Mesopotamian Arabic Rhotics: Evidence from Jewish Baghdadī-Basrāwī Arabic Presentation, Representation & Formal Account of Government Phonology

Aldahook, Uthman A.

Mesopotamian Arabic Rhotics: Evidence from Jewish Baghdadī-Baṣrāwī Arabic
Presentation, Representation & Formal Account of Government Phonology

Uthman A Aldahook

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy
School of Modern Languages and Cultures

Durham University
2023

< Law-*r*-and Order >

ACKNOWLEDGMENT

This research project has gone through many challenges before it was achieved at the end. Many thanks, though, go to everyone who was part of this particular point in my journey, and tried to make it feel better. Before going into the listing of people who contributed to this research project, I would like to send my utmost gratitude and appreciation to Prof. Patricia Schneider-Zioga for maintaining her communication with me, especially when I needed it the most. During the last 2 years, she was never hesitant to provide guidance or support. I am immensely grateful.

I would like to first enclose my appreciation to the committee of my viva panel. I, hereby, include the examiners: Prof. Janet Watson, and Prof. Sergey Tyulenev. I thank them both so much for all their efforts in getting all the paperwork needed ready, for preparing for the session, and for developing all the questions they needed answers for during the defence.

I need to thank my previous main supervisor Dr. Alex Bellem for her patience and attempted guidance throughout our meetings where we discussed the data or my analysis. I would also like to thank her for introducing me to the theoretical framework I used in this study. Throughout the years of her time in the PhD program at Durham University, she has offered me some constructive comments, and guided my understanding to broader issues in this study. Any remaining shortcomings are solely the responsibility of the author.

I have to also include my thanks to Prof. Marcela Cazzoli, my secondary supervisor, for her input on my initial research plan and for her time and combined effort in our meetings either in person or through Zoom to develop the shape of this thesis.

It is also likewise important for me to extend my gratitude and appreciation to Mr. Eli Timan for answering my questions and commenting on the data; and also for providing information about the Jewish community of Iraq. I am also thankful for his overall effort and involvement in my research on Jewish Iraqi Arabic. I should also thank him for granting me access to his own corpus of spoken data of Jewish Iraqi Arabic which was recorded, digitized and archived in ELAR.

I would also like to express my heartfelt thanks to the language consultants of Jewish Iraqi Arabic: Mr. Sami Dallal and Dr. Nimrod Raphaeli for their valuable time and input during the elicitation sessions of the data. I should also not forget to thank Dr. Mila Neishtadt for sending me copies of some important references on Jewish Iraqi Arabic. I am also equally grateful for Ms. Niran Bassoon-Timan for sending me a list of books she keeps available on the history and culture of Iraqi Jews.

This must also include my gratitude to Prof. Paul Starkey who engaged in reviewing this thesis towards the end of my studies and in conducting a run-up report on the readability of the thesis.

I have to also send out my appreciation to Prof. Ghada Khattab for her review of the technical chapters (chapters1-5) and for providing some comments and suggestions. I am immensely grateful.

I should also thank Dr. Norval Smith for sharing with us a list of bibliography he compiled while working on rhotics representation.

I am of course equally grateful to Ms. Lucia Luck for her general academic involvement in providing needed information and in accommodating my enquiries by providing the right directions. Ms. Luck has always been active in sending out emails on academic matters, and also never shown hesitation in answering my emails in a timely manner.

It is important for me to send out my gratitude and appreciation to Dr. Marc Schachter, Dr. Adam Talib, Dr. Marie-Claire Barnet, Prof. Sergey Tyulenev and Prof. Charles Burdett for being part of my consecutive annual review committees throughout the years of my study in Durham university.

Many thanks also go to Dr. Rebecca Walker for agreeing to proofread this thesis, and for providing comments and suggestions.

It is also significant to show my thanks to Prof. David Cowling, Prof. Sergey Tyulenev, Dr. Francisc-J. Hernandez-Adrián, and Prof. Jonathan Long for replying to my emails and queries; and for meeting with me online throughout my years in Durham.

I should also include my gratitude and appreciation to everyone in Ustinov College since 2017 and throughout 2023 to friends, members, staff and administrators.

I am also thankful to quite a few people out of my academic circle. I include in this everyone in the Blue Sky Trust organization for their regular casual meetings, and for their personal development and volunteering opportunities; and their well-rounded efforts in making this world a better place.

I also dedicate this research project to my sweet mother, Mariam. Wishing you good health, peace, and all the happiness in the world. I want to also take this opportunity to dedicate this research project to the soul of my father, my first teacher.

I am also grateful for my family: Jill, Nerita and Xavier for their company most of the time throughout the years of my study in Durham University. I thank them for all the love and wonderful time we have together. I miss you all.

It is equally significant for me to include my gratitude and appreciation to William Stewart, Linda Stewart, Helen Stewart and Kate Stewart for their company throughout my stay and while around in their family. Thank you all.

I should also not forget to thank some close friends including: Farid (Tony-Abu Saqir), Brandon John Hamer, Jot Preet Singh, Shamme Shamsun Nahar, Marshall Brown, and Ash for their short time company towards the end of my studies in Durham University.

I should also send out my gratitude and appreciation to Qassim University, in general, and to the Royal Embassy of Saudi Arabia Cultural Bureau in London for facilitating and making this opportunity possible; to pursue my graduate studies through their scholarship programs.

Abstract

'Rhotics' are known for their phonetic variability; and their irregular universal phonological behaviour, which still, however, known to be conditioned by language-specific phonological systems. Therefore, recent research proposals on rhotics suggest an 'arbitrary' relationship between the phonetics and phonology of rhotics; and calls for an underspecification or unspecification for the phonological structure and phonetic content of rhotics. The new data on rhotics, however, motivated some scholars to seek new perspectives for the understanding and formal representation of rhotics collectively.

This study arrives as a contribution to the formal and descriptive study of rhotics in general, and to the understanding of Arabic and Mesopotamian rhotics in particular. Rhotics in Arabic can be typologically classified into two major macro groups: (a) CORONAL-TYPE; and (b) DORSAL-TYPE. This classification is informed, justified and supported by phonological processes and by distributional restrictions exclusive in both types. The CORONAL-TYPE and DORSAL-TYPE are unified in their formal representation by an identity element in the base of their phonological expression.

On the formal and phonological side, this thesis employs Government Phonology and Element theory as a theoretical research framework to capture the unity of rhotics as they occur in Jewish Baghdadi-Baṣrāwī Arabic (JBBA). Rhotics in JBBA, and Arabic in general, were found to be characterized by an |A| element in their phonological expression. The |A| element signifies articulatory openness, and acoustic central spectral energy. The manifestation of the |A| element in rhotics is supported by empirical evidence with tendencies in phonological processes towards extending pharyngealization and/or retraction to adjacent sounds; disfavouring palatalization or fronting environment; and vocalization to a non-front glide or non-front vocalic output. Rhotics in JBBA are composed 'minimally' of an |A| element in nuclear position; and of |U.A.L| elements in non-nuclear position.

On the phonetic side, this study also proposes a novel pairing and matching between the articulatory and acoustic properties unique to rhotics. This proposal has also crosslinguistic implications. Thus, this thesis puts forward a TRAJECTORY OF RHOTIC AERODYNAMIC-LINGUAL COMPLEXITY CONTROL. This trajectory mirrors together the articulatory and acoustic properties of rhotics; and projects rhotic variation and distributional frequency. A schematic representation for the stages of aerodynamic and lingual

constrictions of rhotics highlights the potential directionality towards simplification in rhotics either by OPENING and/or REDUCTION. Both processes were found to be informed by historical and active processes of lenition.

This model looks at CORONAL- DORSAL rhotics from a holistic view, as overlapping phonetic-phonological systems; which are collectively rooted in an identical set of phonetic manners of articulation. Both CORONAL-DORSAL trills and taps have a ‘complete closure’ and involve ‘quantitive’ differences in the *lingual control*, and are governed by the *reduction* continuum. CORONAL-DORSAL fricatives, approximants, and vocalized rhotics all have an ‘incomplete closure’, and involve ‘qualitive’ differences in the *aerodynamic control,* and are governed by the *opening* continuum. Thus, the phonetic archetype of rhotics, in general, is phonetically governed within a triad spectrum: (i) CLOSURE; (ii) OPENING; (iii) VIBRATION.

TABLE OF CONTENT

Acknowledgment iv

Abstract vii

List of Tables xiii

List of Figures xiii

Practical Orthography and Transcription xvi

Chapter 1. Why Rhotics?
1.0 Introduction 1
1.1 Purpose of this Study 4
1.2 Theoretical Framework: Government Phonology & Element Theory 6
1.3 Thesis Structure 7

Chapter 2. Phonetic & Phonological Description of Rhotics
2.0. Introduction 9
2.1. Defining the Term 'Rhotic' 9
2.2. Phonetic & Phonological Description of Rhotics 10
2.2.1 Trills 13
2.2.2 Taps & Flaps 17
2.2.3 Fricatives 21
2.2.4 Approximants 23
2.2.5 Retroflexes 26
2.2.6 Vocalic Rhotics 27
2.2.6.1 Rhotic Vowels 28
2.2.6.2 Coda-diphthongized Rhotics 30
2.3. Summary 31

Chapter 3. Formal Representation of Rhotics
3.0 Introduction 32
3.1. Distinctive Feature Theory 32
3.1.1 The Feature [SONORANT] 34
3.1.2 The Feature [LIQUID] 35
3.1.3 The Feature [RHOTIC] 36
3.2 The Family Tree Model 43
3.3 Exemplar-Based Phonology 45
3.4 Government Phonology & Element Theory 48
3.5 Summary 52

Chapter 4. Historical Sound Changes & Phonological Processes Involving Rhotics
4.0 Introduction 54
4.1 Rhotic Coarticulation & Assimilation 54
4.2 Rhotic Dissimilation 56
4.3 Fronting & Palatalization in Rhotics 57
4.4 Rhotacism 59
4.4.1 *n > r* 59

4.4.2 *s > r* 60
4.4.3 Recent Instances of Rhoticism 61
4.5 Rhotic Lateralization 62
4.6 Rhotic Vocalization 63
4.7 Sandhi & Linking Rhotics 64
4.8 Rhotic Devoicing 64
4.9 Summary 65

Chapter 5. Overview of Arabic Rhotics
5.0 Introduction 67
5.1 Historical Background to Coronal Rhotics 67
5.2 Coronal Rhotics: Phonetics & Phonology 69
5.2.1 Plain Rhotics 69
5.2.2 Pharyngealized Rhotics 71
5.2.3 Distribution of Coronal Rhotics 73
5.2.4 Phonological Processes in Coronal Rhotics 76
5.2.4.1 Pharyngealization of Coronal Rhotics 76
5.2.4.2 Assimilation of Coronal Rhotics 78
5.3 Summary 79
5.4 Historical Background to Dorsal Rhotics 80
5.5 Dorsal Rhotics: Phonetics & Phonology 85
5.5.1 Distribution of Dorsal Rhotics 89
5.5.2 Phonological Processes in Dorsal Rhotics 95
5.5.2.1 Assimilation of Dorsal Rhotics 95
5.5.2.2 Vocalization of Dorsal Rhotics 96
5.5.2.3 Dissimilation of Dorsal Rhotics 98
5.6 Micro-Typology of Arabic Rhotics 99
5.7 Summary 101

Chapter 6. The Basis for this Study: Jewish Baghdadī-Baṣrāwī Arabic
6.0 Introduction 103
6.1 Jewish Baghdadī-Baṣrāwī Arabic: Linguistic Profile 103
6.2 Sociohistorical & Linguistic Background: Mesopotamia 105
6.2.1 Sociohistorical & Linguistic Background: The Jewish Community in Mesopotamia 110
6.2.1.1 Sociohistorical & Linguistic Background: Baghdad & the Jewish Community 112
6.2.1.2 Sociohistorical & Linguistic Background: Baṣrā & the Jewish Community 115
6.3 Research Methodology 117
6.3.1 Data & Language Consultants 119
6.4 Summary 122

Chapter 7. Jewish Baghdadī-Baṣrāwī Arabic rhotics: Phonetic & Phonological Description
7.0 Introduction 123
7.1 Rhotic Variation in Arabic 124
7.1.1 The Coronal-Type & Dorsal-Type Analogy 131

7.2 Rhotics in JBBA 139
7.2.1 Distribution of Variants of Rhotics in JBBA 140
7.2.1.1 Trills 142
7.2.1.2 Taps 148
7.2.1.3 Fricatives 152
7.2.1.4 Approximants 156
7.2.1.5 Retroflexes 159
7.2.1.6 Vocalized Rhotics 161
7.2.1.7 Rhotic Clusters 165
7.2.1.8 English Loanword Phonology of Rhotics in JBBA & Maṣlāwī 167
7.2.2 Modelling Phonetic Variation in Rhotics 171
7.3 Summary 179

CHAPTER 8. FORMAL REPRESENTATION OF JEWISH BAGHDADĪ-BAṢRĀWĪ ARABIC RHOTICS: GOVERNMENT PHONOLOGY
8.0 Introduction 180
8.1 Government Phonology 181
8.1.1 Syllable Structure 185
8.1.2 Licensing & Government 186
8.1.3 Element Theory 187
8.1.3.1 Subsegmental Structure of Speech Sounds 191
8.2 Representation of Rhotics 194
8.2.1 Representing Rhotics in JBBA 199
8.2.1.1 Evidence of ‘m|A|ss’ in Rhotics 200
8.2.1.2 Subsegmental Geometry of Rhotics in JBBA 203
8.2.1.3 Distribution & Behaviour of Rhotics in JBBA 205
8.3 Summary 213

Chapter 9. Conclusions
9.0 Conclusion 214
9.1 Main Findings 214
9.2 Shortcomings 216
9.3 Recommendations & Future Directions 217

References 219
Appendix 239

List of Tables

Table 2.1: Attested consonantal rhotics in the languages of the world 12

Table 4.1: Rhotacization of a nasal in intervocalic position in Tosc 60

Table 4.2: The development of rhoticism in Proto-Italic and Proto-Germanic 61

Table 7.1: Attested consonantal rhotics in the languages of the world 133

Table 7.2: Attested vocalic rhotics in JBBA 134

Table 7.3 Initial consonant clusters with rhotics 166

Table 7.4 Final consonant clusters with rhotics 167

Table 7.5 Treatment of English loanwords with etymological rhotics 169

Table A: Metadata of Language Consultants 240

List of Figures

Figure 2.1: A diagram of the active and passive articulators in oral cavity 11

Figure 2.2: Voiced uvular trill in *rok* 14

Figure 2.3: Voiced alveolar trill in *riem* 15

Figure 2.4: The relationship and the emergence of uvular and alveolar trills 16

Figure 2.5: The indirect relationship between alveolar trills and taps in Dutch 19

Figure 2.6: Voiced alveolar tap in *rok* 20

Figure 2.7: Voiced alveolar fricative in *riem* 22

Figure 2.8: Voiced uvular fricative in *peer* 22

Figure 2.9: Voiced alveolar approximant in *beren* 24

Figure 2.10: Voiced uvular approximant in *beren* 24

Figure 2.11: Rhotic types in the F2-F3 Bark plane 25

Figure 2.12: Voiced retroflex approximant in *boer* 25

Figure 2.13: Low-mid front vowel in *schaar* 29

Figure 2.14: Central vowel in *boer* 29

Figure 2.15: Low vowel in *boer* 30

Figure 3.1: Wiese (2001) proposal for the fixed point of r-sound on the sonority scale 38

Figure 3.2: PSM basic geometry 40

Figure 3.3. Representation of /r/ and /rˤ/ in the split-r group 41

Figure 3.4. Representation of /rˤ/ in the emphatic-r group 41

Figure 3.5. Representation of /r/ in the plain-r group 42

Figure 3.6. Representation of /r/ in (a), and /ʁ/ in (b); in the uvular-r group 42

Figure 3.7: The rhotic 'family resemblance' parameter model 44

Figure 3.8: The rhotic 'family interrelation' parameter model 45

Figure 3.9: Family relationship between Dutch r variants 46

Figure 3.10: Rhotic relations in BP 47

Figure 3.11: Representation of /r/ in German 50
Figure 3.12: Subsegmental structure 50
Figure 3.13: Representation of rhotics in DA and MBA 51
Figure 3.14: Representation of rhotics in MA 51
Figure 5.1: The distribution of the four major types of Arabic rhotics 100
Figure 6.1: Mesopotamian Arabic language family as spoken in Iraq and JBBA subgrouping 104
Figure 7.1a: *Lenition spectrum of coronal rhotic reduction in JBBA* 141
Figure 7.1b: *Lenition spectrum of coronal rhotic opening in JBBA* 141
Figure 7.2a: *Lenition spectrum of dorsal rhotic reduction in JBBA* 141
Figure 7.2b: *Lenition spectrum of dorsal rhotic opening in JBBA* 141
Figure 7.3: Spectrogram & waveform of the word [d͡ʒo̞·rˤɑ̞ː] ‘handkerchief’ 143
Figure 7.4: Spectrogram & waveform of the word [bˤɑ̞ʀʀɑ̞ː] ‘outside’ 144
Figure 7.5: Spectrogram & waveform of the word [bˤɑ̞r̤ˤr̤ˤɑ̞ː] ‘outside’ 144
Figure 7.6: Spectrogram & waveform of the word [ər.rʊ̞mmɑːn] ‘pomegranate’ 145
Figure 7.7: Spectrogram & waveform of the word [giːr̥] ‘stick shift’ 146
Figure 7.8: Spectrogram & waveform of the word [qʌ̞rə̠n] ‘horn’ 148
Figure 7.9: Spectrogram & waveform of the word [suːʀ̆iː] ‘Syrian’ 149
Figure 7.10: Spectrogram & waveform of the word [dɑkɑːtɾ̻ᴴɐ] ‘doctors’ 151
Figure 7.11: Spectrogram & waveform of the word [sɑ̠miːʀ̥̆] (proper name) 152
Figure 7.12: Spectrogram & waveform of the word [qʊ̞ʀᴴʃ] (unit of curreny) 153
Figure 7.13: Spectrogram & waveform of the word [pɑ̞rᴴ.t͡ʃa] ‘brush’ 153
Figure 7.14: Spectrogram & waveform of the word [bˤɑ̞ʁʁ̝ɑ̠ː] ‘outside’ 156
Figure 7.15: Spectrogram & waveform of the word [ɹˤɑ̝jʔe̝] ‘my opinion’ 157
Figure 7.16: Spectrogram & waveform of the word [χœ̞ʁ̝̊bˤe̞ːn] ‘malfunctioned’ 158
Figure 7.17: Spectrogram & waveform of the word [ħɑ̝ːɻɑ̝ː] ‘neighbourhood’ 160
Figure 7.18: Spectrogram & waveform of the word [qɑ̝d-ɑ̞ːwʷi] ‘I was illustrating’ 163
Figure 7.19: Spectrogram & waveform of the word [qo̞ːsˤɑ̝·] ‘flat bread’ 164
Figure 7.20: Spectrogram & waveform of the word [nœʕə̞f] ‘we know’ 165
Figure 7.21a: Articulatory Properties of Rhotics 172
Figure 7.21b: Acoustic Properties of Rhotics 172
Figure 7.21c: Distribution of Rhotics in JBBA 175
Figure 7.22: *Lingual control continuum* 172
Figure 7.23: *Aerodynamic control continuum* 173
Figure 7.24a: CORONAL-TYPE Rhotic System 177
Figure 7.24b: DORSAL-TYPE Rhotic System 177
Figure 7.25a: CORONAL-DORSAL-TYPE merger 178
Figure 7.25b: Archetype of Rhotics 178
Figure 8.1: |I| or ‘dIp’ pattern in spectral slice (left) and a spectrogram of [i] (right) 189

Figure 8.2: |U| or ‘rUmp’ pattern in spectral slice (left) and a spectrogram of [u] (right) 190
Figure 8.3: |A| or ‘mAss’ pattern in spectral slice (left) and a spectrogram of [a] (right) 190
Figure 8.4: Representation of /r/ in German 196
Figure 8.5. Representation of rhotics in DA and MBA 198
Figure 8.6. Representation of rhotics in MA 198
Figure 8.7: Spectrogram & waveform of the word [qo̞ːsˤɑ̝ˑ] ‘flat bread’ 200
Figure 8.8. Spectrogram & waveform of the word [ħɑ̝ːɻɑ̝ː] ‘neighbourhood’ 201

Practical Orthography and Transcription[1]

Orthography	IPA	Orthography	IPA
<ʾ>	[ʔ, ʡ]	*<ī>*	[iː, i·]
<b>	[b, bˤ, b̥]	*<ā>*	[ɑː ɑ·]
<p>	[p, pʰ]	*<a>*	[a, ɑ]
<t>	[t, t̪]	*<e>*	[ɛ, ə, ʌ]
<ṯ>	[θ]	*<ē>*	[eː, e·]
<j>	[d͡ʒ, ɟ]	*<o>*	[o]
<č>	[t͡ʃ]	*<ō>*	[oː, o·]
<ḥ>	[ħ, ʜ]	*<u>*	[ʊ, u]
<x>	[x, χ]	*<ū>*	[uː, u·]
<d>	[d, d̪, d̥]	*<æ>*	[æ, ɐ, ɘ]
<ḏ>	[ð]	*<ə̄>*	[əː, ɐː]
<ž>	[ʒ, ʒˤ]	*<i>*	[i]
<RR>	[ʁ̞ʁ̞, ɹɹ, rr, ʀʀ]	*<y>*	[j]
<r>	[ɾ, r, rr, ɹ, ɻ, ʁ, ʀ]	*<w>*	[w]
<ṛ>	[ɾˤ, rˤ, rrˤ, ɹˤ]		
<z>	[z, zˤ]		
<s>	[s]		
<š>	[ʃ, ʃˤ]		
<ṣ>	[sˤ]		
<ḍ>	[dˤ]		
<ṭ>	[tˤ]		
<ḏ̣>	[ðˤ]		
<ʿ>	[ʕ, ʢ]		
<ġ>	[ɣ, ʁ, ʀ]		
<f>	[f, f ˤ, f̬]		
<q>	[q]		
<g>	[g, ɢ]		
<k>	[k]		
<l>	[l, lː]		
<ḷ>	[lˤ, lːˤ]		
<m>	[m, mˤ]		
<n>	[n, nˤ]		
<h>	[h]		

[1] Diacritics used in practical orthography and phonetic or phonemic demonstration: [ˈ] primary stress, [ˌ] Secondary stress, [.] syllable boundary, [̚] unreleased, [˔] raised, [˕] lowered or approximant, [˖] advanced, [ˍ] retracted or backed, [˺] weak articulation, [̣] whispery voice, [˞] rhotacized, [˗] retracted tongue root, [̥ /˚] voiceless, [·] half long, [ː] long, [˜] nasalized, [͈] strong articulation, [↓] ingressive airflow, [ᴴ] fricative, [͡] affricate, [ᵊ] epenthetic schwa, pharyngealized [. / ˤ].

Chapter 1

Why Rhotics?

1.0 Introduction

The study of speech sounds has been always the centre of research in the field of Phonetics and Phonology; and in a more systematic way since the dawn of the early 1950s (Jakobson et al. 1952). 'Rhotics' is one of those appealing speech sound categories which, of course, had its own share from systematic scrutiny and analysis (Wells 1968; Lindau 1980 & 1985). Since then, what seems to be a common understanding, for a while, about rhotics is that "[m]ost of the traditional classes referred to in phonetic theory are defined by an articulatory or auditory property of the sounds, but the terms rhotic and r-sound are largely based on the fact that these sounds tend to be written with a particular character in orthographic systems derived from the Greco-Roman tradition, namely the letter 'r' or its Greek counterpart rho" (Ladefoged & Maddieson 1996: 213).

The term 'rhotic' conventionally refers to a set of phones known collectively as 'r-sounds' (cf. Table 2.1; and §2.1, later on). These r-sounds more often correspond to the orthographic representation of the Roman letter <r>. The orthographic representation of rhotics has been also shown differently in other languages: *reš* < ר > in Aramaic and Hebrew, *rāʾ* < ر > in Arabic and *rho* <P> in Greek. The Greek *Rho* <P> in turn is most likely derived from Phoenician **rūš* <𐤓>. This latter orthographic representation can be assumed to be inspired by a pictogram of a 'head' <𓁶> in the Sumero-Akkadian cuneiform and the Egyptian hieroglyph corresponding systems (cf. §2.1, for more details).

This commonplace perception of the sounds 'rhotics' boils down to their phonetic variability. Phonologically, however, there were some attempts to derive a structural unity that rhotics might share (cf. Walsh Dickey 1997; Wiese 2001). As more studies started to unfold with much more phonetic and phonological details on specific languages, such as, for instance, Brazilian Portuguese (BP), or Dutch, more aspects about rhotics are being uncovered (Rennicke 2015; Sebregts 2015). These recent studies revealed more about the irregular universal phonological behaviour of rhotics, which still, however, was found to be conditioned by language-specific phonological systems. These findings highlighted an evident disconnection between the phonetics and phonology of rhotics which deemed underspecification or even unspecification in some cases (Hall 1997; Natvig 2020). For this reason, the new data on rhotics motivated some scholars to seek new perspectives for the understanding of rhotics (Chabot 2019; Natvig 2020).

A stimulating novel phonetic evidence comes from Howson's (2018) study on rhotics in Upper and Lower Sorbian, and BP which demonstrates how rhotics can be unified as a class, which he shows by: (i) an 'articulatory' characteristic, as rhotics have a 'tongue root gesture' coordination with a 'tongue tip or body gesture'; or by (ii) an 'acoustic-perceptual' characteristic which rhotics show as having a similar F2 formant shape.

There also some other contributions for the study and understanding of rhotics which come from Government Phonology (GP) and Element Theory (ET). Rhotic acoustic signal was found to be characterized by an |A| element as a head/non-head in some languages, or an |I| non-head element in some others (cf. §3.4 & 8.2, for more details). In her study of final devoicing in German, Brockhaus (1995) argues for |A.@| to represent rhotics. In a different proposal, and from empirical evidence in Arabic rhotics, Bellem (2007) argues for a 'headless' rhotic which is composed of an |A.I| elements in Muslim Baghdadi Arabic and Damascene Arabic. In the same study, Bellem (2007) also argues for three types of rhotics to be represented in Moroccan Arabic: /r/ as having an |I| element, /rˤ/ as having an |A.I| elements, and *R* as an unspecified resonance element (cf. §3 & 8, for more details).

In an attempt to study and model the phonology of Arabic rhotics, Youssef (2019) surveys the phonological behaviour of rhotics in their distribution, their contrastive minimal pairs, their phonological processes as triggered or targeted by r-sounds, and their behaviour in loanword phonology. His analysis follows a contrast-based model of feature geometry to formally capture Arabic rhotics. He adopts the Parallel Structures Model (PSM) which is a minimalist and contrast-based rooted in feature geometry. He suggests that Arabic rhotics enjoy a semi-arbitrary relationship between their phonetics and phonology.

