriptive framework for long term qualities	
4.2	Sagittal section showing stylised radial displacements of the notional	138
	centre of mass of the tongue body in settings	144-6
4.3a	-c Long term spectra of voice qualities (speaker JL)	148–50
4.4a	-c Long term spectra of voice qualities (speaker 1717)	152
4.5	Long term spectra of voice qualities: amplitude ratios	154
4.6	Long term spectra of voice qualities: slope approximation	161
4.7	Means for formant frequencies for long term qualities: mp 1-16	101
4.8	Means of formant frequencies for nine long term qualities: mp 17-67	170
	and (circled) 1–16	172
4.9	Subcategorisation of measurement points (JL)	179
4.10	Subcategorisation of measurement points (FN)	-
4.11	Tracings from x-ray pictures of the larynx and pharynx in neutral	, 183
	extreme raised larynx, and extreme lowered larynx settings	105