In his typological realization of Arabic rhotics, Youssef (2019) classified rhotic phonological patterns as they occur in Arabic into four major micro-typology: (a) the split-r dialect group; (b) the emphatic-r dialect group; (c) the plain-r dialect group; (d) the uvular-r dialect group. The split-r dialect group and the uvular-r dialect group have two contrastive rhotic phonemes plain-pharyngealized; /r/ and /rˤ/; and coronal-dorsal /r/ and /ʁ/, respectively. The emphatic-r dialect group and the plain-r dialect group have one rhotic phoneme /rˤ/ and /r/, respectively.

As can be discerned from the previous presentation of the state of the art in studying rhotics, there is an evident paucity in the phonetic and phonological literature of rhotics crosslinguistically and especially in Arabic. To the best of my knowledge, the only systematic study which has been devoted to studying and analysing Arabic rhotics is Youssef, 2019. Thus, this study comes to bridge this gap in the literature of rhotics in Arabic and in general.

The reason why we chose Jewish Baghdadi-Baṣrāwī Arabic[2] (JBBA) to study rhotics is because of an ethical call, as it is an under-documented language variety today and has only around 4 native speakers, according to latest estimates, still in their native homeland (Faraj & Benhaida 2021; also see §6.1, for more details). Most of the native speakers emigrated in 1950-1951 elsewhere, mainly to Israel, UK, US and Canada (cf. §6.1; 6.2.1.2; 6.3; & 6.3.1, for more details). JBBA is also one of the Tigris subgroups of *qəltu*-Arabic in which dorsal rhotics are known as a feature of this group. JBBA is also one of these Tigirs subgroup varieties where access to native speakers is plausible. Unlike, for instance, CBA where access to native speakers, to the best of my knowledge, is very scarce. language corpus of JBBA is still maintained and in 'good quality' in, for instance, SOAS and Heidelberg Universities.

This thesis uses GP as an architecture of language grammar theoretical framework, and ET as a theory of phonological representation to explain and show the internal structure and behaviour of rhotics in JBBA because both use melodic information of acoustic cues processed and derived from acoustic evidence (cf. §1.2; 8.1; 8.1.3, for more details). Thus, GP and ET can inform the literature on rhotics as it has many implications, especially to a sound category as heterogenous as rhotics (cf. § 2.1; 2.2, for more details). Moreover, this

[2] It is significant to introduce some key terms associated with JBBA, and its speech community. The term 'Judeo-Arabic' is used in the literature to refer to both the spoken and written language of the Jewish population of the Arabic-speaking world (Khan 2018a; Hary 2018). I use the term Iraqi Judeo-Arabic in this study to describe the written and spoken language of the Jewish population of Iraq. I also use the term Jewish Baṣrāwī or Jewish Baghdadi to refer to the Jewish people and/or their spoken languages of Basra and Baghdad, respectively. I use the term Jewish Baghdadī-Baṣrāwī Arabic to refer to the Jewish Arabic varieties of Baghdad and Baṣrā. This is the case because there is no syntactic or morphological differences between the two to require separate classification between both varieties. There still, however, some very minimal difference and is limited to a small set of vocabulary in Jewish Baṣrāwī: e.g. [gawɹọ·g] 'toasted bread'. For more in-depth description (cf. §6.2.1, for more details).

theoretical framework has been rarely used for rhotics in Arabic, and for rhotics crosslinguistically (Bellem 2007; Backley 2011; also cf. 1.2; 3.4; 8.2, for further details).

1.1 Purpose of this Study

This thesis arrives as a contribution to the formal and descriptive study of rhotics in general, and to the understanding of Arabic and Mesopotamian rhotics in particular. Thus, this thesis has a typological and descriptive goal; and also a formal representational goal. After presenting some key information for 'rhotics' and the theory of their representation in the first 3 chapters, with providing a well-rounded review for the literature in the next 3 chapters, chapter 7 presents the descriptive account of rhotics as they occur in JBBA, and the novel typological proposal for rhotics. It also offers an original proposal for the phonetics of rhotics. Chapter 8 presents a formal representation of rhotics as they occur in JBBA using Government phonology and Element theory. Thus, this study attempts to answer the following questions:

(a) Can 'rhotics' be typologically classified in Arabic? And if so, in what way(s)?
(b) What types of 'rhotics' are found in Arabic, and in JBBA specifically?
(c) In what way can 'rhotics' be similar acoustically, articulatory, or any other way?
(d) What is the phonological behaviour of rhotics? How can this be modelled or represented?

This study will present empirical evidence which demonstrates that rhotics in Arabic can be typologically classified into two major macro groups: (a) Coronal-Type; and (b) Dorsal-type (cf.§5 &7, for more details). This phonetic and phonological macro grouping builds on the quadruple micro-typological categories proposed by Youssef (2019). This classification is informed, justified and supported by phonological processes and by distributional restrictions exclusive in both types (cf. §5& 7, for details). The Coronal-Type and Dorsal-type are both unified in their formal representation by an identity element in the base of their phonological expression. The research questions (a), (b), and (c) are addressed in §7.

On the formal and phonological side, this thesis employs Government Phonology and Element theory as a theoretical research framework to capture the unity of rhotics as they occur in JBBA; and so to address the research question (d). Rhotics in JBBA, and Arabic in general, were found to be uniformly characterized by an |A| element in their phonological expression. The |A| element signifies articulatory openness, and acoustic central spectral energy. The manifestation of the |A| element in rhotics is supported by empirical evidence with tendencies in phonological processes towards extending pharyngealization 'emphasis' and/or retraction to adjacent vowels, disfavouring palatalization or fronting environment, and vocalization to a non-front glide or non-front vocalic output (cf. §8.2, for more details).

Rhotics in JBBA are composed 'minimally' of an |A| element in nuclear position; and of |U.A.L| elements in non-nuclear position (cf. §8.2, for more details). Both CORONAL-DORSAL rhotics have the same phonological expression. DORSAL rhotics are |U| headed; and CORONAL rhotics are |A| headed in the expression. The headedness of the |U| element in DORSAL rhotics was supported by a process of dissimilation with etymological-*ġ*, a process of total assimilation to /q/ and /χ/, and a process of lenition and vocalization to [o̹ː] and [ə̹] (cf. §8.2.1.3, for more details). The headedness of the |A| element in CORONAL rhotics was supported by the acoustic signal of rhotic retroflexes. Rhotic retroflexes have a 'fronting' secondary gesture counteracted by a 'lowering' gesture component in the rhotic, which is the higher F1 value (cf. §8.2.1._, for details).

On the phonetic side, this study also proposes a novel pairing and matching between the articulatory and acoustic properties unique to rhotics. This proposal has also crosslinguistic implications for rhotics. Thus, this thesis puts forward a TRAJECTORY OF RHOTIC AERODYNAMIC-LINGUAL COMPLEXITY CONTROL (cf. §7.2.2, for more details). This trajectory mirrors together the articulatory and acoustic properties of rhotics; and projects rhotic variation and distributional frequency. A schematic representation for the stages of aerodynamic and lingual constrictions of rhotics highlights the potential directionality towards simplification in rhotics either by OPENING and/or REDUCTION. Both processes were found to be informed by historical and active processes of lenition (cf. §5; 7 and 8, for details).

This model looks at CORONAL- DORSAL rhotics from a holistic view; as overlapping phonetic-phonological systems; which are collectively rooted in an identical set of manners of articulation. Both CORONAL-DORSAL trills and taps have a 'complete closure' and involve 'quantitive' differences in the *lingual control*, and are governed by the *reduction* continuum. CORONAL-DORSAL fricatives, approximants, and vocalized rhotics all have an 'incomplete closure', and involve 'qualitive' differences in the *aerodynamic control,* and are governed by the *opening* continuum. Thus, the phonetic archetype of rhotics, in general, is phonetically governed within a triad spectrum: (i) CLOSURE; (ii) OPENING; (iii) VIBRATION (cf. §7.2.2, for details).

1.2 THEORETICAL FRAMEWORK: GOVERNMENT PHONOLOGY & ELEMENT THEORY

This thesis uses Government Phonology (GP) and Element Theory (ET) to explain and show the internal structure and behaviour of rhotics in JBBA. The Standard Government Phonology framework was first developed by Jonathan Kaye, Jean Lowenstamm and Jean-Roger Vergnaud in the early 1980s; while the earliest serious steps towards modelling the framework started in Kaye's 1985 study (Kaye et al. 1985) (cf. §8.1, for more details). Phonological knowledge in GP is established by inspecting a segment's phonological behaviour, both within the system, and in phonological processing; and the phonetic object does not participate in the process of 'understanding' of phonological objects and their behaviour (Kaye 2005).

GP works in a 'spill-out' operation in the phonetic-phonology interface in which phonetic values are assigned by phonological primes for lexical words which are ultimately phonetically interpretable (Harris & Lindsey 1995; Scheer & Kula 2017). GP focuses on the local source of phonological events; which in turn helps in classifying phonological phenomena into two major types: (i) *assimilation*; and (ii) *lenition*. In *assimilation*, GP assigns a 'melodic prime' node which is the 'locus' of the phonological event attached to a relevant 'tier' in the hierarchy to project the 'LINKING' of the 'elemental' characteristics to the (adjacent) 'target'. In *lenition,* 'weakening', the local source is the 'weak' prosodic position of the segment, as in word-final or rhyme, which in turn results in 'weakening' or 'no licensing'; and this is technically in GP 'DELINKING' i.e. loss of (some) characteristics; or 'DECOMPOSITION'.

Element Theory (ET) is a component for representation in GP which uses elements of melodic representations that have their roots in Dependency Phonology (Anderson & Jones 1974). ET was developed as a theory of sub-segmental structure. Elements were first introduced on the representations of the triad vowels by the work of Kaye et al. (1985) and Harris & Lindsey (1995). These elements are mapped into the acoustic signal which are arranged on their own tier below the skeletal tier. Elements are strictly 'privative'; they are either present or absent in a 'phonological expression', and are phonetically interpretable (Harris & Lindsey 1995). These elements can occupy a nuclear, non-nuclear and empty slots. This in turn could make the elements in complex phonological expressions to have asymmetrical relation which can be, however, organized by ranking 'headedness' and 'dependency' relations (Kula, Botma & Nasukawa 2013).

These elements are composed of basic primes of vowels known as *place elements* (Kaye et.al. 1985): |A| (with central spectral energy, and high F1 [F1– F2 convergence]) [-high], |I| (with high F2 [F2 – F3 convergence]) [-back], and |U| (low spectral peak [F1 – F2 convergence]) [+round] (Kula, Botma & Nasukawa 2013; Scheer & Kula 2017). These three elements can be independently interpreted as /a/, /i/ and /u/, respectively. In a five-vowels language system, these elements can be assigned with a 'dependency' and 'headedness' combination to capture |A.I| for /e/; and |A.U| for /o/. In a seven-vowel language system, the high mid and low mid vowels /ɛ/ & /ɔ/are headed as |I.A̲| elements for /ɛ/, and headed as |U.A̲| elements for /ɔ/, respectively (Botma & Nasukawa 2013).

Elements are also composed of three *laryngeal* or *manner elements* |ʔ.L.H| that complements the place elements we discussed earlier (Harris & Lindsey 1995; Kula, Botma & Nasukawa 2013). The |ʔ| element is independently a glottal stop which is characterized acoustically by abrupt and sustained fall in amplitude and can be non-continuant segments like stops. The |L| element represents voicing and nasality which is characterized by periodicity and can be any voiced obstruent or nasal. The |H| element represents voicelessness and frication which is characterized by aperiodicity and can be any voiceless segment or fricative sound (Kula, Botma & Nasukawa 2013; Scheer & Kula 2017)[3].

After this brief review of the theoretical framework, the next section is an outline of the thesis structure and content.

1.3 Thesis Structure

This thesis provides a crosslinguistic review, and a detailed account for the study of 'rhotics' in JBBA. The thesis is structured as follows. Chapter 1 has already provided a basic introduction to this thesis, its purpose, and the theoretical framework utilized in formal

[3] For further details on GP and ET refer to chapter 8.

analysis. Chapter 2 presents crosslinguistic key information for 'rhotics'; and well-rounded description for rhotic types and their distribution from empirical evidence. Chapter 3 offers a synopsis for the theory of speech sounds and the formal representation of rhotics from crosslinguistic evidence. This includes attempts in representing rhotics in the Distinctive Feature Theory, the Family Tree Model, Exemplar-Based Phonology, and Government Phonology. Chapter 4 presents crosslinguistic historical sound changes and active phonological processes connected to rhotics. This includes processes of coarticulation, assimilation, dissimilation, palatalization, rhoticism, rhotic lateralization, vocalization, Sandhi, and devoicing. Chapter 5 presents rhotics in Arabic. This includes background, definition, description, distribution, and typology and classification of rhotics in different varieties of Arabic. Chapter 6 provides a historical, sociological and linguistic overview of Mesopotamia and the Jewish populations of Mesopotamia. This review will particularly focus in two separate subsections on the Jews of Baghdad and Baṣrā. This chapter also presents the research methodology used in collecting the data. Chapter 7 offers the articulatory and acoustic aspects of rhotics as they occur in JBBA. This chapter also provides a systematic distribution of rhotic variants in JBBA. This chapter also presents two original contributions to the study of rhotics: (i) the typological classification into two major macro groups: (a) CORONAL-TYPE; and (b) DORSAL-TYPE; and (ii) a phonetic model that unifies both CORONAL and DORSAL-TYPE rhotic variants into one trajectory that mirrors both articulatory and acoustic properties which all governed by two subprocesses of lenition: (i) *reduction*; and (ii) *opening*. Chapter 8 offers another contribution to the study of rhotics. It presents a formal representation for rhotics in JBBA utilizing GP and ET. Rhotics in JBBA in general were found to be characterized by an |A| element in the base of the phonological expression. Rhotics in JBBA are composed 'minimally' of an |A| element in nuclear position; and of |U.A.L| elements in non-nuclear position. The last chapter, chapter 9, presents the concluding remarks for this thesis which includes the main findings, shortcomings, and recommendations for future research in this area.

CHAPTER 2

Phonetic & Phonological Description of Rhotics

2.0 INTRODUCTION

This chapter will present crosslinguistic key information associated with speech sounds known as 'rhotics'. It will synthesize an overview for 'rhotics' from a crosslinguistic perspective. In section §2.1, it will start with a conventional definition of what we know or classify as 'rhotics'. The next part, section §2.2, will provide a well-rounded description of rhotic-type speech sounds and their distribution. This includes rhotics with distinctive phonetic manner of articulation: trills (§2.2.1); taps & flaps (§2.2.2); fricatives (§2.2.3); approximants (§2.2.4); retroflexes (§2.2.5); and vocalic rhotics (§2.2.6) – which comes in two parts including: rhotic vowels (§2.2.6.1); and coda-diphthongization rhotics (§2.2.6.2). The last part, section §2.3, will present a summary, and general realizations for this chapter.

2.1. DEFINING THE TERM 'RHOTIC'

The term 'RHOTIC' has been traditionally used to refer to a set of 'r-sounds', (cf. Table 2.1, below), which corresponds to the orthographic representation of the Roman letter <r>. This set of r-sounds has been also labelled differently in other languages: *reš* in Aramaic and Hebrew, *rāʾ* in Arabic and *rho* in Greek. The Greek *Rho* <P> in turn is most likely derived from Phoenician **rūš* <𐤓>. This latter orthographic representation can be assumed to be inspired by a pictogram of a 'head' <𓁶> in the Sumero-Akkadian cuneiform and the Egyptian hieroglyph corresponding systems.

There is one hypothesis that the term 'RHOTIC' is in fact a calque from the Latin word '*rhotica*' (Wiese 2011). A more plausible, and better supported hypothesis is that the term was first coined through back-formation from '*rhotacism'* by Wells (1968). His use of the term is to label the varieties of English that articulate the sound /r/ in a prosodic word coda or word-final position[4]. Since then, the term ‘rhotic’ started to be widely used to refer to or describe the r-sounds crosslinguistically (Wells 1970; McKay 1975; Wigforss 1975; Trask 1978; Lindau 1980 & 1985; Dixon 1980; McGregor 1988; Ladefoged & Maddieson 1996; Hall 1997; Walsh-Dickey 1997; Wiese 2001, Chabot 2019, Natvig 2020). Trask (1996: 310) in his dictionary of phonetics and phonology defines the term ‘rhotic’, as, “any member of a particular group of phonetically heterogeneous segments which for various phonological reasons are conveniently treated as a class - informally, the class of 'r-sounds'. The most familiar rhotics are the alveolar and post-alveolar taps, trills and approximants, but various retroflex and uvular segments, as well as the American molar r, are also included”. Ladefoged & Maddieson (1996) in their monograph on the sounds of the world’s languages devoted a whole chapter to ‘rhotics’ reinstating the notion that it is plausible to specify formal features for a single rhotic phone or phoneme. However, those languages that have more rhotic variants or phones may lack a unifying articulatory or auditory feature to group them all as a ‘phonetic class’.

After this brief introduction to the term ‘rhotic’, and its correlates, the next part will synthesize the phonetics and phonology for the speech sounds crosslinguistically known or labelled as ‘rhotics’.

2.2. Phonetic & Phonological Description of Rhotics

Throughout this thesis, several phonetic terms associated with rhotics are used. Detailed definitions of these terms are provided. First of all, a distinction between ‘active’ and ‘passive’ articulator has to be introduced (cf. Figure 2.1, below). The ‘active’ articulator is either the lower lips or some part of the tongue, and it may arguably include the glottis (see Rennicke 2015, on Brazilian Portuguese). This active articulator, often referred to as just ‘articulator’ in the phonetic literature, moves towards the fixed, passive articulator, which is the area that extends on the upper side of the vocal tract, from the upper lips to the

[4] Wells (1968) coined the term ‘rhotic’ and its derivative ‘non-rhotic’ to show how r-sounds pattern in non-word-initial postvocalic position in some varieties of English. In theory, the basis of this classification is the prosodic word coda position in which most of the lenition processes ‘weakening’ take place (cf. §2.2.6; 4.6-8; 7.2.2, for similar notes on JBBA). There is a practical shortcoming, at face value, which has to do with the semantic connotation of the term ‘non-rhotic’ as it gives the impression that the varieties classified as such are ‘lacking’ rhotics per se, while they merely exhibit rhotic lenition processes in ‘weak’ syllable position; whereby also all sounds, with no exception, are lenited in similar environment. Similar notes have been already also echoed by Harris (2013) on this ‘rhotic’ and non-rhotic’ dichotomy as being ‘overly simplified’.

pharynx. The ‘passive’ articulator is also referred to as ‘place of articulation’ in the phonetic literature.

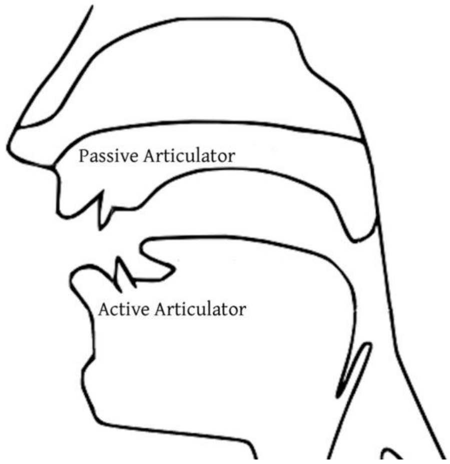


Figure 2.1: A diagram of the active and passive articulators in the oral cavity

In this thesis, it is significant to introduce two specific regions of the active and passive articulators. The active articulator again is either the lower lip or the tongue. The tongue is traditionally divided into three parts: tongue tip, tongue blade and tongue back/body. Sounds produced with the tongue tip are called ‘apical’, those with the tongue blade ‘laminal’, and those constricted further back or by the tongue dorsum are ‘dorsal’. There also three major parts or points of articulation in the oral cavity. They are often referred to as ‘labial’ - for the lips, ‘coronal’ – covers the area that extends from the upper teeth to the hard palate, and ‘dorsal’ – stretches from the palate to the uvula, in the relevant phonetic and phonological literature.

One of the interesting facts about the phonetic properties of what we universally recognize as rhotics lies in their articulatory variabilities. This can be attributed to their crosslinguistic high frequency in distribution - they show much variation in their production more than any other sound category. Wolff (1958: 22) recapitulates his understanding of rhotics as “[t]here is perhaps no other phoneme that admits of as many variations in place of articulation, manner of production, sonority and syllabicity, as r”. Thus, rhotics crosslinguistically consist of a heterogenous set of sounds that can vary in place of articulation: from labial [B][5] to laryngeal [ɦ][6]; and in manner of articulation, as: trills, taps, flaps, fricatives and approximants, retroflexes, and also vocalics[7]. Table 2.1 below presents the crosslinguistically attested consonantal 'rhotics' using the IPA notation system.

Table 2.1: Attested consonantal rhotics in the languages of the world (Chabot 2019: 13; Labrune 2021: 3)

	Labio-dental	Dental alveolar	Retroflex	Velar	Uvular	Glottal
Trill		r	r̠/ṛ[8]		ʀ	
Tap/Flap		ɾ	ɽ			
Fricative		ʃ ʒ	ʂ ʐ	x ɣ	χ ʁ	h ɦ
Approximant	ʋ	ɹ	ɻ	ɰ		
Lateral Flap		ɺ	ɺ̣			

Rhotics are articulatorily and aerodynamically diverse, but still can be defined. The manner in which the variation of rhotics can be majorly produced is as follows. Trills are articulated with a vibration of one articulator touching another. They could range from alveolar[9] [r] when the tip or the blade of the tongue touches the alveolar ridge, or uvular [ʀ] when the uvula vibrates touching the tongue dorsum. Alveolar taps and flaps[10] [ɾ] or retroflex flaps[11] [ɽ] are produced with approximately somewhere between the tongue tip and blade touching the alveolar ridge. Fricative rhotics[12] are produced by turbulent airflow

[5] It is not conventionally treated as a 'rhotic', but there is also no obvious reason as to not treat it as such (cf. for instance, Wiese 2011).
[6] Attested in Brazilian Portuguese (cf. Rennicke 2015)
[7] There is crosslinguistic evidence for rhotic vowels, rhotacized vowels or r-colored vowels (cf. Sebregts 2015; Rennicke 2015). However, Chabot (2019) in his recent article on 'what makes a rhotic', and on the analysis and representation of rhotics argues against 'rhotic vowels' and that they should be excluded from the rhotic category of sounds.
[8] Not in the original table but added as described by Hamann (2003: 25).
[9] There also a retroflex trill [r̠] that occurs in Malayalam (see, Hamann 2003:26) and is also attested in the Dravidian language Toda (Hall 1997: 105-106; Whitley 2003: 82)
[10] In the phonetic literature, there is only one cover symbol in the IPA notation system [ɾ] that corresponds to an alveolar tap or flap. There is a phonetic difference between the two (cf. section 2.1.2, for further details).
[11] Retroflexes always exhibit two coarticulatory gestures. In the case of a retroflex flap, which is often seen as a flapped stop "the tongue tip is curled inwards and approaching the post-alveolar region but flaps out before the actual contact takes place" (Hamann 2003: 26) (see also Laver 1994: 221).
[12] There is a wide spectrum of rhotic fricatives that includes: [ʃ], [ʒ], [ʂ], [ʐ], [x], [ɣ], [χ], [ʁ], [h], [ɦ]. It is worth noting that also other variants of rhotics can exhibit degrees of frication commonly in 'weak' syllable positions. A subscript uptack notation [˔] is sometimes used for phonetic demonstration of rhotic frication (see Sebregts 2015; and Rennicke 2015).

passing through a stricture at a certain point in the vocal tract. They could range from alveolar, velar, uvular, and less commonly glottal. Approximants[13] are produced with a stricture wider than fricatives. This incomplete constriction may range from labio-dental [ʋ] through alveolar [ɹ] to the uvular regions [ʁ̞], and the active articulator (the tongue tip/body) may be curved backwards to produce retroflexion or bunched to produce retroflex approximants [ɻ]. r-colored[14] vowels can be produced in two ways: by raising the tongue tip, elevating and bunching the tongue body, or less commonly a constriction in the pharynx due to the retraction of the tongue (Ladefoged & Johnson 2011: 94- 95).

After this brief introduction on the articulatory aspects of rhotics, we will now turn to the manner in which rhotics can be articulated.

2.2.1 Trills

Trills are articulated with a vibration of one articulator touching another. The production of trills can take many forms: (i) labial, when the two lips vibrate touching each other; (ii) alveolar, when the tongue tip/blade vibrates touching the alveolar ridge; or (iii) uvular, when the uvula vibrates touching or approximating the dorsum of the tongue. The process of producing trills uses a technique similar to the one used when producing voiced sounds through the vibration of the vocal cords. That is, "an adequate airflow must run through a sufficiently narrow aperture" (Rennicke 2015: 30). Ladefoged & Maddieson (1996: 217) also attribute this to the reasons that trills are often more like the non-trilled fricatives or approximants. This takes place when the tongue position or slightest deviation of airflow fails to cause trilling and in turn leads to an approximant or fricative articulation in the point of constriction. Voicing, number of closures and duration of a trill, varies from one language variety or speech style to another (Rennicke 2015: 30). Ladefoged & Maddieson (1996: 225) point out statistical universals that alveolar trills are much more common than uvular trills and they calim that the latter rarely occurs outside Western Europe.

[13] Crosslinguistically, in the IPA notation, approximant rhotics can be labio-dental [ʋ], dental alveolar [ɹ], and velar [ɰ] (Chabot 2019: 13; Natvig 2020: 4). Rhotic trills and fricatives also can become approximants in weak syllable positions, especially in coda. A subscript downtack [̞] is sometimes used to show that the manner of the rhotic is approximant (see for example, Sebregts 2015).

[14] 'Rhoticity' of vowels or r-coloration of vowels affects vowel quality yielding a rhotacized quality of the vowel. In IPA notation, a hook is used attached to the right of the vowel showing rhoticity, as in [ɚ, ɝ].

Sebregts (2015: 134) suggests that trills can be articulatorily viewed as difficult sounds to articulate from a number of points of view. They are relatively complex due to the large amount of precision which is critical for trilling to take place. Moreover, alveolar trills require a specific degree of stiffness for the tongue body. The aerodynamic of trills, simultaneously with voicing, requires a narrow constrained space in which trills can be successfully performed (Solé 2002). There has been much research done on the description for the production of uvular and coronal trills (cf. for instance, Catford 1977; Laver 1994; and Ladefoged & Maddieson 1996). Coronal trills can occur in some varieties of Brazilian Portuguese (BP) as variants of strong-r and in syllable coda position (Rennicke 2015).

Acoustically, trills show a succession of light vertical bars, corresponding to opening phases, and darker vertical bars, corresponding to closure phases, in the spectrogram (Rennicke 2015: 30). Lindau (1985) and later Sebregts (2015: 136) both suggest that a uvular trill (cf. Figure 2.2, below) tends to have a higher third formant than alveolar trills (cf. Figure 2.3, below); and that uvular trills can be longer than alveolar trills. Coronal and dorsal trills similarly consist of pulse patterns: a vocalic-like phase with formant structure showing phases of silence (Sebregts 2015: 135). Both trills frequencies are reported to be (very) similar (25 – 33 Hz) (Lindau 1985; Ladefoged & Maddieson 1996; Sebregts 2015).

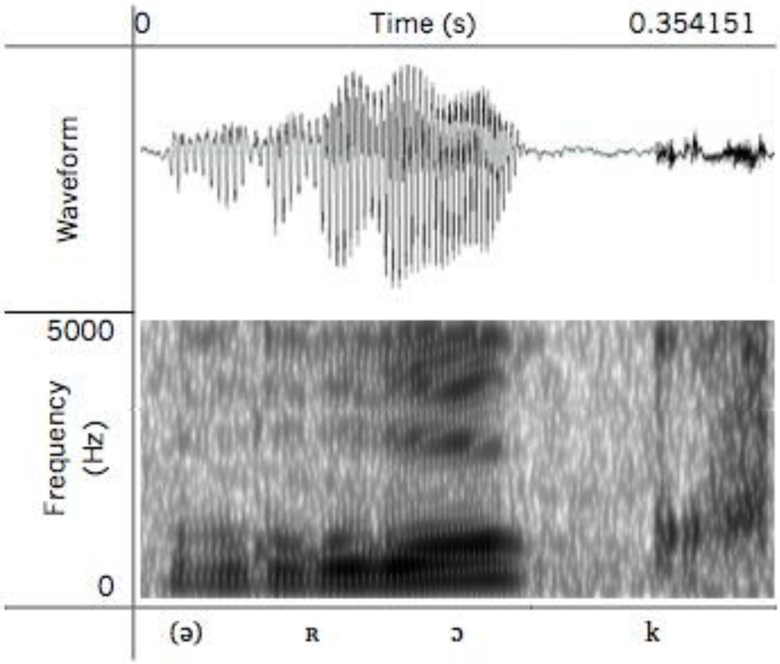


Figure 2.2: Voiced uvular trill in *rok* [(ə)ʀɔk] (Sebregts 2015: 64)

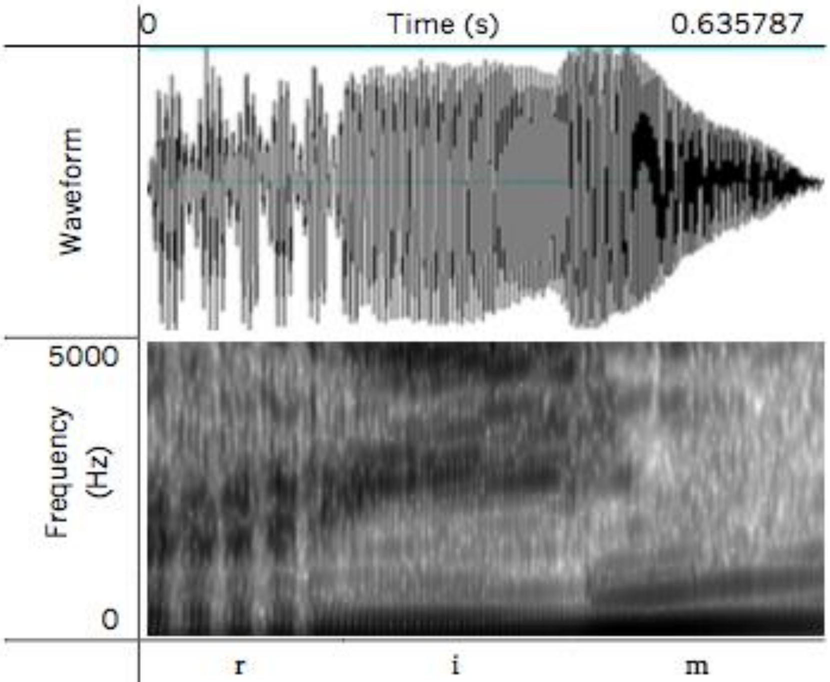


Figure 2.3: Voiced alveolar trill in *riem* [rim] (Sebregts 2015: 58)

In the literature of Arabic phonetic studies, scholars often equate a trill with multiple taps. For instance, Al-Ani (1970) shows that the apical-r in word-initial environment surfaces as either a trill or a 'series' of taps. A trill or 'multiple' taps are more typically found in intervocalic position (Nasr 1966: 5; Shaheen 1979: 142; Anani 1985: 132; Khattab 2002: 94). In word-final position, however, there is a tendency for r-sounds to become devoiced/lenited (Shaheen 1979: 148-150; Khattab 2002: 95).

Some previous research on rhotics attempt to attribute the development of apical to uvular trills as more articulatorily gradual and as a result of lenition (Morin 2013). Sebregts (2015: 136) findings, however, do not support Morin's hypothesis. He suggests that uvular trills are in fact the result of their 'perceptual' similarity to apical trills, and the complexity of the articulation of the latter. He postulates that uvular trills are acquired during the acquisition process, even in language areas where they are marginal or stigmatized, while establishing an articulatory correlation is not evident. Even syllable position was proven to be not relevant to the environment where the uvular trill would most likely surface, even in the 'strong' absolute word-initial environment (Sebregts 2015: 136). In his study of Dutch r, Sebregts (2015) demonstrates with a diagram that shows the relationship between the alveolar and uvular trill in Dutch (cf. Figure 2.4, below). He attributes the nature of the relationship between the apical and uvular trills to be rooted in ‘perception’ and that the origin of the uvular rhotics emerge in the acquisition process.

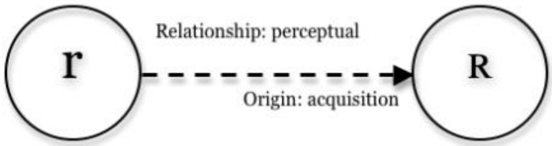


Figure 2.4: The relationship and the emergence of uvular and alveolar trills (Sebregts 2015: 137)

As described by Sebregts (2015), the dashed line between the alveolar and the uvular trill represents the indirect relationship between the two, i.e. the latter is not a reduced or lenited form of the former. The relationship is ‘perceptual’, based on trilling, and not articulatory. The uvular trill emerges in acquisition and not as a result of a casual speech process. The arrow shows directionality where the uvular trill form surfaces in language varieties where an alveolar trill is the common variant and not vice versa. This, as attributed by Sebregts (2015), is not meant to capture the representation for the knowledge of the speaker.

This is by no means meant to account for the genesis of uvular rhotics in Dutch; or to attribute their current or historical linguistic status either in Dutch or crosslinguistically to be, merely, phonologically-motivated. This section is concerned with the ‘spontaneous’ innovation of the uvular trill which arise in the early acquisition process[15]. Sebregts (2015) points out that the reasons for such an ‘innovation’ seems to rest mostly on the articulatory difficulty associated with the alveolar trills [r], and the ‘perceptual’ similarity between the uvular trill [ʀ] and the alveolar trill [r].

There is an overwhelming pieces of evidence that demonstrate the complexity of trills in L1 and L2 language learning. For instance, apical trills are mastered late in the early acquisition process (Vihman 1996). However, other types of trills – such as bilabial, ingressive and uvular trills are described, through experimental phonetic studies, to occur at the babbling stage (Vihman 1996). Thus, Solé (2002) suggests that these reasons in turn cause L2 learners of a language with apical trills to encounter difficulties ‘rolling’ their [r]’s.

[15] For more details on reports of children having difficulties in acquiring the apical trill in different languages; see Sebregts (2015) for review.

She elaborates that this difficulty arises from the fact that tongue-tip trills involve complex production mechanisms that require critical coarticulatory gestures which include combining the positioning of the active articulator, a stiffness condition of the tongue, and aerodynamic manner requirements. Thus, a substitution, or spontaneous innovation of a uvular rhotic by individual speakers during the acquisition process seems to be due to coping and maintenance strategies.

The substitution of uvular trill [ʀ] for alveolar trill [r] by individual speakers is well-documented in the literature of Dutch. Some scholars had related to this tendency from personal experience, although they had categorical apical-r parents, but ended up learning a uvular trill [ʀ] (Sebregts 2015: 134-135). Despite the fact there are pieces of evidence noting the substitution of alveolar trills with uvular trills, there is still no evidence reported from experimental phonetic studies that uvular trills are easier or simpler in their aerodynamics or gestural configuration (Sebregts 2015: 135). Sebregts (2015) states that the main reason children acquire uvular trills and why it persists to adulthood unlike other common sound substitutions such as [n] or [j] is because it does not posit problems for the system of contrasts. Thus, the different articulations of trills are still perceptually satisfactorily similar to be acceptable enough for the intended speech category, and are sufficiently different for maintaining contrasts (Sebregts 2015: 135).

After this well-rounded overview on many aspects of rhotic trills, the next part will provide a synopsis on rhotic taps and flaps.

2.2.2 Taps & Flaps

The term 'tap' is used in the phonetic literature to refer to a manner of articulation involving the active articulator - the tongue, making a brief contact with the passive articulator – the alveolar ridge (Punnoose 2011: 27). Taps are produced by a single contact of the tongue tip/blade with the alveolar ridge. Ladefoged & Maddieson (1996: 230–231) describe it as when the tongue tip moves and touches the alveolar ridge a tap is produced. Myers (2015) explains in further details that the coronal taps are constricted when "[a] high front tongue body posture puts the tongue tip close to the alveolar ridge, facilitating the tongue tip contact gesture in both a lateral and a tap" (71). Myers (2015) demonstrates also that "[a] tap isn't high or front, but it is produced with a tongue tip closure that is made easier by a high front tongue body position" (71). The single contact rhotic has been always described as a ‘tap’ in many languages in the world such as Spanish and Portuguese (Rennicke 2015: 31).

Harris (1969), Ladefoged (1975) and many others use the terms *tap* and *flap* interchangeably. However, Ladefoged & Maddieson (1996: 230) argue that it is significant to make a distinction between a rhotic articulated primarily with the movement of the tongue towards the alveolar ridge to produce a ‘tap’, and when the tongue moves ‘briefly’ towards the alveolar and then ‘strikes’ it in passing to produce a ‘flap’. Establishing this difference is said to be essential when characterising the liquid systems of some Dravidian and Australian languages. Walsh Dicky (1997: 75) believes that taps are always coronal. However, this is not always the case, as there is an evidence for the existence of dorsal taps in some languages of the world, especially in West Germanic languages (see, Lodge 2009, for some examples).

By accommodating a gestural model, Proctor (2011) in his comparative study of Russian and Spanish liquids demonstrates that both taps and trills exhibit a “coordination of a stabilizing tongue body gesture with a coronal approximation gesture, different rhotic allophones can result from small differences in airstream properties, tongue-tip stiffness, coronal aperture, tongue body placement, and inter-gestural timing.” (475). Investigating a similar contrast in Catalan, Recasens and Pallarès (1999) concluded that “the tongue body is subject to a higher degree of constraint during the production of the trill than the tap”.

Solé’s (2002) attempt in providing an articulatory definition for both: rhotic taps and flaps; and also trills is perhaps the best to approximate this reality. She states that trills are the product of “the vibration of certain supralaryngeal articulators (tongue- tip, uvula, lips) caused by aerodynamic forces, as opposed to taps and flaps, which involve active muscular movements of the tongue” (656). Sebregts (2015: 170) suggests that the overwhelming instances of what appears to be a single contact between the articulators are actually ‘very short’ trills in Dutch. In other words, articulatorily, these taps are, in fact, successful single contact trills. Sebregts (2015: 178) also concludes that although the tap shares with the trill the same articulators, the tap is more robust and requires less articulatory control. Therefore, he suggests the tap to be a lenited form of the trill in Dutch (see Figure 2.5, below).

There is, in fact, a long-standing discussion in the literature on whether a tap, regardless whether single or multiple contact(s), is in fact a short or single occlusion(s) of a trill. Sebregts (2015), for instance, and what seems from an evolutionary perspective, argues for a short trill explanation of a tap; and he suggests that the tap in Dutch is lenited form of the trill. On the other hand, Rennicke (2015) suggests that there is a difference between a tap and a trill acoustically: taps are constricted with a single 'ballistic flick gesture', while trills with a maintained and 'prolonged posture', which echoes Solé's articulatory findings (cf. Catford 1977; Barry 1997, as well).

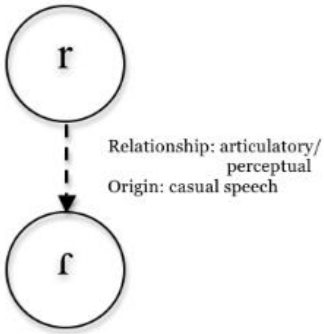


Figure 2.5: The indirect relationship between alveolar trills and taps in Dutch (Sebregts 2015: 179)

On the same line with Sebregts's hypothesis that taps are an offshoot of trills and are due to historical lenition; or as development out of trills in Dutch, Barry (1997) suggests that although there is a lack of direct articulatory connection between trills and taps, there still a standing hypothesis that taps can be a diachronic development and derived from trills due to their perceptual similarity – this can be analogous to how flaps have historically developed in varieties of English as intervocalic variants of /t/ and /d/. Sebregts (2015) points out that "there is considerable evidence that the occurrence of taps as variants of *r* is not relatable to any failure of implementing or sustaining trills." (170).

Acoustically, there is no study until today that attempts to demonstrate whether there is an auditory difference between a tap and a flap. In fact, as we mentioned earlier, both terms are still equated even in recent research. A tap exhibits similar closure phase to each contact of a trill, but the production configuration for taps and trills is fundamentally different (Rennicke 2015: 31). Taps are constricted with a 'single ballistic flick gesture' (cf. Figure 2.6, below), while trills are produced with a 'maintained and prolonged posture' (Catford 1977: 130) (cf. Figure 2.2 & 2.3, above). Barry (1997) states that simply reducing the time duration of a trill would not make it a ballistic tap. There is also an empirical evidence that demonstrates a single contact trill or a tap trill as a variant of an absolute trill. Blecua Falgueras (2001) shows that in Peninsular Spanish alveolar trills can be produced with one closure phase. Therefore, Rennicke (2015: 31) suggests that trills and taps seem to share a link not only on the perceptual level, but also on the articulatory level – a trill can have one-closure variants with somewhat stable tongue configuration and as the chronology of lenition progresses, she hypothesizes that speakers may start to articulate these variants but with a ballistic tap.

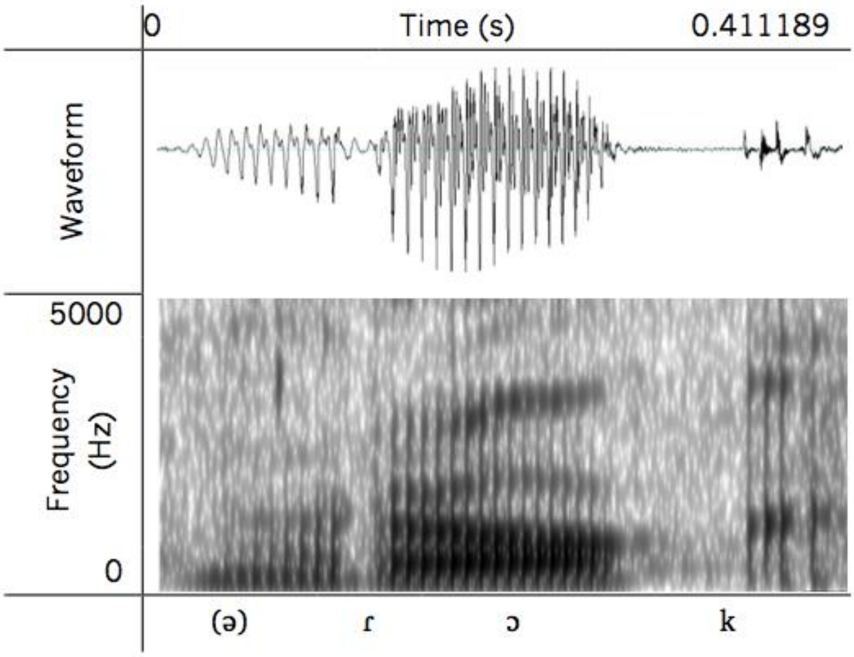


Figure 2.6: Voiced alveolar tap in *rok* [(ə)rɔk] (Sebregts 2015: 62)

Evidence for contrastive uvular trill-tap is still questionable, while contrastive alveolar trill-tap is crosslinguistically well-established, as in, Kurdish, Huave, Basque, Catalan, Spanish and Portuguese (for review, see Sebregts 2015; Rennicke 2015). Sebregts (2015: 171) suggests that there are no instances of contrastive taps and single-contact trills in the languages of the world. Rhotic taps are commonly voiced, but a voiceless alveolar tap or 'fricative' tap has been also reported in European Portuguese as a 'weak-r' and 'strong-r' variant that occurs in a weak syllable position, namely, word-final (Jesus & Shadle 2005).

Alveolar taps were found to be limited to the intervocalic position environment in BP as in *caro* 'expensive', or in consonant clusters as in *prato* 'plate', or in very minimal cases in coda position in limited varieties of BP (Rennicke 2015: 32). Sebregts (2015) also found taps to be relatively infrequent in coda position and especially in word-final position in Dutch. Sebregts (2015: 178-179) shows that taps favour intervocalic position in Dutch. He also demonstrates that taps commonly also occur in word-initial, especially in initial consonant cluster onsets of the type *Cr* whereby a brief vowel occurs before the tap, which seems to maintain the intervocalic syllable position for the tap. Sebregts (2015) suggests that this brief vocalic element could also be as part of the tap – a diphthong-like. In BP, taps occurring in clusters also usually have a vocalic element similar to the vowel in the syllable nucleus; and she suggests that is not a schwa (Rennicke 2015).

In Arabic, Watson (2002) suggests that rhotic taps [ɾ] are the most common variants of r-sound in the varieties of Arabic. The alveolar tap in Arabic is characterized by a single apical closure, whereas a trill is more common in gemination (Youssef 2019).

After this synthesis on the articulation, acoustic, perception and distribution of rhotic taps and flaps, the next part will provide a presentation on rhotic fricatives.

2.2.3 Fricatives

Rhotics with fricative manner are constricted and characterized by a turbulent airflow going through a stricture at a designated point in the vocal tract. They could range in the point of articulation from alveolar, velar, uvular; and less commonly glottal as in BP (see, Rennicke 2015).

Ladefoged & Johnson (2011: 201 & 204) demonstrate that this turbulent airflow causes a noise which reads in a spectrogram as random energy with wide range of frequencies, and those frequencies in turn vary according to the point of articulation (cf. Figure 2.7 & 2.8, below). Rennicke (2015: 32) states that alveolar fricative rhotics are produced with a narrower constriction than alveolar approximant rhotics, and are a bit more forward. Ladefoged & Maddieson (1996: 217-230) suggest that rhotic trills usually have fricative and approximant variants that they attribute to failing in achieving the aerodynamic conditions of the trill (cf. Figure 2.7 & 2.8).

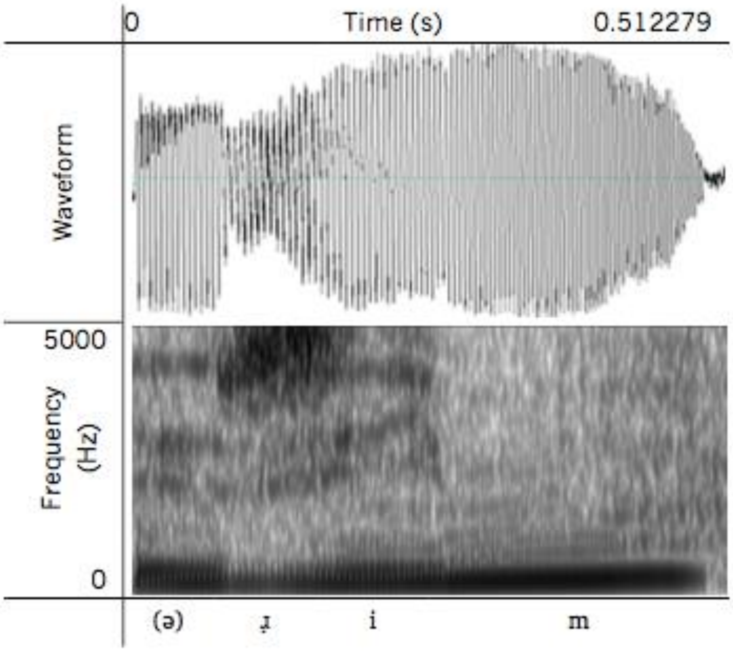


Figure 2.7: Voiced alveolar fricative in *riem* [(ə)ɹ̝im] (Sebregts 2015: 60)

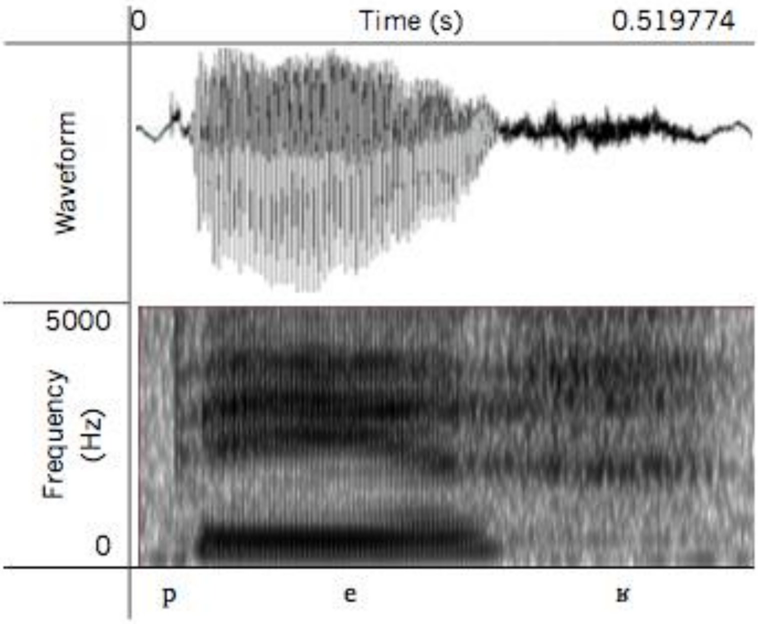


Figure 2.8: Voiced uvular fricative in *peer* [peʁ] (Sebregts 2015: 65)

There is a common diachronic and synchronic trill-fricative alternation pattern attested crosslinguistically (for a review, Bhat 1974: 91-92). This tendency favours word-final position, and less commonly word-initial position. It also occurs after front vowels or a palatalization process that triggers trills to become fricative. Bhat (1974) reports spirantisation to take place word finally in Albanian, Eastern Armenian, Somali, Turkish, Farsi, Hopi, Kunjen, Mbe, Mantjitjara, Kunimaipa. Also, in fronting environment in Basque, Carib, Albanian, Tswana, Czech and Polish. Spirantisation also occurs word initially in Pame, Sinhalese, Somali, Albanian, and Sa'ban.

As far as coronal Arabic rhotics are concerned, Shaheen (1979: 142-145) in his phonetic acoustic demonstration of Egyptian Arabic reports voiceless fricatives to occur word-final position. Fricative rhotics also occur in Tripolitanian Libyan Arabic when the alveolar rhotic is geminate (see, Issa 2017; and section 4.1.3, for further details). As far as dorsal Arabic rhotics are concerned, velar-uvular fricatives occur in some varieties of Levantine, Mesopotamian, and Maghrebi Arabic (cf. sections §4.1 & 4.4, for further details).

Now after this brief synopsis on rhotic fricatives, the next section will provide a phonetic and phonological overview for rhotic approximants.

2.2.4 Approximants

This part will synthesize a summary for rhotic approximants and their phonetic makeup. Approximant rhotics are produced with partial constriction which may range from the alveolar to the uvular regions. The active articulator (the tongue tip/body) could be curved backwards to make retroflexion; or the tongue briefly bunches against the roof of the mouth to articulate approximants. Approximant rhotics are phonetically represented with three cover symbols in the International Phonetic Alphabet notation system: [ɹ] for an alveolar approximant, and [ɻ] for a retroflex approximant, and ʁ̞/ʁ̞ for uvular approximants (IPA 2005).

The formant structure of approximants is like that of vowels due to the fact that the production of approximants is wider in stricture than as evident in fricatives (cf. Figure 2.9 & 2.10, below). Rhotic approximants are reported to have a lower third formant (Scobbie 2006). In a more original study, Engstrand, Frid & Lindblom (2007) demonstrate that front velar approximant r's[16] are acoustically similar to alveolar approximants in the second (F2); and are more similar in the third formant (F3). Below in Figure 2.11 is a demonstration on the Bark plane to show this similarity.

[16] The authors argue that front velars are closer to the alveolar region, and back velars are closer to the uvular region.

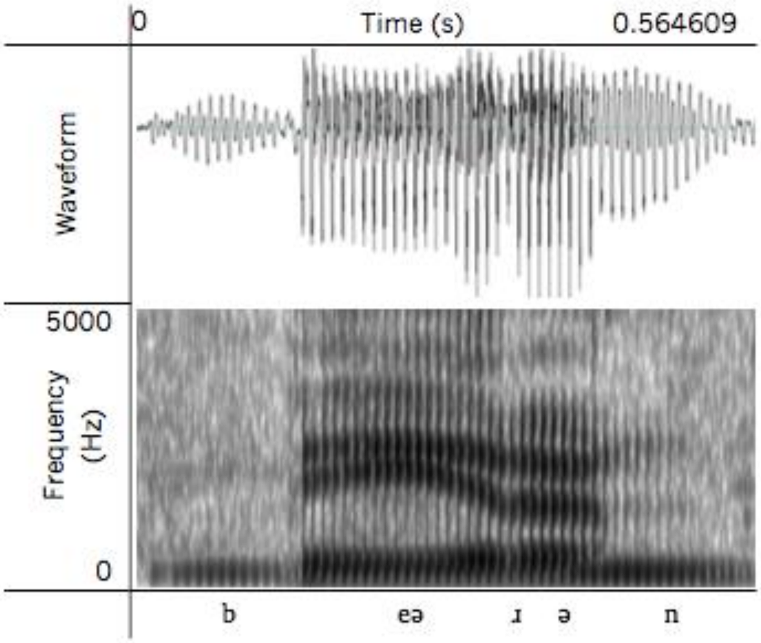


Figure 2.9: Voiced alveolar approximant in *beren* [beəɹən] (Sebregts 2015: 63)

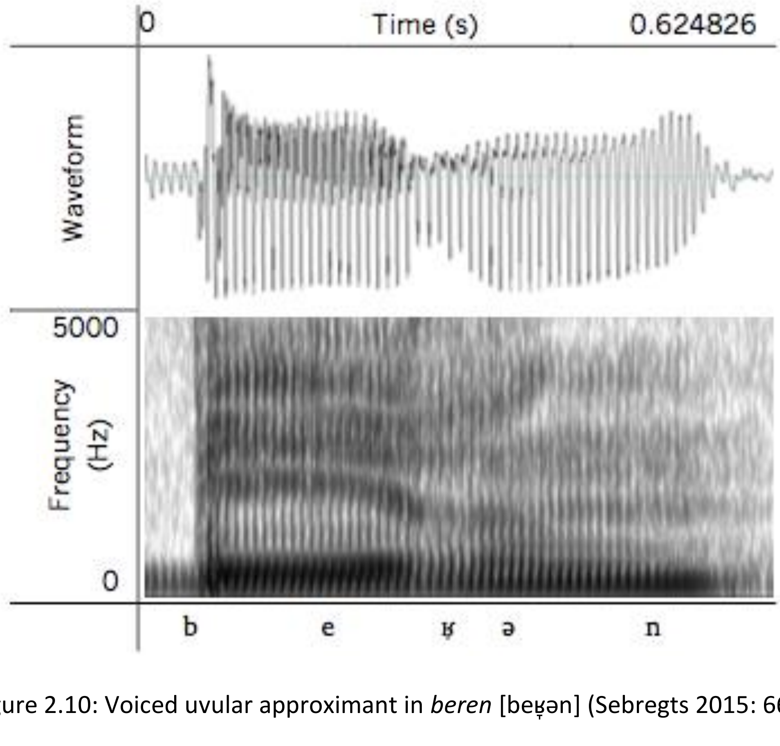


Figure 2.10: Voiced uvular approximant in *beren* [beʁ̞ən] (Sebregts 2015: 66)

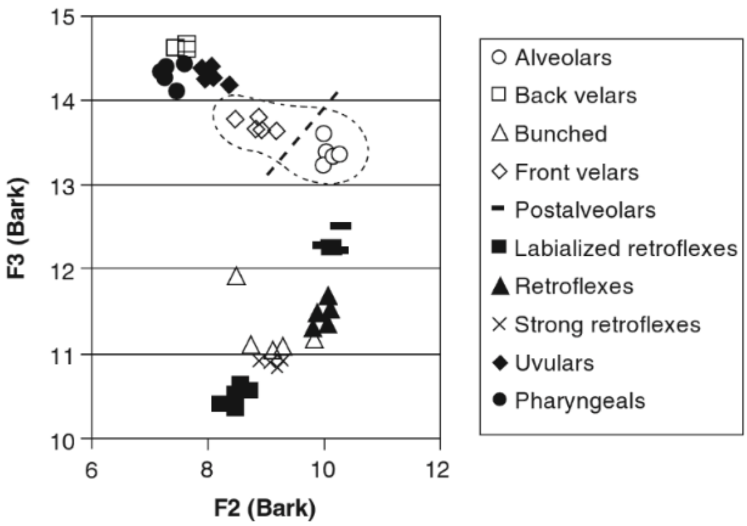


Figure 2.11: Rhotic types in the F2-F3 Bark plane. The dashed line used to distinguish the coronal 'circle' alveolars from dorsal 'rhombus' velar rhotics (Engstrand, Frid & Lindblom 2007: 178)

Delattre and Freeman (1968) conducted a study on English rhotics that has provided a better comprehension for the acoustic and perceptual aspects of approximants. Their instrumental study identified eight types of tongue shapes associated with approximant constrictions. Six of them are common in American English having two constrictions: one at the pharynx and another at the palate; and two in British English. Their results and findings show no direct correlation between tongue shapes of retroflex or bunched approximants; and their formants with F3 lowering. This in turn entails that listeners perceptually have no acoustic cues to decode any difference and so speakers just use both interchangeably achieving similar output.

Gick and Campbell (2003) conducted a similar experimental study utilizing ultrasound and video to study 'timing' of tongue gestures for rhotics in some varieties of English, which includes American, Canadian and British. They demonstrated that in the production of rhotics, the participants in their study use lip rounding, tongue root retraction and tongue body raising to articulate rhotics. Timing was measured for these gestures of /r/ in initial, intervocalic and final positions. Their results show that rhotics in initial position are constricted with lip gesture first, next the tongue body, then the tongue root. In intervocalic and final positions, there is little timing difference, but in word-final the lip gesture is sometimes reduced or obscured. Tongue mid lowering was found to pattern with anterior tongue body gesture rather than with the tongue root gesture, which suggests that the tongue mid lowering occurs as a mechanism to assist the tongue body raising gesture.

Scobbie and Sebregts (2010) conducted an ultrasound tongue imaging instrumental study on rhotics in Dutch. Through the speech of five language consultants, three of those speakers opt for bunched or retroflex approximants in coda position. One speaker alternates retroflex approximants with fricatives and alveolar approximants. Another speaker alternates a bunched approximant with uvular trills. They also reported retroflex and bunched constrictions of rhotics having a secondary pharyngeal articulation.

After this overview on approximant rhotics, the next part will present a synopsis of rhotic retroflexes.

2.2.5 Retroflexes

In her comprehensive monograph on retroflexes, Hamann (2003) identifies three post-alveolar r-sounds that have a retroflex constriction: a flap [ɽ], a central approximant [ɻ], and a trill [r̲]. These r-sounds, however, also exhibit a wide range of variation in place and manner of articulations.

The retroflex flap is obstructed in the apical region. "[T]he tongue tip is curled inwards and approaching the post-alveolar region but flaps out before the actual contact takes place" (Hamann 2003: 25). The retroflex flap could be also perceived or classified as stop once it is in complementary distribution with a voiced retroflex stop [ɖ] as it is the case in many Indo-Aryan languages such as: Sindhi, Hindi, and Panjabi (Masica 1991: 97).

During the production of a retroflex trill, the lower part of the tongue vibrates somewhere against the post-alveolar passive articulator. For some reasons beyond the author's understanding, there is still no IPA notation system symbol corresponding to the retroflex trill which occurs in Malayalam and Toda. Some scholars just developed their own such as that of Laver (1994: 220) using an underlined Roman-r as a cover symbol for retroflex trills [r̲], or the much older symbol Roman-r with a subscript dot [ṛ] adopted and recognized by Dravidianists. Hamann (2003: 26) suggests that there is "a language-specific" variation within the collective group of retroflex trills crosslinguistically.

The approximant [ɻ] is the last type of r-sound retroflexes. Dixon (1980) reports that the retroflex approximant and the retroflex stop emerge from the same region in the vocal tract. Such a speech sound is common in Australian languages. Articulatorily, this approximant retroflex exhibits no evidence for a forward co-articulatory tongue gesture unlike the other two types of retroflexes.

In Dutch, Sebregts (2015) describes the retroflex or bunched approximant to be different from the alveolar and uvular approximants we discussed earlier in section §2.1.4. Retroflex approximants are longer in duration and have more defined formants; and do not show 'weakening' of all formants as in plain approximants (cf. Figure 2.12, below).

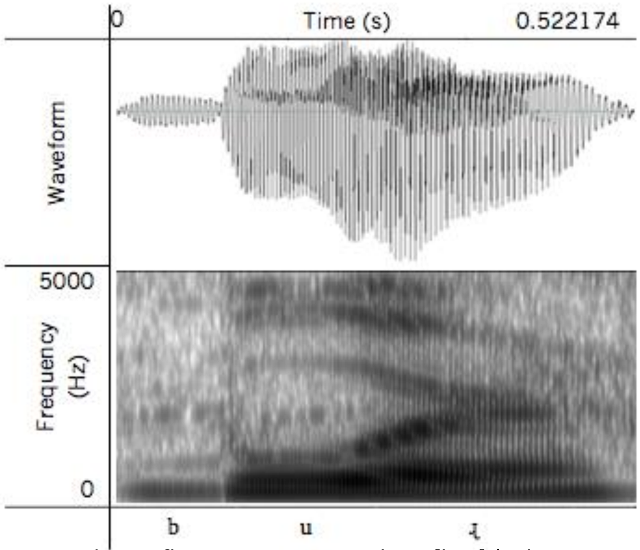


Figure 2.12: Voiced retroflex approximant in *boer* [buɻ] (Sebregts 2015: 67)

The retroflex approximant also shows a converging, almost conflating, formants of F2 and F3. Articulatorily, Sebregts (2015) is not certain whether this variant is the result of bunching the tongue dorsum, or tongue tip retroflexion. This retroflex rhotic is known in the Netherlands and Flanders as "Gooise *r*" (Sebregts 2015: 66).

This was a brief summary on retroflex rhotics. All of the five preceding sections were on consonantal variants of rhotics. The next part will be an overview on a quite different aspect of rhotics, namely vocalic rhotics.

2.2.6 Vocalic Rhotics

According to Rennicke (2016), vocalic outputs corresponding to (consonantal) rhotics are two folds in the suprasegmental realm: a syllabic vowel segment which is widely known as a schwa(r) or r-coloured that can be underlyingly a rhotic; or a schwa(r) vowel occupying the syllable coda. I will name the latter 'coda-diphthongization' rhotics.

2.2.6.1. Rhotic vowels

According to Ladefoged & Johnson (2011: 94-95), rhotacized vowels, also known as retroflex vowels[17], occur as a vocalic-r colouring when vowels are followed by [r] in what is conveniently known as 'non-rhotic[18]' varieties of English. They claim that if [r] is pronounced after a vowel then this variety would be 'rhotic'. Ladefoged & Johnson state that the rhotic varieties of English are the norm in most of the parts of North America. This also used to be the case throughout Britian in Shakespear time, and still, however, thrives today in the West Country, Scotland, and other regions distant from London (Ladefoged & Johnson 2011: 94). After it became a trend in the South East of England to lenite the postvocalic [r], this habit started to spread to areas of the United States, as in New England and parts of the South. They also state that these regions are 'non-rhotic' to some degrees. Standard BBC English, for instance, has diphthongs, a central vowel [ə], [ɪa], [ɛə], and even a centring diphthong for some which all correspond to [r].

Rhotacized vowels can occur in what is traditionally known as be stressed [ɝ] or unstressed [ɚ]. Rhotic vowels are rare and occur solely in less than one percent of the world languages (Maddieson 1984). They are known as r-coloured vowels, and they occur in the North American varieties of English, in the varieties of Mandarin Chinese, Dutch, and recently reported in BP (see Ladefoged & Maddieson 1996: 313-14; Sebregts 2015; and Rennicke 2016: 38-40, for further details). A common property of rhotic vowels lies in their acoustic structure in which they have been reported to always have a lowered third formant (Ladefoged & Maddieson 1996: 313).

In Dutch, Sebregts (2015) elicits three different vocalic rhotics that occur in spontaneous speech: a low-mid front vowel [ɛ]; a central vowel [ə]; and a low vowel [ɐ]. The low-mid front vowel [ɛ] is characterized by a presence of a formant similar to that of a front vowel (cf. Figure 2.13, below).

[17] (Ladefoged & Johnson 2011: 94).
[18] For a discussion on the term 'rhotic' and 'non-rhotic' (cf. §2.1, for more details)

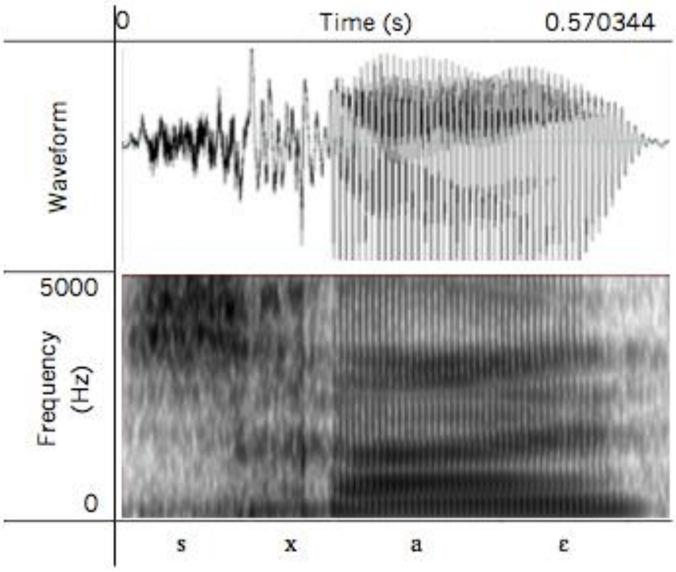


Figure 2.13: Low-mid front vowel in *schaar* [sxaɛ] (Sebregts 2015: 68)

The central vowel [ə] is characterized by an even spaced formants. The F2 and F3 are closer together which indicates that the tongue configuration is similar to that of a retroflex rhotic (cf. Figure 2.14, below).

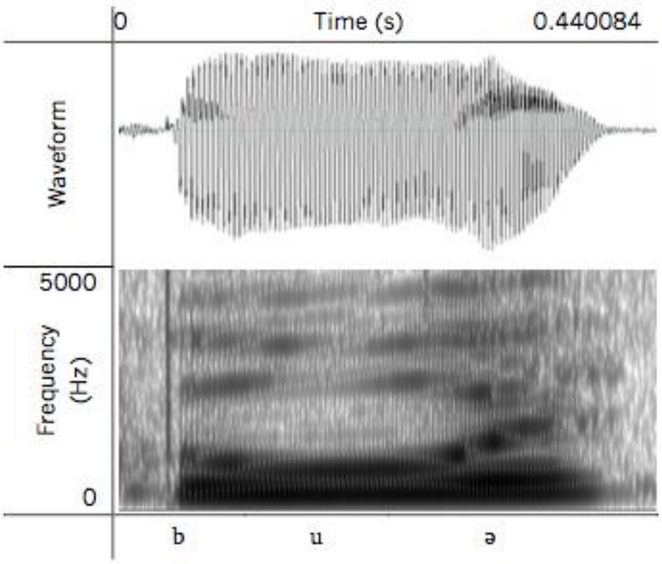


Figure 2.14: Central vowel in *boer* [buə] (Sebregts 2015: 69)

The low central vowel [ɐ] is characterized by a formant structure similar to low central or low back vowels. F1 is relatively high, and F2 is lowering to F1; which could suggest pharyngealization (cf. Figure 2.15, below).

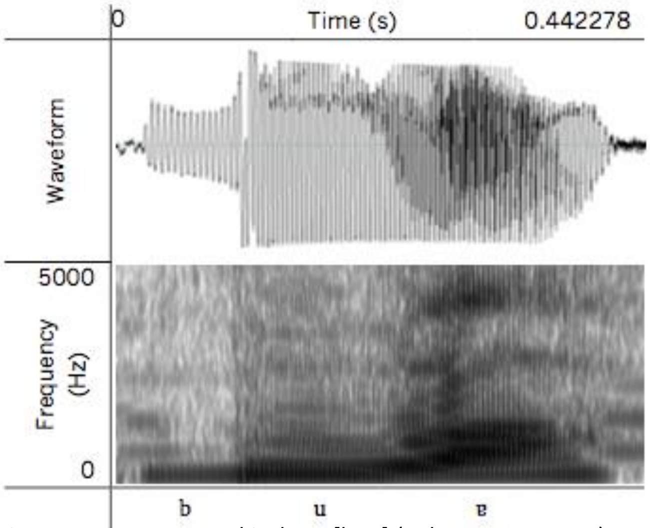


Figure 2.15: Low vowel in *boer* [buɐ] (Sebregts 2015: 69)

After this concise overview on rhotic vowels with some demonstration from Dutch, the next part will present a synopsis of a different type of vocalic rhotics.

2.2.6.2 CODA-DIPHTHONGIZED RHOTICS

Coda-diphthongization is a known feature for Received Pronunciation (RP) English. The schwa-like coda is acoustically similar to the vowel-retroflex sequences (Scobbie 2006). In the phonetic notation of (IPA), it can be sometimes represented by merely an unstressed central vowel schwa [ə]. Schwa-like coda reflexes of a rhotic segment have been also reported in Dutch and Scottish English (Sebregts 2014; Scobbie and Stuart-Smith 2015). The latter schwa-like segment is, in fact, a merger of the prerhotic vowels /ɪ/ /ɛ/ /ʌ/ in Scottish English.

Rennicke (2015) hypothesizes that "[t]hese transitions make for a diphthong-like sequence in which the transitions help cue the presence of a rhotic as much as reaching the target does. The retroflex/bunched target can thus be replaced by a centring diphthong, and the link between retroflex/bunched approximants and schwa is established".

After this brief synopsis about rhotic variation, and the phonetics and phonological aspects of rhotics. The next part will present a summary of this chapter.

2.3 Summary

This chapter had presented an introduction and definition for the term ‘rhotic’. The core focus of this chapter was also to provide a well-rounded description for rhotic sounds. This was a descriptive account of the manners of articulation in which rhotics occur. This description was, where available, articulatory, acoustic, perceptual, and distributional. This included rhotic: trills; taps & flaps; fricatives; approximants; retroflexes; and vocalic.

CHAPTER 3

Formal Representation of Rhotics

3.0 INTRODUCTION

This chapter will take us through the theory of speech sounds, and through the formal representation of rhotics from crosslinguistic evidence. Thus, this part of the thesis will synthesize a review for the phonetic and phonological theories, and formal representation of rhotics. Section §3.1 will begin with a presentation for a dominant theory in the study of phonetics and phonology – the Distinctive Feature Theory. This part will focus on the features crosslinguistically associated with the representation of rhotics, including the features: [SONORANT] (§3.1.1); [LIQUID] (§3.1.2) and [RHOTIC] (§3.1.3). Section §3.2 will present the Family Tree Model which is inspired by Wittgensteinian's (1953) philosophical concept of 'family resemblance'; which was first implemented by Lindau's (1985) acoustic study of rhotics. Section §3.3 will offer a review for accounts that used Exemplar-Based Phonology to represent rhotics. This part presents two accounts from two languages: Brazilian Portuguese and Dutch. The next section, §3.4, will provide contributions from Government Phonology on the representation of rhotics. This part shows that rhotics are composed of a vocalic simplex headed or non-headed |A| element; or a non-headed |I| element. The last section, then, will present a sum up for this chapter.

3.1 DISTINCTIVE FEATURE THEORY

In the neogrammarian tradition, sounds of a human language are represented by a single concrete speech sound called a *segment*. These small units, i.e. segments, can be systematically derived from an *underlying* cognitive representation known as a *phoneme*. A phoneme is a manifestation of a cluster of distinctive articulatory or auditory features. Since (Jakobson et al. 1952) earliest systematic attempts in providing a model of cognitive understanding for speech sounds, the aim has always been to 'classify' speech sounds into what later became known as *natural classes*. This grouping was based on abstracting distinctive sound 'features' that can capture the segment's characteristics and behaviour.

Kenstowicz (1994) in his handbook of generative grammar defines the sounds that pattern similarly in a language to be grouped as natural class. However, this basic definition leaves a wide margin for the many ways in which such sounds can be grouped together similarly. Phonetically, for instance, a natural class can refer to “a group of sounds in an inventory that share one or more phonetic properties, to the exclusion of all other sounds in the inventory” (Mielke 2008: 12). While phonologically, it could refer to “a group of sounds in an inventory that share one or more distinctive features within a particular feature theory, to the exclusion of all other sounds in the inventory” (Mielke 2008: 12). On a more confined spectrum comes the concept of an ‘active natural class’, which is defined as “a group of sounds in an inventory that do at least one of the following to the exclusion of other sounds in the inventory” (Mielke 2008: 12). They trigger a phonological process; undergo a phonological process; or present a static distributional restriction (Mielke 2008: 12-13).

Ladefoged & Maddieson (1996: 213) state that “[m]ost of the traditional classes referred to in phonetic theory are defined by an articulatory or auditory property of the sounds, but the terms rhotic and r-sound are largely based on the fact that these sounds tend to be written with a particular character in orthographic systems derived from the Greco-Roman tradition, namely the letter ‘r’ or its Greek counterpart rho”.

Chomsky and Halle (1968: 177), for instance, assigned the American English /r/ the features [+ vocalic], [+consonantal], [+coronal], [+voice], [+continuant]. This idea of a string of phonetic contents specification designated to classify the /r/ altogether, which is based on phonetic distinctive features, was proven elusive in capturing a unity for r-sounds. Even after many improvements on the SPE model to capture r-sounds (Kenstowicz 1994), it still suffered major drawbacks especially when confronted with articulatory variation of rs’ either within a single or across language(s) (Lindau 1985; Ladefoged & Maddieson 1996; Walsh-Dickey 1997; Wiese 2001, Chabot 2019, Natvig 2020). This is due to rhotics elaborate phonetic heterogeneity, and this in turn led to a disconnection between the phonetics and phonology of r-sounds (Chabot 2019, Natvig 2020).

After this very basic synthesis, we should now turn to the question: whether rhotics in fact belong to a natural class, and if so, in what way(s). In the next section, we will look at speech sound features connected to our cognitive (universal) understanding of rhotics.

3.1.1 THE FEATURE [SONORANT]

The loose term *sonorant* is problematic on the phonetic and phonological levels. Most of the research proposals on rhotics or liquids in the literature do not provide an explicit definition for the term 'sonorant' or its derivatives as used to describe a set of data (see Walsh-Dickey 1997; Chabot 2019; Natvig 2020, for instance). Phonetically, the term 'sonorant', also known sometimes by 'resonant', has been used in the phonetic literature to refer to non-turbulent phonation *continuity* and/or *voicing*, and this criteria fits: vowels, glides, rhotics, laterals, and nasals, from the most sonorous to the least, respectively. Ladefoged & Johnson (2011) defined 'sonority' of a speech sound as "its loudness relative to that of other sounds with the same length, stress, and pitch" (245). On a similar ground, Parker (2002) associates sonority with "a single, uniform acoustic property (intensity) as well as a single aerodynamic property (intraoral air pressure)" (218). On a wider scope, and acoustically, Lindau (1985) associates sonority with the presence of formants. Phonologically, Parker (2011) also defines sonority as "a unique type of relative, n-ary [non-binary] feature-like phonological element that potentially categorizes all speech sounds into a hierarchical scale" (1160).

However, 'sonority' in the literature of phonetics and phonology has been also used to refer to a number of different phonation *qualities* and could also differ according to the language being analysed. The following is phonological in nature, for instance, there are voiced stops in Southern Barasano, a Tucanoan language of Colombia, which are subject to an oral-nasal alternation as a result of nasalization harmony (Botma, Kula & Nasukawa 2013). Another instance that highlights the issue with the term sonorant comes from fricatives in Turkish where fricatives maintain voicing similar to sonorants in coda; both of which are known classically to belong to obstruents (see Botma 2011 for many more examples and issues with the feature 'sonorant').

More issues also have to do with the interpretation of sonority – at face value, in the fact that voicing is never crosslinguistically contrastive in sonorants which suggests that the so called 'sonorants' have a different configuration to laryngeal contrasts than in obstruents (cf. also Botma 2011). Other issues with the sonority feature has also to do with the sonority status of devoiced (aspirated) sonorants (cf. Botma 2011). Similarly, and in this this study, some rhoric variants undergo frication and devoicing in the acoustic signal, has to do with the 'resonance' status of some rhotic variants in Jewish Baghdadī-Baṣrāwī Arabic.

As can be discerned from this part, the basic understanding of the phonation quality or feature ‘sonorant’ is elusive. This in turn brings about more caution to how the feature ‘sonorant’ can be used to characterize ‘rhotics’. Now we can go to two narrower classical phonetic and phonological features which both have been associated with rhotics – the unspecified feature [RHOTIC]; or the underspecified feature [LIQUID].

3.1.2 THE FEATURE [LIQUID]

In their study of the sound patterns of English (SPE) which was inspired by Jakobson et al. (1952) and Jakobson & Halle (1956), Chomsky and Halle (1968) established the grounds for a static structuralist configuration that accesses a generative archetype of sound system based on binary segmental features, and for the first time organize the sounds into *classes* based on articulatory or auditory phonetic similarities. Since then, rhotics and laterals were believed to form a natural class – namely, the class of *liquids*.

The word ‘liquid’ is a calque from Latin *liquidus* which is etymologically derived from Ancient Greek <ὑγρός>, which in turn means ‘fluid’ or ‘unstable’; and the term was used to specifically refer to laterals <λ>, rhotics <ρ> and, nasals <μ,ν> (Allen 1973: 211; Walsh Dicky 1997: 1). In Latin, the word *liquidus* started to semantically narrow to refer to only laterals and rhotics; because solely both participated in poetic ‘fluidity’ (Walsh Dicky 1997: 1). In modern linguistics, the term ‘liquid’ has become synonymous with collectively l-sounds and r-sounds (Bhat 1974; Maddieson 1980; Ladefoged & Maddieson 1996; Walsh Dicky 1997).

Walsh Dicky (1997) in her research thesis on laterals and rhotics from crosslinguistic evidence, and adapting insights from Standard Generative Phonology (SGP), Walsh Dicky (1997) attempts to derive the sound category of laterals and rhotics from a structural configuration through a feature-geometric model. Walsh Dicky (1997) argues for only sonorant laterals and all rhotics to belong to a higher class category due to phonetic and phonological similarity in her language sample - the class of liquids. The feature [LIQUID] is defined as “a consonant with a vocal tract configuration which allows for spontaneous voicing without necessary use of the nasal cavity” (Walsh Dicky 1997: 140). Phonologically, Walsh Dicky’s (1997) argument for the existence of a higher class category which serve a need for the feature [LIQUID] to combine sonorant laterals and rhotics, was supported by a number of pieces of evidence: (a) phonotactic restriction – prohibition in word-initial position in 8 languages; (b) Total assimilation of nasals only to liquids – English *in-legal* →

[ɪlijgəl], *in-responsible* [ɹijspɑnsɪbəl]; (c) Deletion – in the Australian language Djaru a retroflex lateral gets deleted only before a liquid consonant; (d) OCP restrictions on liquid clusters - rhotics and sonorant liquids are not allowed to cooccur in the Australian languages Yidiny and Gumbaynggirr; and on a morphemic level, in Javanese, only one liquid is allowed in a root; (e) Similarity in dissimilation patterns with other sounds, and favouring assimilation with one another in cases of dissimilation (Walsh Dicky 1997: 154-169).

Walsh Dicky (1997) also argues that there is a necessity for the feature [LIQUID] over just using the features [+SON, +CONS, -NASAL]. One instance in favour of this argument, is that the feature [LIQUID] is needed to capture a contrastive plain and nasalized trills in Igbo. Another argument has to do with maintaining 'privativity' of the positive phonological specification of the feature [NASAL] by which Walsh Dicky argues that it will not be possible to distinguish sonorant laterals and rhotics from nasals using the string of features: [+SON, +CONS, NASAL].

The takeaway from Walsh Dicky's proposal on her study of liquids, is that all rhotics share a structure on a branching place node with an underlying coronal and dorsal specification. However, although this might be accurate for taps and trills in languages like Russian and Spanish; and in languages with similar approximants to American English and Dutch, the lack of coronal gesture in Danish, French pharyngeal rhotics, labiodental r-sounds in English; or the lack of dorsal gesture in some taps in Catalan can posit some questions to these realizations (cf. Sebregts 2015: 233; Rennicke 2015: 15, for review).

Now we can proceed to look at even a narrower phonetic and phonological feature associated with rhotics – the unspecified feature [RHOTIC].

3.1.3 THE FEATURE [RHOTIC]

In his monograph on the phonology of coronals drawing empirical evidence from 120 language varieties, Hall (1997) dedicated a chapter to the feature specification of r-sounds. Through an alternative proposal to the specification model we discussed above, Hall (1997) uses underspecification theory and assigns an empty phonetic content for r-sounds - the feature [+RHOTIC], based on empirical evidence from many languages. Underspecification simply means that features are not specified on the underlying level, but captured at a later stage through derivation so this leaves room for capturing variation. As rhotics are heterogeneous even within a single language, as for instance in the Dravidian language Toda

(Hall 1997: 105-106), this in turn posits a challenge to the feature-based approaches in phonological analysis. That is, in the abstract representation of a minimalist speech unit, i.e. a phoneme, features are captured through binary values (+/-). This entails no two distinct sounds to have the same featural basis; otherwise they will result in overlap or interfere in production and perception. He also makes a phonological classification by assigning the feature [+RHOTIC] to potential candidates which display allophony, since they display similar phonotactic patterns, to the exclusion of other consonants including laterals. Hall's (1997) proposal, though, does not provide an explanation for the learnability and mapping of r-sounds as being 'unspecified'. Gąsiorowski (2006), for instance, labels such attempts, i.e. 'underspecification' or 'unspecification', as "an admission of defeat" or "desperate". Sebregts (2015) also believes that this proposal is 'ad-hoc' and because of its unrestrictive nature, it does not confine the rhotic class. In other words, any sound can be captured vacuously by this feature. Furthermore, it does not communicate cognitive information about the rhotics and how they can be mapped/learned.

Similarly, and on the same line as Hall (1997), Natvig (2020) attributes the conflicting phonological behaviour of r-sounds to a lack of positive content in their formal representation. By using a Modified Contrastive Specification model and a modular organization of sound system, he puts forward a representational crosslinguistic definition for [LIQUID] and [RHOTIC]. He defines [LIQUID] as the underspecified non-nasal sonorants, and [RHOTIC] as the unspecified sonorants with a negative or empty phonetic content due to the elaborate variation r-sounds exhibit on the phonetic level. His proposal makes rhotics in oppositional position to all of the other phonemes. The backbone of Natvig's proposal is somehow similar to that of Hall's (1997) [+RHOTIC] but conventionally different in its own realizations and theoretical implications. Rennicke's (2015) findings in BP rhotics suggest non-sonorant glottal fricatives [ɦ] ~ [h] as a common variant of r-sounds.

Although earlier phonetic proposals assign an empty or unspecified phonetic content for r-sounds [+RHOTIC], others, attempt to derive the unity of rhotics from a structural geometric configuration (Walsh Dickey 1997). On the same line with previous insights from SGP, Walsh Dickey (1997) attempts to derive the class of rhotics from a structural configuration through feature-geometry model. In her proposal, rhotics are captured by having a branching place node with underlying specification for both coronal and dorsal and a non-primary Laminal node. Walsh Dickey (1997: 71) also argues that rhotics are a “polymorphous” sound category characterized by a set of overlapping phonetic features. Scobbie (2006) argues that since rhotics are very heterogenous and many sounds can function as a rhotic, it is perhaps plausible to see what they are not: not labial, not lateral, not palatal, but oral lingual sonorants. He in turn suggests that because of their intrinsic complex articulation i.e. involve an apical and a pharyngeal element, it is possibly a basis of their susceptibility to variation and change. Although this change may initiate a makeover of their phonetic identity or content; it does not change their function in the language system.

In another proposal, Wiese (2001) differs with his approach towards rhotics from the preceding scholar. He does not propose a phonetic unifying feature, but he examines the phonology of rhotics in their phonotactic structure on the Sonority Sequencing Principle (SSP). Rhotics occupy a fixed point on the sonority scale located between laterals and glides towards the vocalic end (cf. Figure 3.1, below). However, there are some challenging issues with this model as there are glides and r-coloured vowels as variants of r-sounds in Dutch (Sebregts 2015). Rennicke’s (2015) findings also posit another challenge to this model as the non-sonorant glottal fricatives [ɦ] ~ [h] are at the opposite far end as obstruents. Sebregts (2015: 233-234) also argues that the sonority scale is in fact a ‘theory-internal’ hypothesis and this proposal cannot capture an actual articulatory features of rhotics.

obstruent < nasal < lateral < rhotic < glide < vowel

Figure 3.1: Wiese (2001: 355) proposal for the fixed point of r-sound on the sonority scale.

At the same time, most of such theory-driven analyses seek for a potential uniform link amongst r-sounds not on a surface level, but at a deeper abstract level. Thus, on the one hand, some scholars treat r-sounds as an umbrella term and a class of sounds from an orthographic convention (cf. for e.g. Maddieson 1984, and Hall 1997). On the other, those who attempt to establish an articulatory link such as a demonstrated non-primary Laminal node across all the rhotics (Walsh Dickey 1997), or those who hypothesize an acoustic correlate for some of the r-sounds, such as a lower third formant (F3) (Lindau 1985). Sebregts (2015: 287), however, believes that these attempts are merely ‘ad-hoc’ and insufficient for analysing r-sounds, and for this reason rejects any similar demonstration in capturing the unity of r-sounds from synchronic abstract universal representations in the phonological theory. Wiese (2001) provides some statistical tendencies for the behaviour of rhotics crosslinguistically.

Wiese (2001: 340) draws some possible generalizations for the phonological behaviour of /r/, (also from Ladefoged & Maddieson 1996; Hall 1997):

1. Rhotics are adjacent to vowels in any language allowing consonant clusters and the syllable shape is CrVrC.
2. Rhotics often have a syllabic variant.
3. r-sounds, synchronically and diachronically, of one type often alternate with r-sounds of another type.
4. If r-sounds alternate with one another, the phonotactics of these rhotics do not change.
5. Phonological constraints on /r/ and any similar generalizations can refer to it without any reference to the type of /r/.

In an investigation in support of substance-free phonology for the understanding of rhotics, Chabot (2019) suggests that although rhotics phonetically exhibit elaborate and fine variation crosslinguistically, rhotic variation in phonological processes does not interrupt the process itself – 'Procedural Stability'. That is, phonological processes in rhotics remain intact regardless of this variation in phonetic outcome. Another characteristic of rhotics is that with this variation that could be also diachronic, their phonotactics still remain intact – 'Diachronic Stability'. Thus, his proposal is in support of substance-free phonology and that the phonology of rhotics does not have reference to specifications that guide their surface forms, and that these variants or forms are conditioned by language-specific phonological systems and not linguistic universals. Thus, Chabot believes that such attempts of principled criteria in defining and classifying rhotics are 'arbitrary' although the same principled criteria worked well for other phonological classes. His proposal on rhotics shows us that the relationship between phonetics and phonology can be arbitrary, but at the same time still functional.

In a first attempt to study and model the phonology of Arabic r-sounds, Youssef (2019) surveys the phonological behaviour of rhoitcs in: their distribution, their contrastive minimal pairs, their phonological processes as triggered or targeted by r-sounds, and their behaviour in loanword phonology. His analysis follows a contrast-based model of feature geometry to formally capture Arabic rhotics. He adopts Parallel Structures Model (PSM) which is a minimalist and contrast-based rooted in feature geometry. In this model, consonant and vowels show 'parallel structures', and uniform features for laryngeal, manner, and place articulations. In Figure 3.2 below, each laryngeal, manner, and place feature is attached to a C-class or V-class node.

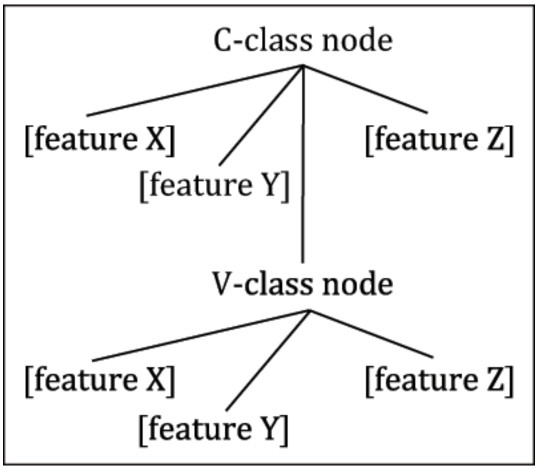


Figure 3.2: PSM basic geometry (Youssef 2019: 4)

The V-class node is in dependency relationship with C-class node. Rhotics can have both a C- and V-terminal features, but vowels have only the latter. In the PSM, there are three basic node types that attach to the C-class and V-class nodes. The C-place node and its daughter V-node have a 'place' tier which consists of the three main place features: [labial], [coronal], and [dorsal]. The C-manner node and its daughter V-node consists of the features [open] and [closed]. The 'laryngeal' tier has the same architecture. However, Youssef (2019) uses only C-laryngeal [lax] to differentiate voiced from voiceless obstruents.

Thus, he argues for a minimal or underspecified distinctive features for Arabic rhotics and a semi-arbitrary relationship between phonetics and phonology. Youssef (2019: 28) also shows an empirical evidence that challenges Chabot's (2019) formal representation of rhotics' 'diachronic stability' principle - which dictates that despite all this variation in rhotics, their grammatical rules do not change, by "[t]he new /ʁ/ sound has wholeheartedly melted with the fricative /ʁ/ phoneme, and no longer behaves as a sonorant" in the uvular-r group he proposed (cf. Figure 3.6, below).

In his typological and phonological realizations, Youssef (2019) arrived at four major micro-typological Arabic rhotics. (a) the split-r group type - which is characterized by a plain-pharyngealized /r/ ~ /rˤ/ contrasts (cf. Figure 3.3, below), evident in: the varieties of Maghrebi Arabic, the Egyptian Arabic as spoken only in Sudan and Egypt; Nigerian and Chadian Arabic, and also Anatolian Arabic only in south-eastern Turkey.

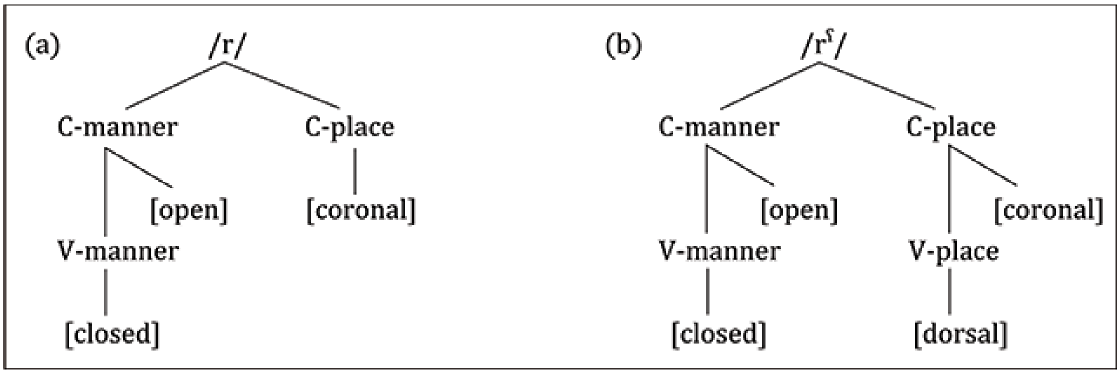


Figure 3.3: Representation of /r/ and /rˤ/ in the split-r group (Youssef 2019: 13)

(b) the emphatic-r dialect group type – which is categorized by an underlying pharyngealized /rˤ/ with an allophonic plain [r] (cf. Figure 3.4, below); attested only in Levantine Arabic as spoken in Syria, Palestine, Jordan and Lebanon.

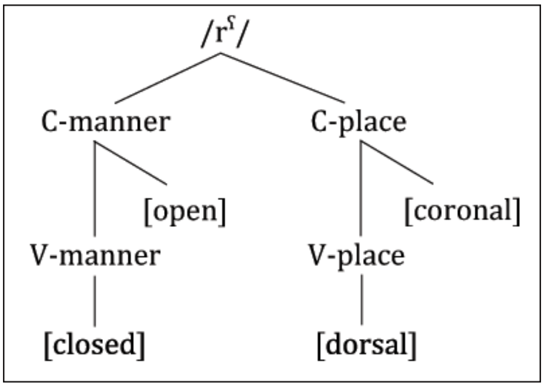


Figure 3.4: Representation of /rˤ/ in the emphatic-r group (Youssef 2019: 19)

(c) the plain-r group type – which is marked by a phonemic plain /r/ and a pharyngealized [rˤ] in complementary distribution (cf. Figure 3.5, below); evident in: Mesopotamian *gələt*-Arabic in Iraq, Kuwait, northeast Syria and Iran, Peninsular Arabic, and the Arabic varieties spoken in Malta, Cyprus, Uzbekistan, Juba and Nubia, the last varieties maintained only plain /r/

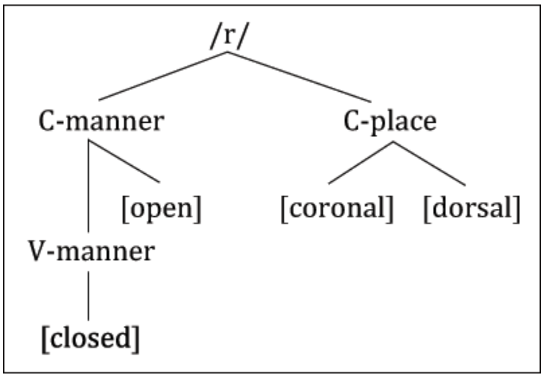


Figure 3.5: Representation of /r/ in the plain-r group (Youssef 2019: 23)

(d) the uvular-r group type – which exhibits an underlying uvular fricative phoneme /ʁ/ with an alveolar tap-trill /r/ phoneme (cf. Figure 3.6, below); evident in: Mesopotamian *qəltu*-Arabic in the Tigris and southern Kurdistan groups as spoken in and around the areas of Tikrit, Mosul and Kirkuk, the Jews and Christians in Baghdad and Southern Iraq, and in some urban dialects of Maghrebi Arabic (Youssef 2019: 24, for more details).

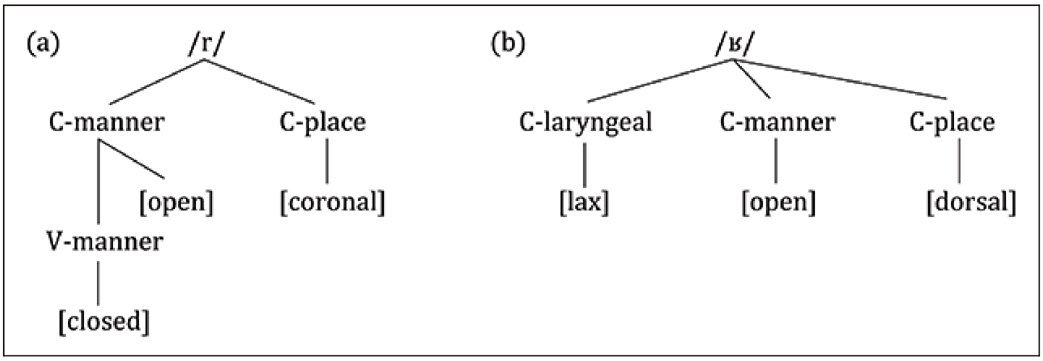


Figure 3.6: Representation of /r/ in (a), and /ʁ[19]/ in (b); in the uvular-r group (Youssef 2019: 28)

In his articulatory and acoustic perceptual account of rhotics, Howson (2018) argues for the validity of the natural class of rhotics and that their unity lies in acoustic-perceptual and articulatory characteristics. He conducted one acoustic, and two ultrasound studies on Upper and Lower Sorbian rhotics. He also conducted an ultrasound study on rhotic variants

[19] Again as discussed earlier below Figure 3.2, the feature [lax] is used to distinguish voiced from voiceless obstruents.

in Brazilian Portuguese, and a perceptual study on rhotic variants by English native speakers. His findings demonstrate that all rhotics in both Brazilian Portuguese and Sorbian were characterized by a tongue root gesture coordination with a tongue tip or body gesture. Moreover, he found that secondary palatalization in Upper Sorbian show a tendency of avoidance or delay in constriction with rhotics which he attributes to constraints associated with the tongue root conflicting configuration. Last but not least, his perceptual experiment demonstrates a similarity in perception between the rhotics /r/, /ɻ/, and/ʀ/. He attributes this perceptual similarity to their similar acoustic signal on the second formant (F2). Howson (2018) also suggests that this perceptual similarity can also explain the implicational universal tendency for the lack of large rhotic inventories in the languages of the world. Liquid inventories of more than 2 rhotics and no laterals are not yet attested, whereas liquid inventories of up to 6 laterals and no rhotics are attested (cf. also Maddieson 1984).

Now, after having shown this synthesis of different presentations for rhotics on the distinctive feature theory, we will turn to a different model that looks for a connection amongst the different variants of rhotics instead of uniform classification.

3.2 The Family Tree Model

Attempts in describing r-sounds from perceptual, acoustic or phonological properties started to gain more appeal in showing more plausible explanation for a potential connection between the members of this sound category. Recent proposals adapt Wittgensteinian's (1953) philosophical concept of 'family resemblance' to look for ways to connect rhotics in one way or another. Lindau (1985), for instance, argues for phonetic parameters arriving at classification based on acoustic properties of different variants of r-sounds from empirical evidence from American English, Southern Swedish, Hausa, Edo, Yoruba, and French (cf. Figure 3.7, below). This model assumes that each variant of the rhotics resembles the other members in one or more property(s) either in manner or point of articulation. For instance, coronal trills [r] and coronal taps [ɾ] are similar in 'closure duration' and 'spectral energy distribution'; dorsal trills [ʀ] and coronal trills [r] in 'pulse pattern' etc. as these are demonstrated in Figure 3.7 below with key information on the diagram corresponding to the phonetic parameters on the left. Lindau also proposed an acoustic correlate associated with many variants of rhotics, especially approximants, but not all rhotics - a lowered third formant. Sebregts (2015: 28-30) states that the shortcoming of this model is it focuses only on synchronic evidence while a great deal of information on the relationship and development of r-sounds is encoded in diachrony. Similar realizations has been also put forward by Ladefoged & Maddieson (1996: 245) on the historical connections between the rhotic variants and their unity.

a1 Pulse pattern (trill)
a2 Closure duration
a3 Presence of formants (sonorant)
a4 Presence of noise
a5 Spectral energy distribution (place of articulation)

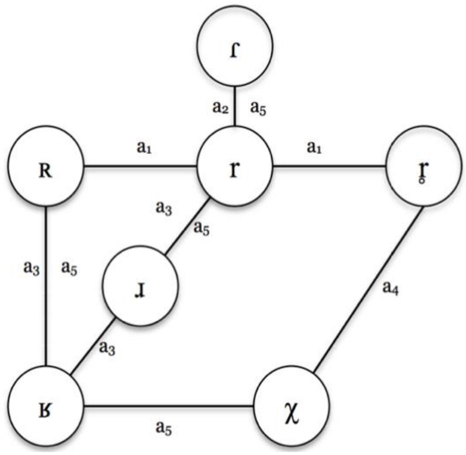


Figure 3.7: The rhotic ‘family resemblance’ parameter model as proposed by Lindau (1985: 167).

Later, Magnuson (2007) takes Lindau’s model of rhotics from ‘family resemblance’ to ‘family interrelations’, and establishes a two vocal tract model: a laryngeal/pharyngeal vocal tract (LPVT); and an oral vocal tract (OVT) (cf. Figure 3.8, below). He also incorporates more r-sounds, r-coloured vowels, to the model and aligns the place and manner of articulations into two organized and elaborate axes: horizontal representing the front and back oral cavity vis-à-vis the point of articulation, and a vertical axis for manner of articulation with complete closure at the top, and r-coloured or lenited r-sounds at the bottom. More importantly, this model designates a momentary closure and sustainable articulation which helps in distinguishing between trills and taps, where only trills can be sustained (Rennicke 2015: 38). Lindau’s and Magnuson’s models both attempt to answer the long standing problem of ‘what makes a rhotic/r-sound?’. Both instead tries to establish a ‘resemblance’ amongst r-sounds (Sebregts 2015: 279).

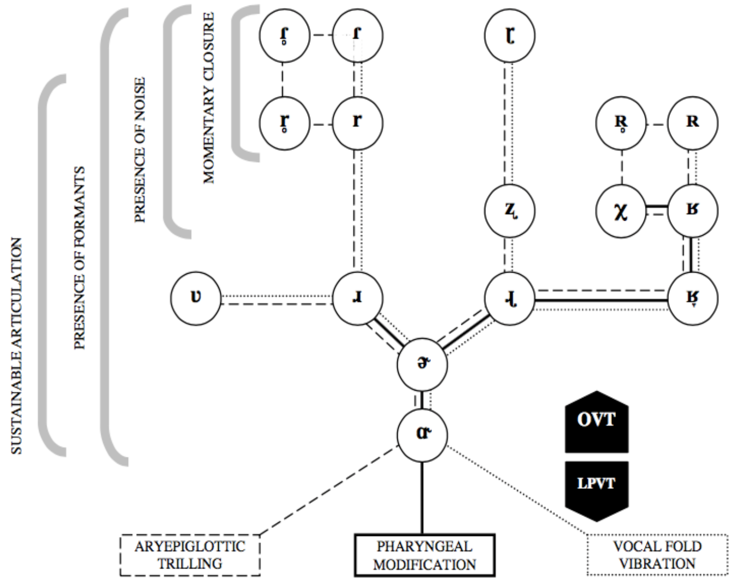


Figure 3.8: The rhotic ‘family interrelation’ parameter model as proposed by Magnuson (2007: 1195).

Sebregts (2015: 28-29) maintains that there still some fundamental issues in both of these models presented by Lindau and Magnuson. For instance, he questions whether resemblance alone can be a basis for any classification of rhotics. He demonstrates that although [s] and [r̥] both exhibit an evident turbulent noise and share the same place of articulation, and [l] shares place of articulation with [r], neither [s] nor [l] can be considered rhotics. Thus, he argues that ‘resemblance’ alone cannot be taken as a phonetic characteristic to classify rhotics. “This means looking at relationships between sounds, as if investigating family lineage, instead of mere resemblances. The main point here is that rhotics seems to be not a universal or fixed class of sounds; rather, they form a language-specific class defined by the phonotactics and phonetic variation of the language in question” (Rennicke 2015: 13).

After this review of Wittgensteinian’s family model, the next section is still inspired by Lindau’s ‘family resemblance’ proposal, but utilizes an Exemplar-Based Phonology to model our understating of rhotics in two different languages: Dutch and Portuguese.

3.3 Exemplar-Based Phonology

Exemplar-Based Phonology (EBP) representation and processing of usage-based information is derived from the school of cognitive psychology, and it involves the use of hints from the individuals' memory to represent and process information. Exemplar Theory, then, "is a theory of the representation and processing of categories in which stimuli are processed by comparing them to a set of previous experiences stored in memory" (Frisch 2017: 553). Thus, unlike in Generative Phonology or Government Phonology, representation in this model is not 'static', 'underspecified' or 'abstract'.

By using a diachronic-functional model to describe the evolution, development and variation of Dutch rhotics, Sebregts (2015) proposes a lenition rooted explanation to arrive at 'family relationship' model for rhotics in Dutch (see Figure 3.9, below).

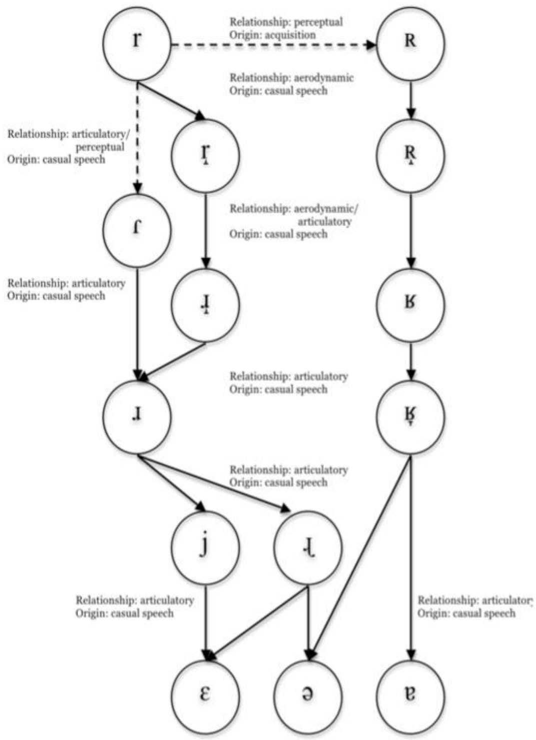


Figure 3.9: Family relationship between Dutch r variants as proposed by Sebregts (2015: 281). Place of articulation on the x-axis and manner on the y-axis.

This family relationship model was inspired, as many subsequent studies on rhotics, by Lindau's (1985) "family resemblance" model (cf. Figure 3.7, above). Sebregts's proposal also demonstrates that the core process that rhotics undergo, though not exclusive, is also lenition. He also assumes that this model should apply to any other language. Sebregts (2015) indicates that his model has some drawbacks: one in capturing a bunched approximant or retroflex [ɻ] because there are two ways to articulate this output; and another has to do with representing a contrastive allophonic palatal glide [j] in two distinct environment, as it surfaces word-final and after high front vowels.

Rennicke (2015) as well adopts a similar approach by using a Complex Adaptive System method in an EBP framework to model rhotics in (BP) on the basis of lenition processes in a 'family relationship' archetype (cf. Figure 3.10, below). Rennicke combines the historical accounts of sound change and the relationship between rhotics in one model to capture r-sounds' diachronic and synchronic lenition in BP.

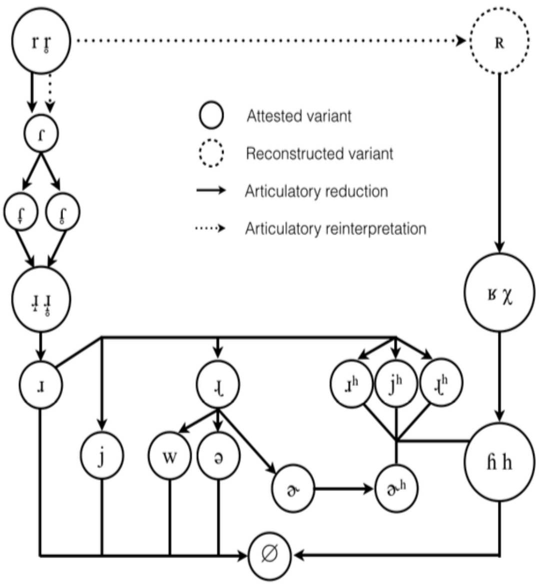


Figure 3.10: Rhotic relations in BP as proposed by Rennicke (2015: 239). Place of articulation (x-axis) and manner of articulation (y-axis).

One of the major findings of this study is that the relationship of rhotics always language-specific. Rennicke (2015) suggests that rhotics can capture any articulatory range allowed by the language. In other words, "[t]he virtually infinite range of articulatory possibilities for rhotics cross-linguistically once again underlines the non-descriptive nature of the term rhotics: rhotics are not always "rhotics". There is no articulatory or phonetic property necessarily shared by all rhotic variants in a language, which is why the class of rhotics across languages is featurally, articulatorily, and phonetically unspecified, and most importantly, what can be labelled a rhotic is always language- specific" (Rennicke 2015: 252).

After this brief synopsis of two examples and presentations of Exemplar-Based Phonology approaches to rhotics, we will now turn to a recently developed research program that mirrors acoustic signal and see what it has to offer for our understanding of rhotics.

3.4 Government Phonology & Element Theory

Attempts from non-linear models like autosegmental phonology were also important in representing rhotics. One of these research programs is Standard Government Phonology framework (GP) which was first developed by Jonathan Kaye, Jean Lowenstamm and Jean-Roger Vergnaud in the 1980s, but the first serious step was in 1985 (Kaye et al. 1985). GP is a 'restrictive framework' that looks at the phonological behaviour of speech sounds; and promotes less specification compared to the previous approaches through melodic representation. The 'restrictiveness' of the framework lies in its key tools of 'government' and 'licensing'; alongside the elimination of the structural unit of the 'syllable'. GP was also developed at a later stage by Kaye et al. (1990) and Charette (1991); and we will review GP in details in chapter 8 later on. Until today, there are four main presentations and review of the theory: Charette (1991); Harris (1994); and Gussmann (2002), Scheer & Kula (2017).

A critical component of GP is Element Theory (ET) which is based on elements associated with broad phonological characteristics derived from the acoustic signal to arrive at melodic representations. This melodic representation contains elements arranged on their own tier below the skeletal tier. An Element Calculus is used to convert the melodic representations into metrics of unary features that could be interpreted phonetically (Kaye et al. 1985; Harris & Lindsey 1995).

The elements are the 'internal representation' of the listener's auditory input, and this input is pattern templates as 'resonance' properties (Harris & Lindsey 1995). These elements are composed of basic 'primes' of vowels that can be interpreted as 'place' elements which are known as the 'triangle' hot features (Kaye et al. 1985). These are the |A| element (with central spectral energy, and high F1 [F1– F2 convergence]) [- high]; |I| (with high F2 [F2 – F3 convergence]) [-back]; and |U| (low spectral peak [F1 – F2 convergence]) [+round] (Kula, Botma & Nasukawa 2013; Scheer & Kula 2017). These three elements can be independently interpreted as /a/, /i/ and /u/ in nuclear position; or /ɹ/, /j/, and /w/ in non-nuclear position, respectively (Backley 2011). For instance, in a five-vowels language system, elements can be specified in a 'dependency' and 'headedness' manner with a combination as: |A.I| for /e/; and |A.U| for /o/; and in a seven-vowel system that distinguishes between high mid and low mid vowels /ɛ/ & /ɔ/: /ɛ/ would be headed |I.A̲| element, and /ɔ/ as headed |U.A̲| element (Botma & Nasukawa 2013) (cf. 8.1.1 & 8.1.2, for more details on ET). There also three 'laryngeal' or 'manner' elements |ʔ.L.H| which complements the place elements we discussed earlier (Harris & Lindsey 1995; Kula, Botma & Nasukawa 2013). The |ʔ| element is independently interpreted as a glottal stop and is characterized acoustically by 'abrupt' and 'sustained fall' in amplitude which can include non-continuant segments, such as stops. The |L| element represents 'voicing' and 'nasality', and is characterized by 'periodicity'. The |H| element represents 'voicelessness' and 'frication', and is characterized by 'aperiodicity' (Kula, Botma & Nasukawa 2013; Scheer & Kula 2017). Thus, this makes up a total of six elements |A.I.U.ʔ.L.H| in the most recent version of ET (cf. 8.1.3, for more details).

Proposals for the representation of rhotics that adopted ET within a broader GP framework, for instance, Broadbent (1991), Backley (1993), Harris (1994), for English; Ploch (1993) and Brockhaus (1995), for German; Torre (2003) for Dutch; Nasukawa & Backley (2011), for Japanese; Bellem (2007), for Arabic; or Backley (2011), crosslinguistically; represent rhotics as having a vocalic simplex headed or non-headed |A| element, which is characterized acoustically by a high first formant (F1 – F2 convergence); or a non-headed |I| element which is characterized by high F2 (F2 – F3 convergence) (Backley 2012).

Brockhaus (1995) in her study of final devoicing in German argues for |A.@| to represent rhotics. The neutral element |@|, which is not used in ET anymore, utilized to signify 'empty' nuclear position and 'velarity' for consonants. The |@| element can be attached to an onset to capture [ɐ̯], i.e. vocalic-r. This representation shows an alternation between two underlying variants of rhotics: one is consonantal-r, and another is vocalic-r. Vocalic-r occupies a coda position as [ɐ̯] unless it is followed by a vowel then it would be /r/. In other words, it is 'lenited' in weak environment. The consonantal-r, thus, is composed of |@| as a 'head' and |A| as an 'operator' in onset position, whereas in coda where [ɐ̯] is present, both elements are available but only |@| is licenced. There is also a case of /ər/ sequences which is realized as [ɐ] – a slightly longer variant than [ɐ̯], which suggests that [ɐ] perhaps occupies two positions instead of one as in the case of [ɐ̯]. Brockhaus (1995) argues that in the case of [ɐ] spreading occurs from the root node sharing the element features of the onset (cf. Figure 3.11, below). The main characteristic that distinguishes /r/ from /l/ or

/n/ in German is that it is composed of elements found in nuclear position and for this reason it consistently spreads into an 'empty' nuclear position to its left.

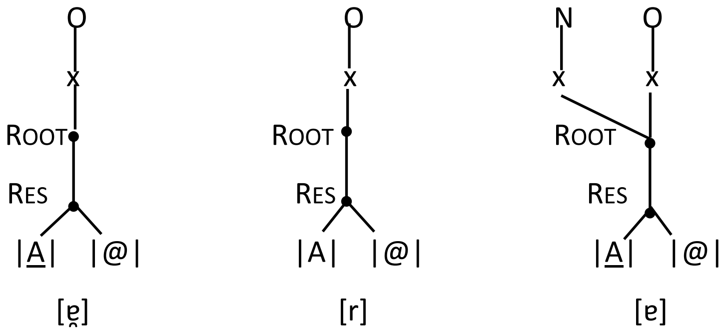


Figure 3.11: Representation of /r/ in German (Brockhaus 1995: 230-232)

Bellem (2007) in her comparative study of the typology of 'emphatics' in the Semitic sound system and into Arabic proposes a structural or contour view in the representation of dorsal(ized) consonants within the element theory in GP. Her proposal is inspired by Nasukawa & Backley (2005) and consists of a 'core' and optional 'offshoot'. The 'core' comprises a root node (ROOT) which carries the manner elements |ʔ.L.H| and resonance nodes: resonance (RES) where the place elements |U.I| are attached, and fundamental that carries the place element |A|. The 'offshoot' is a modifier node (MOD) which carries secondary features that are not necessarily present in all segments: either in non-nuclear position |ʔ.L.H| or in nuclear position |A.I.U.ʔ.L.H| (cf. Figure 3.12, below).

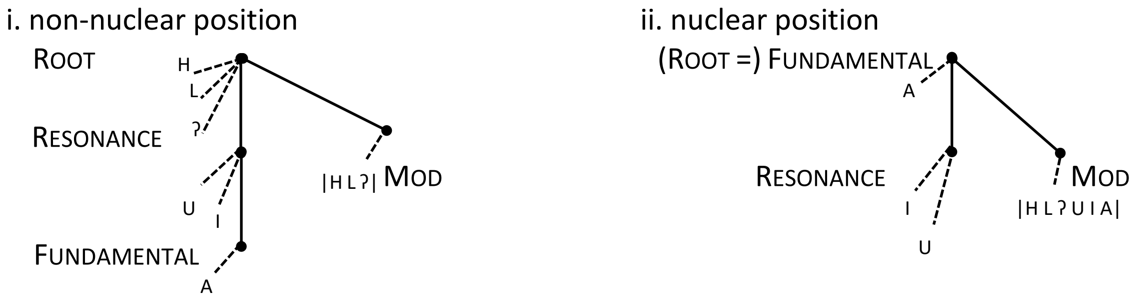


Figure 3.12: Subsegmental structure (Bellem 2007)

Bellem (2007: 128) argues that Arabic pharyngealized consonants (known traditionally as emphatics) have an increased volume resonance in the oral cavity through a secondary pharyngeal constriction, which can be increased by jaw-lowering and lip protrusion. Acoustically, pharyngealized consonants are characterized by a lowered F1 and raised F2 – corresponding to the |A| element. However, some other varieties of Arabic, as Yemeni and Iraqi Arabic, show a lowered F2 for the phryngealized consonants which corresponds to both the |A| and |U| elements (Bellem 2007: 128). She states that in MBA and DA, rhotics are sonorants and are underlyingly 'back'. There exists a pharyngealized rhotic, but it is in a complimentary distribution with an underlying plain rhotic, and the pharyngealized rhotic also depharyngealizes in fronting environment. The pharyngealized rhotic in MBA and DA does not spread pharyngealization to surrounding segments (Bellem 2007: 232). Bellem (2007) argues for a 'headless' rhotic which is composed of an |A.I| elements in MBA and DA (cf. Figure 3.13, below).

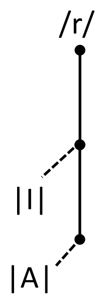


Figure 3.13: Representation of rhotics in DA and MBA (Bellem 2007)

Bellem (2007) argues that in Moroccan Arabic (MA) there are two contrastive rhotics: plain /r/ and a pharyngealized /rˤ/. In MA, the pharyngealized rhotic also spreads pharyngealization to adjacent segments except in one example *ṭṛab* 'dirt', which she suggests it should be treated as a different type of rhotic, as *R*. Bellem (2007) argues for three types of rhotics to be represented in MA: /r/ as having an |I| element, /rˤ/ as having an |A.I| elements, and *R* as an unspecified resonance element (cf. Figure 3.14, below).

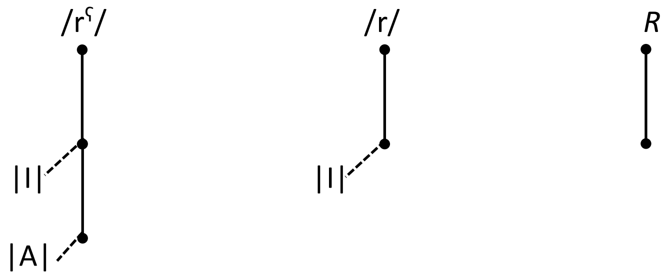


Figure 3.14: Representation of rhotics in MA (Bellem 2007)

This theory of representation, however, receives some criticism from Sebregts (2015) by which he claims that modelling rhotic variation in ET by changing or adding elements is not feasible but solely through decomposition, i.e. loss of elements. He states that this can be demonstrated by the London English onset [t^h] which alternates with [ʔ] in coda; in which the fully specified onset [t^h] decomposes to merely an |ʔ| in coda. He also argues that there is another issue in capturing lenition processes of rhotics. Because of the loss of elements in the representation of rhotics, the segments as a result will become less complex over time, and that even if that complexity of rhotics is served, only subsets of the rhotic variants can be represented as allophones. We will address Sebregts' (2015) arguments again in chapter 8 (section §8.2, later on).

3.5 Summary

This chapter has presented the cornerstone for the theory of speech sounds, and so for the understanding and formal representation of rhotics. The gist that can be taken from this chapter is that the rhotic nature is 'heterogeneous' on the phonetic level. On the phonological level, rhotics show some regularity in behaviour. For instance, those attempts on investigating how rhotic syllabify or pattern in the prosodic word showed some interesting realizations; such as those proposed by Wiese (2001). Moreover, other attempts had shown some structural unity for rhotics within the feature geometry framework (Walsh Dickey 1997). Phonetically, there also attempts from Howson (2018) to show how rhotics can be unified as a class, which he demonstrated by: (i) an 'articulatory' characteristic as having a 'tongue root gesture' coordination with a 'tongue tip or body gesture'; or by (ii) an 'acoustic-perceptual' characteristic as having a similar F2 formant shape across the rhotics in his sample.

Research proposals from Exemplar-based phonology on rhotics represented a turning point in the study of rhotics. They highlighted the fine phonetic details of rhotic phones or variants from empirical evidence in two different languages: Brazilian Portuguese and Dutch. Both studies also contributed to the family tree model proposed by Lindau (1985). These studies also demonstrated that rhotic variants range can be language specific and directly influenced by the language inventory.

Contributions on the study of rhotics from Government Phonology were equally interesting. Rhotic acoustic signal was found to mirror a vocalic simplex headed or non-headed |A| element in some languages, or a non-headed |I| element in some others. There are still very few studies on crosslinguistic rhotics from Government phonology because of its recent development which leaves a big room for development and further research on rhotics. This research program is the theratoical method adopted for studying (Arabic) rhotics in this study as we will see later in chapter 8.

CHAPTER 4

Historical Sound Changes & Phonological Processes Involving Rhotics

4.0 INTRODUCTION

This chapter will present crosslinguistic historical sound changes and active phonological processes connected to rhotics. Section §4.1, will synthesize two processes connected to rhotics: coarticulation and assimilation. To the contrary, the next part section §4.2 will present the process of dissimilation as it occurs in rhotics. The next part section §4.3 will present a brief introduction to the process of palatalization, and then provide a synthesis on how rhotics behave in active palatalization processes. Section §4.4. will take us through the process of rhoticism in synchrony and diachrony, and this part will also provide different instances of coronal consonants' rhoticism. Section §4.5 will provide a linguistic definition and description of rhotic lateralization; and also present examples from different languages. Section §4.6 present a rarely studied topic in linguistics which involves vocalization of consonants. This part, however, will focus only on rhotic vocalization. Section §4.7 will explore processes of Sandhi, and will focus more on linking rhotics with providing some examples from empirical evidance. Section §4.8 will present an auditory definition for the process of devoicing, and will also provide description on how rhotics get devoiced. Then, the last part will present a summary of this chapter.

4.1 RHOTIC COARTICULATION & ASSIMILATION

The articulatory configuration of a given speech sound – namely, 'segment' arises from 'production' or 'coproduction' in the oral cavity. (Co)articulatory production of a given segment can also overlap with neighbouring sounds causing a 'coarticulatory gesture'. Rhotic sounds, like all other sound categories, are subject to harmonious changes or fusions in the acoustic space with adjacent sounds resulting into different phonetic forms. This is especially the case in casual or natural speech with different rates of speed. On the face value, sounds have very basic 'elements' or 'features'. It is those features or elements of the acoustic signal of a sound that become fused in the 'prosodic word' with other neighbouring sounds.

In this part, it is important to make a distinction between two speech phenomena not to be confused with one another, although on the surface level, they might look somehow similar. This has to do with two widely used terms to describe different phonological and phonetic phenomena which both have to be introduced here: *coarticulation* and *assimilation.*

Beginning with *coarticulation*, generally speaking, it refers to an articulatory process mediated in the oral cavity, while *assimilation* is phonologically context-dependent. In the traditional SGP, coarticulation is known to refer to the "transitions between vowels and adjacent consonants, the adjustments in the vocal tract shape made in anticipation of a subsequent motion" (Chomsky & Halle 1968: 259). In more specific terms, *coarticulation* is "the articulatory modification of a given speech sound arising from coproduction or overlap with neighbouring sounds in the speech chain" (Recasens 2018: 1). Coarticulation can be bidirectionally induced by a phonetic segment, known as a trigger, overlapping with another adjacent one, known as the target, due to an overlap in their articulatory gesture (see Recasens 2018, for a comprehensive review).

Experimental and instrumental evidence shows that the difference between 'coarticulation' and 'assimilation' is not in fact watertight (Recasens 2018, for review). However, 'coarticulation' as a process pertains to the physical aspects of speech mechanisms which are governed by universal rules (Farnetani & Recasens 2010). In other words, 'coarticulation' is rooted in the domain of *performance*, and is not part of the grammar, whereas 'assimilation' is in the domain of *competence,* language-specific, and is established in the grammar of a language (Chomsky & Halle 1968; Farnetani & Recasens 2010). Processes of assimilation, simply put in a neogrammarian terms "involve operations on phonological features, and are accounted for by phonological rules, which map lexical representations onto phonetic representations." (Geng 2007: 20).

Some of the good examples that could show the different processes of 'coarticulation' and 'assimilation' in rhotics can be highlighted by the resistance of rhotics to processes of secondary palatalization (cf. section §4.3 on fronting and palatalization in rhotics). In an electromagnetic articulography study on liquids palatalization in Russian, Kochetov (2015) demonstrates that rhotics show a 'delay' in transition to the tongue body gesture associated with secondary palatalization in Russian. As a result, the tongue configuration experience two conflicting gestures; that of the rhotic on one hand; and that of the secondary palatalization, on the other. Thus, this is an example of a phonological process with issues rooted in performance or coarticulation. Throughout this chapter, we will tap on assimilatory processes sometimes with coarticulatory constrains, such as: dissimilation and secondary palatalization.

This was a short synopsis on coarticulation and assimilation, the next part will be on a phonological process quite the opposite of assimilation; it is the process of dissimilation.

4.2 Rhotic dissimilation

On the opposite spectrum of assimilation, there occurs a process of dissimilation whereby a segment(s) become(s) dissimilar in a set of features to neighbouring segment(s). Bennett's (2013) simplified definition of dissimilation is that it refers to "situations where surface consonants obligatorily disagree in some respect" (Bennett 2013: 1). The underlying motivations and the parameters for the process of dissimilation are not quite clear yet because of the lack of a controlled systematic crosslinguistic study on dissimilation (Alderete & Frisch 2007). The only comprehensive surveys on some types of dissimilation to date are Suzuki's (1998) and Bennett's (2013). However, our understanding until today about the causes of dissimilation are rooted in: (a) the coarticulation-hypercorrection theory – which simply attributes dissimilation to a listener reversal of perceived coarticulation; (b) processing motivation – it attributes dissimilation to a similarity avoidance of sequencing of similar speech sounds; (c) place of articulation cues maximization – which has an explanation for cases of manner dissimilation (Patrik 2011, for further details).

Similar to assimilation, dissimilation can be progressive or regressive. Many processes of dissimilation are accounted and informed by the Obligatory Contour Principle (OCP) which dictates that similar neighbouring segments are prohibited (McCarthy 1986). This is very common in occurrence crosslinguistically, and especially for the rhotics and laterals interchangeably. For instance, rhotics in Spanish became dissimilated and as a result lateralized in words of Latin origin, as in: Latin arbor > *arbol* 'tree' or as in Latin rebur > *roble* 'oak' (Proctor 2009: 54; and cf. section §4.5). Other instances of synchronic nonlocal dissimilation of liquids also come from Sundanese, a Western Malayo-Polynesian language, whereby an infix /-ar-/ becomes /-al-/ when it occurs close to a rhotic, as in: base-form *dahar* → [dalahar] plural 'eat', base-form *pərceka* → [palərceka] plural 'handsome', base-form *motret* → [malotret] 'take a picture' (Cohen 1992). The opposite tendency in dissimilation for a lateral to become a rhotic can be also true (cf. section §4.4.3, for details). For instance, synchronic dissimilation of a lateral that become a rhotic can be highlighted by examples from Peninsular and Caribbean Spanish, as in: *glándula* → [grandula] 'gland' or *delantales* → [delantares] 'aprons' (Proctor 2009: 54-55).

Now, this was a brief synthesis on rhotic dissimilation, the next part will take us through the process of palatalization and fronting, and how it interacts in rhotics context.

4.3 FRONTING AND PALATALIZATION IN RHOTICS

One of the first and most well-studied topics in phonological theory and representation is the processes of palatalization and its correlates. It was one of the first systematic studies introduced in the field because it was easy to describe through its 'targets' - the consonants that host palatalization; and its 'triggers' - the segments that activates palatalization to take place (Bateman 2011: 587).

Palatalization, generally speaking, is a phonological process that exhibits feature assimilation and interaction between labials, coronals, and dorsals, on the one hand, and the palatal-place specification on the other (see, Bhat 1978; Bateman 2007 & 2011; Kochetov 2011, for review). Many studies have been devoted to studying this phonological process and its formal representation (for instance, Bateman 2010; Hall & Hamann 2006), either within specific languages, or crosslinguistically (e.g. Bhat 1978; Bateman 2007; Kochetov 2011), and in language diachrony (for instance, in Romance and French, Pope 1961).

There are two broad types of palatalization: 'secondary palatalization' and 'place-changing palatalization' (Bateman 2007 & 2011; Kochetov 2011). Palatalization processes are so common in the world's languages, and can occur as a regressive palatalization, right-to-left, as in Nivkh /p^heq/ → [p^hjeq] 'chicken' (Botma & Shiraishi 2014:182) or progressive, left-to-right, as in Zoque /j- pata/→[p^jata] 'his mat' (Bateman 2007: 76). Distant palatalization, where the trigger does not directly follow or precede its target consonant is also evident in some languages; as in Cypriot Greek or Karok (Bateman 2007: 7). Kochetov (2011) notes that it is significant to distinguish between palatalized contrasts and the palatalization process that could result in alternation, as the former is not synchronically subject to this phonological process although it plays a major role in the innovation that resulted to this contrast.

Bhat (1978) in his crosslinguistic study of palatalization demonstrates that there are three distinct palatalization subprocesses that lead to what have been recognized as collectively processes of palatalization. One is tongue-fronting which targets velars; and tongue-raising which targets apical and labial consonants; and finally spirantization that targets velars, apicals and palatals, but rarely labial consonants. Palatalization can affect labials, coronal, and dorsal stops in more than 120 languages in the world (see again, Kochetov 2011; Bateman 2007; and Bhat 1978, for more details).

There is an overwhelming crosslinguistic evidence that shows rhotics avoidance or resistance to processes of palatalization, and this can be highlighted by how rare or marked palatalized rhotics are crosslinguistically (cf. Hall 2000). In his paper on crosslinguistic rhotics' palatalization and secondary palatalization in rhotics, Hall (2000) argues that palatalized flaps, trills and approximants rhotics are crosslinguistically marked compared to other palatalized consonants. His study also provides empirical evidence which supports his hypothesis that palatalized rhotics are marked with an implicational universal that predicts inventories of possible and impossible palatalized consonants. He attributes the markedness of palatalized rhotics to the fact that apical sounds are 'unstable hosts' for secondary palatalization and this instability stems from that "palatalized [-distributed] sounds are more marked than palatalized [+distributed] sounds" (Hall 2000: 16).

He shows that there are three palatalized rhotics attested in the languages of the world. The palatalized trill [rʲ] that occurs in Toda, for instance, and other languages, the palatalized flap that occurs in, for instance Irish, and the palatalized approximant attested in Igbo. Hall suggests that these rare instances cannot be phonetically attributed [+distributed] in the light of his discussion, and that they could have been subject to misinterpretation.

Kochetov (2005) in his electromagnetic articulography study of liquid palatalization examined the realization of palatalization across the class of liquids as it occurs in Russian, /r/, /rʲ/, /ɫ/, and /lʲ/. He suggests that rhotic realization causes a delay on the 'tongue body gesture' which is associated with secondary palatalization. The tongue tip gesture is fronted in the articulation of palatalized rhotics, whereas it shows retraction for the palatalized laterals when compared to their unpalatalized counterparts. His results demonstrate that there is a conflicting gesture in the posterior place specification of the tongue. This can be due to a delay in the fronting gesture for secondary palatalization in rhotics, which in turn suggests that a tongue retraction is perhaps needed for the rhotic articulation to take place (Howson 2018).

Now after this brief synthesis on palatalization and how it interacts with rhotics in a prosodic word, we should now turn to a historical sound change and sound development into rhoticism.

4.4 Rhotacism

This part will attempt to present a brief description of crosslinguistic rhoticism or rhotacization as an active phonological process or historical sound change. Trask (1996: 310) defines rhotacism as "[A]ny phonological process in which another segment develops into a rhotic, such as the development of early Latin intervocalic s, or of pre-Basque intervocalic l, into r". Rhotacism or rhotacization is a type of sound change whereby an alveolar consonant changes into a rhotic consonant. This type of change has been crosslinguistically attested for the following consonants : /s/,/z/, /t/, /d/, /l/, /n/ /ð[20]/, /ʒ[21]/ > /r/. The next part will explore the change of a nasal into rhotic.

4.4.1 *n > r*

The change from a nasal [n] to a rhotic sound has been attested in Aramaic, Romanian, Albanian, and Celtic. Beginning with Aramaic, Proto-Semitic **n* have developed into **n > r* in some words in Aramaic, such as, **bnu > bar* whereas in Hebrew and Arabic *ben* remains as corresponding to the proto-form **bnu* in proto- Semitic. Moreover, the word **ṯnaimi* and **ṯnataimi* in Proto-Semitic 'M. & F. two' has become *trēn* and *tartēn* 'M. & F. two' in Aramaic while it is *ṯnēn* and *ṯintēn* 'M&F. two' in Najdi Arabic.

Some varieties of Romanian such as the northern Romanian dialects and the Istro-Romanian varieties also exhibit a historical sound change n >r in words of Latin origin in intervocalic position as a result of direct weakening of the nasal consonant in this environment becoming a nasalized /r/ or a fricative /r/, thus: *bono* > *buru*, *bene* > *bire* , *pane* > *pare* (from Nandris 1963: 255; and translated by Catford 2001: 178).

[20]Attested in Central Scotland: Edinburgh and Glasgow (Catford 2001).
[21]Attested in South Slavic languages: Slovenian.

A similar tendency also occurs in Albanian. In the southern Tosk/Tosc varieties of Albanian the nasal becomes a rhotic in intervocalic position. Below in Table 4.1 is a comparison of Tosc to its sister northern varieties Gheg of Albanian which maintained the nasal (Catford 2001: 178).

Table 4.1: Rhotacization of a nasal in intervocalic position in Tosc

Tosc	Gheg	
Zëri	*zâni*	'the voice'
Gjuri	*gjuni*	'the knee'
Shqiperi	*Shqypni*	'Albania'

Another example from (Catford 2001: 178) of a language that shows rhotacization of a nasal consonant is Celtic. There is a regular historical rhotacization of initial consonant clusters in Scottish Gaelic of the type [#knV] > [#krṼ], as in: [krɔ̃x̃k] *cnoc* 'hill'. This systematic sound change still exists in some other Gaelic varieties; and also into solely one Scottish English variety as spoken in the Black Isle Peninsula in the north of Inverness and specifically in the village Avoch, e.g. [kri:] 'knee'.

Now, the next part will take us to a similar result of rhoticism but this time is from a sibilant, and it is way more common as process of rhoticism.

4.4.2 *s > r*

The change from a sibilant [s ~ z] to a rhotic sound has been attested in many Indo-European languages. In this part, I will attempt to present some examples of historical rhoticism from Italic and well-documented Germanic languages.

Beginning with Italic, there is a well-documented instances of rhotacization of sibilants in intervocalic position in this chronology of the root: VsV > VzV > VrV (Catford 2001: 179). This tendency occurs in Faliscan, Umbrian, and early Latin. For instance, in Latin, sibilants in singular noun nominative cases intervocalically develop an alternation with rhotics in the genitive forms in words of Old Latin origin, thus: *os* > *oris* 'mouth', *mus* > *muris* 'mouse', *honōs* > *honōris* (Catford 2001 179; Gorman 2012: 279). Catford (2001) attributed this development to the possible similarity of some rhotic variants, being either a fricative or approximant, already available in the language grammar to the manner of sibilants.

In all Germanic varieties, excluding Gothic, the voicing of /s/ to [z] gave rise to rhoticism (Stuart-Smith 2004: 91). In Verner's Law in Germanic, the voiced fricatives merged with voiced stops except for [z] which became as a result [r] in Verner's Law in West and North Germanic, e.g. OE *cēosan* 'to choose' and *coren* 'chosen' (Roberts 2012: 85). (cf. Table 4.2, below for a schematic representation of the development of rhoticism from Proto-Indo-European into Latin and Proto-Germanic and into Old English in intervocalic position, from Roberts 2012: 85):

Table 4.2: The development of rhoticism in Proto-Italic and Proto-Germanic

PIE	$*b^h$	$*d^h$	$*s$	$*g^h$	$*g^{wh}$		$*p$	$*t$	$*s$	$*k$	$*k^w$
Pital	*β	*ð	*z	*ɣ	$*ɣ^w$	PGmc.	*β	*ð	*z	*ɣ	$*ɣ^w$
Latin	b	d (b)	r	H	W	OE	V	ð	R	g	g (w)

The next section will look at rhoticism in different languages. It will show instances of rhoticism in laterals and how the syllable structure can activate the process.

4.4.3 Recent instances of Rhoticism

As rhotacism or rhotacization is quite elaborate and is interconnected with many historical sound changes, there is only one common property of those changes we deem all together as a manifestation of rhotacization – is the fact that they all seem a surface result of an underlying processes of lenition sonorization whereby an alveolar sound becomes more sonorous, in this case a rhotic.

One instance of rhoticism as an active phonological process, comes from some Romance languages: a variety of Spanish in Havana and Cárdenas, Cuba exhibits rhoticism of a lateral consonant in syllable coda, as in: *delantal* → [delantar] 'apron', or *pulso* → [purso] 'I press' (Proctor 2009: 56). Similarly, in Murcian and Leónese Spanish, rhotacism occurs in tautosyllabic onset clusters, as in: *flor* → [fror] 'flower', *iglesia* → [igresia] 'church', *clavel* → [craβel] 'carnation' (Proctor 2009: 56). In fact, rhotacization of laterals is quite common in Romance languages and has been reported in: Florentine Italian; in Spanish varieties in

Cuba, the Canary Islands, Andalusia and Venezuela; and in Caipira Portuguese (Proctor 2009: 56).

In some Modern Greek varieties such as Sphakiá, a preconsonantal lateral is rhotacized, and realized as a retroflex approximant rhotic before back vowels, as in: /álfa/→ [árfa] 'alpha:.A' /delta/ → [dérta], 'delta:.D', /kaˈla/ → [kaˈɻa] 'good' n.pl., /toˈlaði/ → [tɔˈɻaði] 'the oil', /stoluˈtro/ → [stɔɻuˈtro] 'to Loutro' (Proctor 2009: 34 & 181). Proctor (2009: 181-182) attributes these instances as a result of coarticulatory effects of a blending tongue body gesture of a 'clear' lateral and an adjacent tautosyllabic vowel.

As this part now had provided some interesting examples of historical and active processes of rhotacism, we should now move to the next section on rhotic lateralization.

4.5 Rhotic Lateralization

In contrast with the last sound change we discussed in the last section in which a consonant becomes more sonorous, this sound change is quite the opposite. Lateralization of rhotics[22] refers to the process whereby the rhotic sound becomes less sonorous; and as a result ends up leaning more towards fortition. Rhotic lateralization can occur in coda as in Dominican Spanish *verdad* → [bel.da] 'truth'; or Santigo Cuban Spanish *abrir* → [abril] 'open' (Proctor 2009: 56). Lateralization of rhotics can also surface in 'reversive' derivational suffixes constructions when attached to a (C)VrV verb stem pattern yielding full regressive dissimilation of an intervocalic rhotic to a lateral: [gòró-] 'cover' → [gòl-ló-] 'uncover', or [kɔ́rɔ́-] 'hang up' → [kɔ́l-lɔ́-] 'take down' (Proctor 2009: 34).

For some speakers of Modern Hebrew, Proctor (2009) reports that rhotics can be partially lateralized in word-final position, despite the fact that the rhotic and lateral are contrastive in this environment, thus: /til/→ [til] 'rocket', /saʁ/ → [saʁˡ] ~ [sal] 'minister'. He suggests that this phenomenon warrants further investigation since that the rhotic is not coronal in this language variety; and for the speakers in which he observed this process, he thinks that it would not seem to be a natural candidate for lateralization.

[22] Laterals and rhotics classically constitute the class of liquids (cf. §3.1.2, for more details). Walsh Dicky (1997) distinguishes two types of l-sounds and groups only sonorant laterals with rhotics. Weise (2001) proposed the Sonority Sequencing principle of the sound categories and placed rhotics between the glides, being more sonorous, and laterals, being less sonorous, on the sonority scale (cf. §3.1.3, for more details).

Some instances of lateralization can also show in alternation. In bantu languages, for instance, Van Otterloo (2011) reports through Kifuliiru native words an r- sound in complementary distribution with a lateral [l] whereby an alveolar tap [ɾ] occurs only after front vowels. A similar alternation that occurs between liquids, only a lateral and a rhotic, can be supported by an alternation in Lamba whereby the r-sound surfaces only after front vowels alternating with an elsewhere case lateral.

Now after this brief synopsis on lateralization as it occurs in rhotics, the next part will carry out on a processes of opening sonorization and lenition.

4.6 RHOTIC VOCALIZATION

Vocalization, in general, is a manifestation of sonorization lenition by which a consonant becomes an approximant or a vowel, or in some cases causing a 'colouring' of that vocalic output. Trask (1996) defines vocalization as "[A]ny phonological process in which a consonant is converted into a vowel, or sometimes into a glide" (377).

Vocalization has been crosslinguistically documented as sound change; especially in the case for the class of liquids, that is of course if we count rhotics as such. Within the sound category of liquids, there is a high tendency of vocalization to occur in postvocalic and coda positions (Proctor 2009; Glover 2014). In his systemic study of liquid vocalization in four varieties of German: Standard, Kiel, Gottschee, and Bernese, Glover (2014) observed that onset liquids never vocalize. His argument is that vocalization to a vocoid in coda is motivated by the Coda Law. The Coda Law dictates that (a) coda prefers smaller number of sound segments; (b) coda prefers higher sonority segments over lower ones, e.g. Standard German vocalization, /bɛːʀ/ → [bɛːɐ̯] 'bear'; (c) a complex coda prefers a declining sonority towards the second member of the syllable over a least falling sonority complex codas, e.g. Standard German vocalization, /dʊʀx/ → [dʊɐ̯ç] 'through' (Vennemann 1988: 21; Glover 2014: 29& 202-203).

As a historical sound change and an active synchronic phonological process, vocalization targets the most sonorous consonants, obeying the SSP, and if a said language has a dorsal rhotic the probability of vocalization becomes higher due to an increase in sonority (Glover 2014: 44). There also a relevant degree of opening sonorization in rhotic vocalization. Some varieties of English show such a tendency for post vocalic /ɹ/, e.g. *burr* [bɜr] ~ [bɝ(ɹ) ~ [bɜɚ] ~ [bɜə] ~ [bɜː] (Proctor 2009: 38).

After this presentation of vocalization in rhotics, the next part will take us through the process of Sandhi.

4.7 Sandhi & Linking rhotic

The term '*Sandhi'* is derived from Sanskrit संधिः meaning 'joining'. It has been used as a cover term to refer to phonological processes that occur across the word or morphemic boundries overwhelmingly in the Indian and North Gemranic languages. Trask (1996) describes Sandhi as "[a]ny of various phonological processes applying to sequences of segments either across morpheme boundaries (internal sandhi) or across word boundaries (external sandhi)" (316).

Linking-r, for instance, is a manifestation of external sandhi in words with etymological-r in 'non-rhotic' varieties of English with the exception of the Southern American varieties of English. Trask (1996: 209) states that "[i]n non-rhotic accents of English, the /r/ which surfaces before a following vowel in words which have lost their historical final /r/ in isolation: hence, *far* /fɑː/ but *far away* /fɑːr əweɪ/". Another extension of this process is intrusive-r. It is, however, is an overgeneralization of linking-r. Trask (1996: 185) also defined intrusive-r as "[i]n some non-rhotic accents of English, an /r/ which is automatically inserted after any of /ɑː/, /ɔː/, /ɜː/ or/ə/ or after a centring diphthong when one of these occurs before a vowel, regardless of the facts of etymology or spelling". Epenthetic-r, i.e. intrusive-r, conjoins two lexical items when the first word ends with non-high vowel: /ɪə/, /ɑː/, or /ɔː/, /ə/; and the next begins with a vowel sound, even in non-etymological-r lexical items, e.g. 'bacteria-r-in it', 'Law-r-and order, 'Victoria-r-and Albert Museum', 'draw-r-ing' 'withdraw-r-al.

Now, this was a brief synthesis on Sandhi and linking rhotics, the next two parts will take us through the processes of devoicing in rhotics.

4.8 Rhotic Devoicing

Devoicing or desonorization is attested crosslinguistically to occur in syllable coda or word final position (Wetzels & Mascaró 2001). This phonological process takes place due to neutralization. Phonetically, Van Oostendorp (2008), for instance, argues that these cases of final-devoicing are incomplete – i.e. neutralization is not fully lost and can be recovered in fine-grained phonetic details. There are also two positions in the literature on whether final-devoicing is a process of lenition or fortition (see Iverson & Salmons 2007; Harris 2009, for review on both views).

Sebregts (2015: 14) in his study of rhotic devoicing reports very interesting sociolinguistic correlate observations. He shows that in Dutch it is not solely a matter of devoiced rhotic versus a voiced rhotic, it is the 'degree' of devoicing which he suggests is linked to also age of the speaker. Thus, he shows that there are in fact a gradient rather discrete degree in devoicing of rhotics. He also approaches the topic of whether devoicing can be taken as lenition or not. Sebregts (2015: 27) is more specific in that he assigns the process of devoicing to lenition or fortition depending on where the process takes place: if it occurs in intervocalic position, it is then 'strong' and so is a process of lenition; and if it occurs word-finally, then it is 'weak' and so is more considered as fortition. Sebregts (2015) also relates voicelessness in rhotic trills to fricativisation. He suggests that in the case of the coronal rhotic, for instance, there are gradient similarities in devoicing: a voiced rhotic becomes partially devoiced to a voiceless trill, to then the voiceless trill with frication that will end with a non-trilled fricative – in overall the difference is also very minimal.

Rennicke (2015) in her study of Brazilian Portuguese rhotics also came across a number of observations in terms of rhotic devoicing. Rhotics can become devoiced in coda position. Unstressed high vowels [i, ɪ, u, ʊ] can be devoiced or omitted after a post-tonic intervocalic rhotic and as a result the rhotic become devoiced as in *cachorro* 'dog' or *brasileiro* 'Brazilian'. The same tendency of devoicing in the same structure also occurs in consonant clusters, as in *outro* 'sing'. Moreover, post-tonic rhotics can also become devoiced or fricated by an adjacent [s] as in *brasileiro(s)* 'Brazilian'.

After this section on devoicing, this chapter on the historical sound changes and phonological processes connected to rhotics reaches to its end. Now, the next part will recapitulate the main information and generalizations we tapped on throughout this chapter.

4.9 Summary

This chapter has presented crosslinguistic historical sound changes and active phonological processes connected to rhotics. Processes of coarticulation and assimilation were presented and found to be relevant yet can be differentiated in a number of respects. On the other hand, we devoted another section to the process of dissimilation connected to rhotics which was found to be informed and accounted for by the OCP. Next, the process of palatalization, and more specifically secondary palatalization was found to behave differently with rhotics which highlighted a conflicting gestures that of the palatal place specification, and that of the rhotic articulatory configuration. Palatalised rhotics were found to exhibit a delay in the fronting gesture for secondary palatalization which suggests that the cause of this delay could be the tongue root retraction in rhotics.

This chapter also explored the process of rhoticism as a historical sound development and as an active phonological process in alternation. This part also provided examples for different coronals that majorly experience rhotacization from empirical evidence which includes: sibilants, nasals and laterals. Processes of rhoticism were found to occur in many languages in a very systematic manner: always in intervocalic position or at the end of a prosodic or lexical word, but also as a second member of onset consonant clusters.

The next section presented an opposite tendency to rhotacization, which is on a rhotic becoming lateralized. Lateralization of rhotics was found to occur commonly at the end of a prosodic or lexical word, and in rare cases in intervocalic position. Rhotics were also found, for instance, in Bantu languages to alternate with laterals in whereby rhotics surface in after front vowel environment.

Rhotic vocalization was an interesting understudied topic in consonants overall and is crucially relevant to this study. The common tendency for vocalization in rhotics was found to take place in postvocalic and at the end of a prosodic word. This section explored and presented some instances of rhotic vocalization in German and English.

The next part present processes of Sandhi, and espcially those connected to linking rhotics. It is a common historical process in Indian and north Germanic languages. Linking and inrusive rhotics were both a menifestation of external Sandhi. This part also provides some examples for the different proccesses of Sandhi from English.

The last part of this chapter explored processes of devoicing which is also an understudied topic. Devoicing was found to occur at the end of a prosodic word. This part also synthesized the process of devoicing in rhotics, and showed how devoicing can occur in rhotics. Devoicing was found to exhibit a gradient and not static degree in devoicing across different variants and speakers.

CHAPTER 5

OVERVIEW OF ARABIC RHOTICS

5.0 INTRODUCTION

The main focus of this chapter is to provide a detailed synopsis of r-sounds in Arabic. This chapter also presents background, definition, description and distribution of rhotics in different varieties of Arabic. Rhotics in Arabic can be constricted in two major points of articulation: CORONAL and DORSAL. Along these lines there also a typological classification for Arabic rhotics that fall into four major types. Rhotics in Arabic occur in many phonological processes. Coronal rhotics can be subject to pharyngealization or assimilation. Dorsal rhotics also can have assimilation, vocalization or dissimilation as phonological processes. Thus, section (§5.1) offers a historical background of early documentation of Arabic r-sounds. Section (§5.2) provides a phonetic sketch of Arabic coronal rhotics and a phonological description of their behaviour. Section (§5.4) presents a historical background of early documentation and description of dorsal rhotics in Arabic. Section (§5.5) offers a phonetic and a phonological description of dorsal rhotics and the behaviour they exhibit.
The last section (§5.6) presents an overview for the typology and classification of Arabic rhotics.

5.1 HISTORICAL BACKGROUND TO CORONAL RHOTICS

Al-Farāhīdī's (d. 786) lexicon *Kitāb al-ʿAyn* (ed. al-Maẖzūmī & al-Sāmmarrā'ī 1988) is considered by mainstream Arabists the earliest attested first-hand outline for the sound system of 8th century Arabic (8CA[23]). It assigns *r*-sounds an apical '*đawlaqijja*' point of articulation along with the nasal [n] and lateral [l]. Later, his student Sībawayh (d.796) in his well-known exhaustive volume *Al-Kitāb* (ed. Hārūn 1982: 448) demonstrates through a

[23] 8th century Arabic refers to the koiné known in Arabic scholarship as 'Classical Arabic'. Classical Arabic is a constructed variety, with the help of the early Arabic language prescriptivists and documenters, and it incorporates a bundle of Arabic, Semitic, from the Arabian Peninsula, and Arabian areal features, during different periods of time: pre-Islamic, and post-Islamic. It has been used as a *lingua franca* in diaspora after the Islamic expansion era (roughly between 630 – 790 CE).

process of assimilation *idġām* that the rhotic in 8CA interacts with the other apical sounds [l, n] across the word boundary. This is evident by a process of assimilation within the apical sounds. Thus, */hal raʔajt/ → [har raʔajt] 'did you see?', */min raʔajt/ → [mir raʔajt] 'who did you see?' yield a total regressive assimilation for the lateral and the nasal across the word boundary with the rhotic[24] (ed. Hārūn 1982: 448). This can be taken in support of Al-Farāhīdī's assignment of the /r/ in 8CA as '*đawlaqijja*' 'apical'. Years later, Ibn Jinnī (d. 1002) was the first to devote a systematic study to the sound system of Quranic Arabic in *Sirr ṣināᶜat al-iᶜrāb* (ed. Al-Saqqa 1954). More importantly, Ibn Jinnī (ed. Al-Saqqa 1954:1/60-61) was the earliest to assign the manner of r-sounds as *resonants*[25].

Sībawayh, al-Zamaḫšari and Ibn Yaʿīsh were also the first to highlight a phonetic difference between emphatic *mufaxxam* and non-emphatic or *muraqqaq* sound in Arabic (Cohen 1969; Al-Nassir 1993)(cf. §5.2.1 & 5.2.2, for more details). However, in the Arabic literature of phonetics these differences were usually considered phonetic in nature and rarely phonemic (Youssef 2019).

After this brief synthesis on early phonetic and phonological description of Arabic rhotics, the next part will explore the modern phonetic and phonological description of coronal rhotics from empirical evidence.

[24] Sībawayh (ed. Hārūn 1982: 448) suggests that the 'trill' of rhotics (*mukarrarā*) actually never assimilate to another sound even within the other apical sounds. Ibn Jinnī (ed. Al-Saqqa 1954:2/818) also makes a similar comment that the apical 'trill' is the strongest in resisting assimilation to other apical sounds. The reason why the lateral and the nasal assimilated to the rhotic and not vice versa is due to many reasons: One, the rhotic is the most sonorous in this group of sounds, and to support this, the nasal also assimilates to the lateral, and not vice versa (cf. §5.2.4.2, and (3), for more details) . This makes the [r], [l], and [n], respectively, from the most sonorous to the least in this group. Two, the opposite whereby a rhotic becomes either a lateral or a nasal is not attested (Youssef 2019). Thus, this process is informed by the grammar and mediated by connected speech phenomena (cf. §4.1, for more information). This makes /l or n/ → [r] an active process of rhotacism; and /n/ → [l] an active process of lateralization. Thus, both the lateral and the nasal assimilate to the rhotic, and only the nasal assimilates to the lateral. This shows us that the tendency in this process is that the sounds assimilate to the most sonorous. There also empirical evidence of a rhotic becoming lateralized in some languages (cf. §4.5, for more details). This process, however, seems to be conditioned by inter-speaker variation, alternation, and is crosslinguistically marked. Thus, this entails that it is not as context-dependent as rhotacisim, which suggests that it is a coarticulatory process rather than an assimilatory process.

[25] In traditional Arabic scholarship *resonants* are described as the sounds in manner between stops (Šadidā) and fricatives (Raxwā) (ā, ʕ, w, m, n, j, l, n, r) (Ibn Jinnī ed. Al-Saqqa 1954:1/60-61; and Al-Khafāji ed. Al-ṣaᶜīdi 1969:30).

5.2 Coronal Rhotics: Phonetics & Phonology

Rhotics in Arabic are phonetically heterogenous and the variation in manner could range and may surface across as: trills, taps, fricatives, approximants, and emphatics 'pharyngealized' amongst much more possible variants (Youssef 2019). The most common variant of a rhotic realization in Arabic is a voiced alveolar trill or tap (Younes 1994; Watson 2002). A tap is characterized by a single apical closure, whereas a trill is a geminated [r] (Youssef 2019).

Ladefoged & Maddieson (1996: 219) demonstrate that this tendency occurs in languages where there is a regular pattern of distinction between singleton and geminate consonants, as is the case in many varieties of Arabic. Youssef (2019) suggests that geminate trills can be predictable from a higher level than the prosodic word through their regular patterning in the morphological-semantic interface. He also suggests that their phonotactic licensing as geminates takes place in intervocalic and final postvocalic positions; whereas taps show more freedom in occurrence. Youssef also suggests that trills can be in fact treated as geminated taps and not an independent phoneme from a single tap (cf. §5.1, for details).

Now after this brief introduction to the description of coronal rhotics, the next two parts will provide an overview for plain or non-pharyngealized rhotics and pharyngealized rhotics.

5.2.1 Plain Rhotics

Taps and trills[26] are produced by a single or multiple rapid interruptions of the air stream, and their spectra show similar acoustic features to stops and a vowel-like formant structure marked by a friction noise salient between the transients (Shaheen 1979: 142; Ladefoged & Maddieson 1996: 218; Khattab 2002: 95). In articulatory terms as realized in Damascene, Ismail (2007: 204) states that "the sound [r] is produced by a single or multiple contacts of the blade or tip of the tongue and the alveolar ridge". In his comprehensive acoustic account of Arabic sound system as conduced from Mesopotamian and Jordanian varieties of Arabic, Al-Ani (1970: 33) demonstrates that the apical-r in word-initial environment surfaces

[26] "Taps or trills" are just convenient labels used in descriptive phonetics for demonstrative purposes and not necessarily representative of the structural reality of r-sounds nor hypothesize any uniformity for rhotics.

as either a trill or a series of taps. A trill or longer taps, however, prefer intervocalic position although they are still licenced word-final (Nasr 1966: 5; Shaheen 1979: 142; Anani 1985: 132; Khattab 2002: 94; Youssef 2019). There is a tendency for *r*-sounds to become devoiced/lenited at the end of a word, especially in pre-pausal position (Shaheen 1979: 148-150; Khattab 2002: 95; Youssef 2019).

Watson (2002: 16) in her monograph on the phonology and morphology of Arabic suggests a tap [ɾ] as a consistent r-sound for the varieties of Arabic across-the-board. Al-Ani (1970) demonstrates that the apical tap [ɾ] exhibits a formant structure interrupted by a vertical transient different from the multiple vertical transient evident in trills or series of taps. Mitchell (1993) in his illustrative book on vernacular Arabic and Al-Qahtani (2000) on his descriptive synthesis of Arabic 'sonorants', in general, also adopt Al-Ani's description of the apical-*r* as a trill but also a flap. Trills, however, favour intervocalic environment, and their spectrum in this position is similar to that of a stop, and shows an evident gap in the voice bar (Shaheen 1979: 145-160). As rhotics in word-final position might experience devoicing their spectrum slice will most likely show a frication noise (Khattab 2002: 95). Youssef (2019) suggests that any rhotic can become devoiced in pre-pausal position, as in [mitr̥] 'meter'. Khattab (2002: 95) illustrates that also in the same environment a frictionless continuant shows a lack of salient transient gesture in the spectrogram.

Shaheen (1979:142-145) in his articulatory description of Egyptian Arabic *r*-sounds, observes that rhotics can be plain and pharyngealized: tap [ɾ ~ ɹˤ], a frictionless continuant (approximant) [ɹ ~ ɹˤ] or a voiceless fricative [ɹ̊ ~ ɹ̊ˤ][27]. Pharyngealized rhotics will be introduced in the next section. Youssef (2019) suggests that this rhotic can be either an alveolar approximant [ɹ] or a postalveolar retroflex [ɻ]. He also suggests that these variants can also correlate with certain sociolects of individual speakers and is often viewed as "a deviation from the norm" (Youssef 2019: 5) (cf. Younes 1994, as well).

This was a phonetic and phonological synthesis of plain coronal rhotics. The next part will present an overview of the phonetics and phonology of pharyngealized rhotics as they occur in Arabic.

[27] Shaheen (1979) uses [ɹ̊] as a cover symbol throughout his study for a voiceless fricative of r-sounds in final position.

5.2.2 PHARYNGEALIZED RHOTICS

Before embarking on the description of pharyngealized rhotics, it is important to introduce the terminology used to describe the relevant phonetic and phonological structures as used by different schools of thought in language description: *emphatics* or *pharyngealized* , *emphasis* or *pharyngealization*, *velarization*, and *uvularization*. The term *emphatic* semantically coincides with the term *mufaxxam* in Arabic, the latter being first coined by Sībawayh to describe the sounds with coarticulatory gesture and they are widely-labelled by the term pharyngealized for phonetic reasons we will discuss later on (cf. section §5.2.4.1, for more details) (ed. Hārūn 1982). Sībawayh identifies the (primary) *mufaxxam-a* consonants or more specifically *al-ḥurūf al-muṭbaqā* as *ḏ̣, ṭ, ṣ, ḍ*.

The terms *pharyngealization*, *velarization* or *uvularization* are used in the literature depending on where that secondary point of articulation is argued for. Issues like whether they could exclusively contrast in some languages is beyond the scope of this study. Thus, for modern Semitic languages in general and Arabic in particular these cover terms are always associated with sounds with a coarticulatory dorsal articulation (Sylak-Glassman 2014:129, 138). As emphasis spread is a manifestation of consonant-vowel harmony which occurs in the prosodic configuration, this study favours the term pharyngealization and pharyngealized to label these consonants - both perfectly link velars, uvulars and pharyngeal consonants with primary or contrastive; and secondary or 'marginal' emphatics as they all have raised and/or retracted tongue dorsum towards the pharynx (for harmony and ablaut, Heath 1987& 2002; for review on post-velar configuration, Sylak-Glassman 2014). Thus, a superscript [ˤ] or subscript < . > will be used for any phonetic or orthographic demonstration of a pharyngealized rhotic throughout this study.

The labial-coronal consonants *bˤ, f̣ ˤ, zˤ, mˤ, ʃ ˤ, r ˤ, lˤ, nˤ* are typically referred to as secondary/ 'marginal' emphatics in vernacular Arabic (Bellem 2007; Sylak-Glassman 2014). Heath (1987) in his study of Colloquial Moroccan Arabic believes it is difficult to establish a conditioning pattern of whether a pharyngealized rhotic really contrasts with its plain counterpart. In fact, the same enquiry persists for other varieties of Arabic, too (Watson 2002; Bellem 2007; Sylak-Glassman 2014). However, it is evident that a pharyngealized rhotic surfaces in the vicinity of dorsal consonants as a result of harmony (cf. Heath: 2002, and for review, Sylak-Glassman 2014). Acoustically, Al-Ani (1970: 33) demonstrates that the pharyngealized trill not only surfaces adjacent to other pharyngealized consonants but also in the vicinity of mid low vowels [a] and [aa].

Youssef (2019) suggests that each of the rhotic variants in Arabic can in fact become pharyngealized which in turn makes the size of variation in Arabic rhotics even bigger (cf. also, Shaheen 1979: 145–146). He also shows that Arabic rhotics seems to have more affinity with other pharyngealized consonants, but a rhotic still differs in two aspects: it seems more restricted in its influence on neighbouring sounds; and that it exhibits an alternation with a contrastive non-pharyngealized rhotic. Both of which show how unique and different the rhotic is in its behaviour.

According to Youssef (2019), in most eastern Arabic varieties, a pharyngealized [rˤ] can occur in contact with central and back vowels [ɑ, ɑː, oː, u, uː] and when close to an emphatic obstruent: /tˤ/, /dˤ/, /sˤ/, /zˤ/, and /ðˤ/ or a uvular /χ/, /ʁ/ or /q/. A non-pharyngealized rhotic can occur nearby front vowels [a, aː, eː, i, iː]; only if there is no pharyngealized sound in the prosodic word. However, in most western varieties, the pharyngealized and non-pharyngealized rhotics are contrastive, and as a result show a historical plain rhotic split into these two separate phonemes. Youssef (2019) also attributes this phonemic split to historical processes of morphological and lexical diffusions. In Moroccan Arabic, Heath (1997) suggests that the basis of this split can be attributed to a neutralization of an earlier allophonic distribution of [rˤ] and [r] conditioned by the back-front vocalic environment, respectively.

In Egyptian Cairene Arabic, pharyngealized [rˤ] does not occur with tautosyllabic front vowels [i, iː, eː]. In other words, the pharyngealized /rˤ/ de-pharyngealizes in the vicinity of fronting environment (cf. Broselow 1976; Watson 2002; Youssef 2019). This tendency of de-pharyngealization of a rhotic also occurs in Moroccan Arabic close by tautosyllabic font vowels [i, iː] (cf. Heath 1987; Youssef 2019). However, Youssef (2019) shows that in the case of Moroccan Arabic, some derivatives of a stem with a pharyngealized rhotic may still surface as [rˤ] even in the vicinity of a front vowel within the prosodic word, as in [ʃ̣rˤịḅ] 'drinking', or [ṃrˤẹːẉạ] 'small woman'.

Now after this brief synopsis on pharyngealized coronal rhotics, the next part will show the geo-phonetic and phonological distribution of coronal rhotics from empirical evidence.

5.2.3 DISTRIBUTION OF CORONAL RHOTICS

Cantineau (1960: 49) hypothesizes that Old Arabic[28] (OA) most likely exhibits contrastive plain and pharyngealized apical rhotics; and he attributes this to the higher tendency of r-pharyngealization distribution across the varieties of Arabic. Johnstone (1967:19, 22) reports a plain and pharyngealized alveolar rhotics in the Eastern Arabian varieties of Arabic. Prochazka (1988) establishes an alveolar rhotic in his morphological sketch of the Southern Hijazi, Tihāma, Najdi, and the Eastern Arabian varieties of Arabic. Al-Shahrani (1988:26) in his phonological account of Šahrānī, a descendent of Azd tribe, Arabic as spoken in southwestern Saudi Arabia reports a phonemic set of a dental flap and a pharyngealized alveolar flap, as in [ʕaːri] 'naked' vs. [ʕɑ̣ːrˤɨ̞] 'my shame'[29].

As far as the *qəltu*-*gələt* continuum is concerned, coronal rhotics are consistent in the *gələt*-type Arabic: as spoken by Bedouin Muslims in Mesopotamia and Anatolia, and sedentary Muslims in Lower Mesopotamia. This is also evident in the *qəltu*-type Arabic as in the Euphrates group: ᶜĀna and Hīt (Jews and Muslims), and in the Northern Kurdistan group (Sendor, ᶜAqra, Arbil) (cf. Blanc 1964; Jastrow 2006b). Ingham (1973:535) in his brief comparative grammar of urban and rural Arabic as spoken in Khūzistān[30] uses plain and pharyngealized apical rhotics as representative of this variety. Jastrow (2006a:89) reports a plain and 'marginal' phonemic pharyngealized apical-r in Anatolian Arabic[31], as in Mardin *kara* 'he rented' vs. *karˤa* < **kəl-arˤa* 'he has seen'. The same also aligns with his phonological sketch of Iraqi Arabic having 'marginal' pharyngealized-r and a stable underlying plain-r (Jastrow 2006b).

Khattab and Al-Tamimi (2006) in an acoustic and auditory study of [r] in a variety of Levantine Arabic, Jordanian, report six different *r*-sounds: trills [r(:)] and [r(:)ˤ]; taps [ɾ] and

[28] The term 'Old Arabic' is used in this study as referred by the original authors. It usually refers to both the language of the Bedouin tribes, the Qurān and pre-Islamic poetry and also to the poetico-Qurānic koine carrying structural marked features trace back to certain Bedouin tribes (Versteegh 2014). Old Arabic in the linguistic sense is a proto-language which could also refer to any Arabic variety used before the emergence of Islam, e.g. the Arabic-Aramaic bilinguals' variety of Arabic (in Mesopotamia), Arabic and Ancient North Arabian (in north-central Arabia), or even Arabic and Ancient South Arabian (in south-central Arabia).

[29] Bellem (2007: 253-4) believes that instances of plain consonants pharyngealization in this context are not true minimal pairs because they always contain two morphemes: host + 1SG possessive enclitic [-i], the latter being phonologically functional *i-ʔimāla,* which presumably blocks pharyngealization spread. The plain example is analytical whereas the pharyngealized-r is non-analytical because of the suffix later stage of derivation.

[30] Khūzistān refers to a cluster of dialects traditionally spoken in the southern Mesopotamian area and nowadays a part of Irani Arabic (Ingham 1997:14).

[31] A cluster of Arabic varieties spoken in Turkey.

[rˤ]; and approximants [ɹ] and [ɻ]. Ismail (2007) in her study of Damascene Arabic (DA), another Levantine variety, outlines a palato-alveolar approximant [ɹ], a retroflex approximant [ɻ], and an alveolar trill [r], as intra-speaker features; and a pharyngealized [rˤ]. Younes (1982) describes a phonemic pharyngealized alveolar [rˤ] in the vicinity of low vowels and pharyngealized consonants in Palestinian Arabic, whilst others disagree on the quality of pharyngealization for [r] in this variety (see Card 1983, for review). Borg (1997) in his phonological sketch for Cypriot Arabic reports apical rhotics as reflexes of the superstratum Arabic-r.

Newman (2005: 195) identifies two different *r*-sounds from three corpora of Arabic. One was from a reading of the Quran[32], and the two others were from readings of two native Cairene Arabic speakers[33]. Newman found two denti-alveolar r-sounds each of which varies in manner: a trill [r(:)] and a flap [ɾ]. The *r*-sound can occur word-initially, as in *rakaba* 'he rode'; word-medially, as in *sari:ʕ* 'fast'; and word-finally, as in *ħadʒar* 'rock' in his sample (Newman 2005: 190).

Schulte (1985:33) hypothesizes that it is a bit challenging to assume whether the plain /r/ enjoys a phonemic status in Egyptian Cairene Arabic (ECA). Youssef (2013), however, demonstrates through true minimal pairs evident plain dental flap/trill [ɾ ~ r] and a pharyngealized counterpart [ɾˤ~ rˤ] in ECA as in *rˤaff* 'shelf' & *raff* 'it twitched', *rˤāmi* 'male proper name' & *rāmi* 'throwing'. Watson (2002 :16, 21) shows a contrastive pharyngealized dental-alveolar tap [ɾˤ] with its plain counterpart also in ECA, as in /ɾˤa:gil/ 'man' vs. /ɾa:kib/ 'passenger'. In fact, pharyngealization of [r] appears to be a hallmark of Palestinian and Egyptian Arabic (see Herzallah 1990; Younes 1994; and Ismail 2007: 204).

As far as Maghrebi Arabic is concerned, Heath (1987: 297) in his monograph on ablaut and ambiguity and the phonology of Moroccan Arabic as conducted from native speakers from Fes and Meknes establishes contrastive plain and pharyngealized alveolar rhotics as reflexes of OA **r*. Hachimi (2007) has reports an alveolar trill [r] for Casablancan Arabic, but a post-alveolar approximant [ɹ] for Fessi Arabic (Moroccan Arabic). Issa (2017) through an acoustic study on plain and geminate sonorant contrasts in Tripolitanian Libyan

[32] An audio-tape recordings of Muhammad Sadiq al-Minshawi reading the Quran (Newman 2005: 185, for more details).

[33]One of these readings was of an Arabic translation of a passage: the 'North Wind and the SUN'; and the second reading was of a 100 words list (Newman 2005: 186, for further details).

Arabic notices a manner variation in rhotics across and within her language consultants. This alveolar variation ranges between a tap [ɾ] or approximant [ɹ], and a trill [r], approximant [ɹ] or 'weak' fricative when geminate. Heath (2002) in his study of Jewish and Muslim varieties of Moroccan Arabic reports pharyngealized and plain contrasts of /r/ in Maghrebi varieties of Arabic as a result of pharyngealization harmony with a pharyngealized alveolar or a neighbouring uvular [q, x, ɣ] within the word-stem. The Foreign Service Institute[34] (1961) uses plain and pharyngealized apical trills in their reference grammar for Colloquial Tunisian Arabic. Puech (1994: 17) outlines apical trills in Maltese Arabic as the norm in the standard variety while the tendency in non-standards is either an alveolar tap [ɾ] or alveolar approximant [ɹ].

In most western varieties of Arabic, the pharyngealized and non-pharyngealized rhotics as we came across earlier are contrastive. This shows a historical plain rhotic split that resulted into two separate established phonemes. The varieties that show this phonemic split in their phonological inventories are the language varieties concentrated in Africa and only south-eastern Turkey, and they constitute three dialect families (Youssef 2019): (a) the Western or Maghrebi varieties of Arabic: Moroccan, Tunisian, Algerian, Libyan, and the Ḥassānīya dialect of Mauritania; (b) the Egyptian varieties of Arabic excluding Juba and South Sudan Arabic; and (c) a cluster of dialects in sub-Saharan Africa that includes Chadian and Nigerian Arabic, and in south-eastern Turkey in Siirt, Şırnak and Mardin Arabic. Instances of contrastive pharyngealized and non-pharyngealized coronal rhotics will be given below in (1a-b) from Egyptian Cairene Arabic (1a) (ECA) and Moroccan Arabic (1b) (MCA) (from Youssef 2019, with the same notation system followed[35]):

(1) Contrastive pharyngealized /rˤ/ and non-pharyngealized /r/ in ECA (a) and MCA (b)

a.	[ʔ̣ạrˤḅạʕ̣]	'a Wednesday'	[ʔarbaʕ]	'he guzzled'
	[ḅạrˤrˤạʔ̣]	'he acquitted'	[barraʔ]	'he stared'
	[ẉạrˤrˤạːṇị]	'rear, back'	[warraː-ni]	'he showed me'

[34] Reported the pronunciation of a graphemic *ġ* in the Spoken Tunisian Arabic as similar to Parisian r.
[35] The dots underneath the segments represent the spread of pharyngealization across the lexical word.

b. [rˤạːj̣iḅ]	‘curdled, curd’	[raːjib]	‘collapsed’
[ḅrˤạ]	‘letter’	[bra]	‘needle’
[ẓrˤạʕ]	‘whole wheat’	[zraʕ]	‘he sowed’
[ḥrˤạːṃ]	‘forbidden’	[ħraːm]	‘shawl, veil’
[ḍạːrˤ]	‘house’	[daːr]	‘he did’

Now this was a synopsis for the distribution of coronal rhotics, the next part will sum up some of the phonological processes manifested in coronal rhotics.

5.2.4 Phonological Processes in coronal rhotics

The next two subsections (§5.2.4.1 & 5.2.4.2) will present two phonological processes connected to coronal rhotics in different varieties of Arabic. The first subsection will offer a a process known in Arabic as ‘pharyngealization’ or ‘emphasis’. This process manifests acoustically as ‘backing’ or lowering of the second formant (F2); or ‘retraction’ with cooccurring rising of the first formant (F1) ‘lowering’, and lowering of the second formant (F2) ‘backing’; both of which caused by a dorsal consonant or a dorsal secondary gesture as in ‘pharyngealized’ consonants. The second subsection will offer a review for two assimilatory processes. One is assimilation of the definite article particle /l/ to coronels, and in this case to an adjacent rhotic, resulting into a geminate or a mirror copy of the rhotic trigger. Another is an assimilatory process which occurs within coronal segments, specifically /l/ and /n/, whereby they fully assimilate to an adjacent rhotic across the lexical word boundary.

5.2.4.1 Pharyngealization of Coronal Rhotics

The term *emphasis*, i.e. pharyngealization, refers to the process whereby an emphatic/pharyngealized consonant extends its prosodic or segmental features either rightward/leftward, bidirectional, to over a long range of adjacent sounds within the word boundary (Bellem 2007; Sylak-Glassman 2014). Generally speaking, pharyngealization is a widespread phenomenon across many Arabic varieties, and it could show considerable variation in: its domain of application, its directionality, and its identity in the contrastive pharyngealized triggers (Youssef 2019). In the study of pharyngealization there are two accepted positions: one view treats emphasis as a floating prosodic feature supplemented by both the consonantal and vocalic systems with no recognition of pharyngealization or emphasis as a segmental feature (cf. Lehn 1963; Broselow 1976). The second view treats emphasis or pharyngealization as a segmental feature and it operates on that level whereby emphasis occurs solely in words containing a pharyngealized sound (cf. Younes 1982; Youssef 2013 & 2019).

Youssef (2019) shows that in the split-rhotic type varieties of Arabic, a pharyngealized rhotic can extend pharyngealization over strings of neighbouring segments. Vowels in this environment can become retracted or more centralized and they are characterized acoustically by a lowered F2 value (cf. § 5.2.2, 5.2.3, 5.2.4, and (1), for more details) (Card 1983; Youssef 2019). In ECA, /rˤ/ triggers pharyngealization bidirectionally and within the prosodic word even in a non-tautosyllabic front vowels /i, iː/ environment, as in [rˤạḥịːḅạ] 'terrific' F.SG. and [ḥịrˤạːṣạ] 'guarding' (Youssef 2019). In MCA, pharyngealization can extend to prefixes, and to inflectional suffixes that begins with a vowel and surface as a tautosyllabic stem-final /rˤ/ as in, [ṭạ-ṇ-ʒ̣ḅəṛˤ-ụ] 'I find him' (Youssef 2019, cf. also Heath 1987). The front vowel /i/ and the postalveolar consonants /ʃ, ʒ, j/ were reported to sometimes block left-to-right pharyngealization; and this suggests that pharyngealization can occur more regressively than progressively (Heath 1987: 324).

In the pharyngealized-rhotic type varieties of Arabic (cf. Youssef 2019), and in most Levantine Arabic varieties, right-to-left pharyngealization is less restricted than left-to-right, and it has no blockers and can occur in inflectionless words, as in: [ṣạːf̣ạrˤ] 'he travelled', [ṃạʃ̣ḥụːrˤ] 'famous', [ɣ̣ạj̣j̣ạrˤ] 'he changed', [ṭạṃịrˤ] 'dates (fruit)' (Younes 1993; Davis 1995; Youssef 2019). Rightward pharyngealization, however, can extend to low vowels, as in [rˤạsuːl] 'prophet', and in intervening consonants, as in [x̣ạrˤḅạːn] 'broken down', but can be blocked by a following /w/, /ʃ/or /j/, as in [ʔ̣ạrˤwaːħ] 'souls' or a high vowel, as in [rˤạːmi] 'Rami (male name)' (Youssef 2019).

In the plain-rhotic type varieties of Arabic (cf. Youssef 2019) and in Muslim Baghdadi Arabic (MBA), the rhotic is phonetically described as a pharyngealized trill or tap unless it occurs neighbouring a high front vowel [i] or [iː]. This also causes a lowering of the second formant (F2) of an adjacent low mid vowel [a] or [aː] (Al-Ani 1970: 33; Youssef 2019). Youssef (2019) attributes pharyngealization in MBA to a backing coarticulation in the makeup of the segment, because pharyngealization rarely extends to distant vowels and, in other words, is similar to /q/ and [ɣ] or [ʁ] in having a dorsal coarticulatory element (Youssef

2019). Thus, in the plain-rhotic type varieties of Arabic, pharyngealization in rhotics does not behave similar to the classical pharyngealized segments in triggering long-range pharyngealization or labialization; it phonologically patterns with dorsal consonants like /q/, /k/, /g/, /x/ or /ɣ/ in triggering labialization; and phonetically with /q/ and /ɣ/ in exhibiting a coarticulatory gesture and backing effect on adjacent vowels (Youssef 2019).

After this synthesis on pharyngealization as a phonological process, the next part will take us to explore assimilatory processes in Arabic coronal rhotics.

5.2.4.2 Assimilation of Coronal Rhotics

Processes of assimilations are common across many Arabic varieties. First historical report of this process trace back to Sībawayh’s (d.796) *idġām* ‘assimilation’ in his volume *Al-Kitāb* (ed. Hārūn 1982:448). Sībawayh shows that the rhotics are in assimilatory processes with the lateral [l] and nasal [n], (cf. section §5.1, for further details), which is a type of assimilation that occurs within and across coronals as we will see later.

One common assimilatory process attested in most Arabic varieties is the active total regressive assimilation of the definite article particle [l-] once attached to a noun to signal syntactic definiteness with an initial coronal consonant: /ʃ, ʒ, l, n, r, t, tˤ, d, dˤ, s, sˤ, z, zˤ/. Once the definite article particle [l-] is attached to those coronal consonants, it becomes and mirrors that coronal trigger; thus, in words with initial coronal rhotics[36], the definite article will fully assimilate creating another copy and as a result a geminate segment, as in (cf. (2a) for ECA, (2b) for MCA, (2c) MBA below, from Youssef 2019). Watson (2002: 220–221) suggests that the underlying cause of this process lies in a violation on the Obligatory Contour Principle (OCP) for which there is an adjacent conflicting redundant coronal features, that of /l/ and of /r/.

[36] As this type of place assimilation is reported in the literature to occur in coronal sounds, and as a result dorsal rhotics are not expected to undergo this process. However, Abu-Haidar (1991: 110) on CBA states all consonants can assimilate to the definite article particle except the glottal consonants [ʕ] and [ʔ], as in *l-ʕəməġ* ‘the age’, *l-ʔdab* ‘manners or toilet’. In the case of a dorsal rhotic, an example provided is *əġġəjjāl* ‘the man’ (Abu-Haidar 1991: 101). In fact, a similar tendency has been also reported in the Jewish Libyan Arabic of Tripoli; but only dorsal rhotics of etymological-*r* are assimilated and not etymological-*ġ*, as in [əʀʀɑːħɑ] ‘the rest’, but [əlʀˠɑːbɑ] ‘the forest’; [ɣʀˠʀˠɑːʒəl] ‘the man’, but [əlʀˠɑːʀʌq] ‘the deep one’ (Yoda 2005: 198).

(2) Assimilation of the definite article particle [l-] to rhotics in ECA (a), MCA (b) and MBA (c) (Youssef 2019)

a. /l-rˤubʕ/	→	[ʔi̞rˤ-rˤṳb̤ʕ̤]	'the quarter'
/l-rasma/	→	[ʔir-rasma]	'the painting'
b. /l-rˤɑːʒəl/	→	[ə̤rˤ-rˤɑ̤ːʒə̤l̤]	'the man'
/l-rəkba/	→	[ər-rəkba]	'the knee'
c. /l-rizma/	→	[ər-rizma]	'the parcel'

Another common type of assimilatory process in Arabic rhotics is sonorant coronal assimilation. This occurs in laterals /l/ and nasals /n/ where they go through total regressive assimilation to a following rhotic /r/ across the lexical word boundary resulting into gemination of the triggering rhotic (Heath 1987; Youssef 2013; Youssef 2019). The opposite tendency whereby a rhotic assimilates to another coronal is yet not attested, whereas assimilation of a lateral /l/ to nasal /n/ is available (Youssef 2013; Youssef 2019). Below are instances of lateral and nasal assimilation to rhotics from ECA and MCA (from Youssef 2019):

(3) Assimilation of /l/ and /n/ to rhotics in ECA (a), MCA (b)

a. /min rigl-u/	→	[mir rigl-u]	'from his leg'
/waːkil riɣiːf/	→	[waːkir riɣiːf]	'eating a loaf (of bread)'
b. /n-rˤmi/	→	[rˤ-rˤm̤i̤]	'I throw'
/l-rusija/	→	[r-rusija]	'to Russia'

This was a short synthesis of the process of assimilation as it involves coronal Arabic rhotics. The next part will present a summary for this section on coronal Arabic rhotics.

5.3 Summary

Earliest sketch for the sound system of Arabic dates back to the documentation of eighth-century Arabic. Traditional scholars of Arabic describe 8CA rhotics as apical resonates and interact with [l, n, j] across the syllable and word boundaries. Recent articulatory accounts make further advances in distinguishing between taps, flaps and trills vis-a-vis the intensity of the active articulator interrupting the air stream against the alveolar ridge (the apex of the tongue). Trills are a functional geminate and well-distributed in the intervocalic environment. Taps and flaps are typically salient in onset and lenited or less tense in coda. Acoustically, trills show a similar constriction to that of a stop in spectrum and also exhibit a gap in the voice bar. Taps, however, show a formant shape interrupted by a vertical transient; otherwise when the spectrogram lacks an evident transient gesture it is most likely an approximant/frictionless continuant. In coda, the spectrum slice will show more friction noise a vowel-like formant.

Coronal rhotics in Arabic can be plain or pharyngealized and their manner is disperse: taps, flaps, trills, approximants, retroflex approximants, frictionless continuants, or voiceless fricatives. Inter-speaker and Intra-speaker variation is also attested (cf. Khattab 2002; Ismail 2007). Pharyngealization of rhotics is hypothetically evident in most of the varieties of Arabic, but still disputed whether it enjoys a phonemic status in most of them. For instance, Heath (2002) attributes rhotic pharyngealization to the process of harmony with an adjacent pharyngealized alveolar or a neighbouring uvular [q, x, ɣ] within the word-stem. However, there is an empirical evidence from the split-rhotic group whereby pharyngealized and non-pharyngealized rhotics are contrastive through established minimal pairs.

Coronal rhotics undergo two common types of phonological processes. One is when a pharyngealized rhotic extends its pharyngealization features to adjacent segments. The second is a processes of assimilation whereby the definite article particle /l/ totally assimilates to coronels and in that case to an adjacent rhotic resulting into a geminate or a mirror copy of that rhotic trigger. Another assimilatory process also occurs within coronal segments /l/ and /n/ whereby they fully assimilate to an adjacent rhotic across the lexical word boundary.

Now as this section on coronal rhotics is reaching a closure, the next part will take us through another type of rhotics, i.e., dorsal rhotics as they occur in a cluster varieties of Arabic.

5.4 HISTORICAL BACKGROUND TO DORSAL RHOTICS

After the Arabic expansion of the seventh century, the Arabs and their language spread throughout the Middle East and North Africa, and Arabic was used as a *lingua franca* with the native populations in these areas (Owens 2006: 2). A century later, traditional scholars of Arabic like Al-Farāhīdī (ed. al-Maḫzūmī & al-Sāmmarrā'ī 1988) & Sībawaih (ed. Hārūn 1982) offer first-hand descriptive accounts for 8CA. Any detailed work on the speech norm of the local populations was dismissed, perhaps, until Al-Jāḥiẓ's *Kitab al-bayān wa-ttabyīn* (ed. Hārūn 1986) which should serve as a synopsis or snapshot for the state of linguistic understanding for different speech norms in local diasporic societies.

The earliest attested documentation of Arabic dorsal rhotics dates back to Abbasid times (Al-Jāḥiẓ ed. Hārūn 1986; Jastrow 2006b). Al-Jāḥiẓ (ed. Hārūn 1986) attributed dorsal rhotics and any non-coronal-*r* outputs, including: a glide, lateral, glottal stop, a voiced pharyngeal fricative and a pharyngealized interdental fricative for an underlying rhotic to different separate reasons. Al-Jāḥiẓ treated these cases as *luθġā*[37] 'misarticulation'[38] to: a. *ḥubsah*– a person's struggle to speak; *b. ʿuqlah* – a person's struggle to articulate words*; c. luknah* – a person's dialect as influenced by their prior or early knowledge of other languages; and *d. ḥuklah*– a physical defect in the 'speech organ' *adāt al-lafẓ* (Montgomery 2018: 9-10).

Al-Jāḥiẓ, thus, shows that he is aware that *luknah* 'someone's dialect' could be one of the reasons a speaker opt for a non-canonical 8CA form. For instance, Al-Jāḥiẓ states that a native Aramaic speaker with no speech impediments would turn 'z' into 's', and <ʿ> 'ʿayn' into <ʾ> 'hamzah', as in: *zawraq → sawraq* 'skiff'; and *mushmaʿill → mushmaʾill* 'hastening' (Montgomery 2018:19). Another example reported by Al-Jāḥiẓ comes from Abū Muslim and Ubayd Allāh ibn Ziyād where both turn *qāf* into *kāf* as an influence from their early knowledge in Persian, as in: *qultu → kultu* 'I said' (Montgomery 2018: 20).

Al-Kindī[39] (803-873 CE.) also takes a similar stance towards non-coronal-*r* where he devoted a short monograph *Risāla fi al-lu*θ*ġā* (ed.Al-Tayān 1985) in an attempt to describe the sounds which are often 'misarticulated' by some individuals in Arabic. Again, Al-Kindī herein also attributes the different types of non-apical rhotic cases as 'misarticulations' for distinctive reasons similar to Al-Jāḥiẓ. Blanc (1964: 23) suggests while it was probably not a

[37] First reference to the term dates back to Sībawayh (ed. Hārūn 1982:137) where he demonstrates a tendency in some people with *luθġā* to make r → j as in *mənābir → mənābij* 'rostrum' because of the approximate point of articulation of /r/ to /j/ in this environment (word-medial/final *i-ʔimāla*).
[38] I adapt the translation offered by Montgomery (2018).
[39] Al-Kyndi, Alkindi, Alchindi, Alkindus or Alkendus, also known as "the philosopher of the Arabs", was born in Baṣra and lived most of his life in Kūfa in modern day Iraq.

sociolinguistic feature at that time of Al-Jāḥiẓ and his successors, it might have been on the way to becoming a hallmark of their speech later. Blanc adds (1964: 25):

> "I note in passing that among the Iraqis I have known, no less than six (three Muslims, two Jews, and one Christian, all of Baghdad) were unable to produce the apical trill that is normal in their dialects, and replaced it by /ġ/ or a similar spirant. In other words, they all had a true *luθġa* for which, incidentally, they had no name, nor have I been able to find one in any Iraqi dialect, though in other dialects, where it may be less common, names for it do exist."

This traditional outlook towards dorsal rhotics had equated what could have been for some an individual speech 'misarticulation', with a potential areal/linguistic feature or *luknah* of this substratum. For instance, Youssef (2019: 24) states that "[t]here is little doubt that uvular R originates from Old Arabic alveolar /r/, possibly first as a substrate influence from Aramaic". In other words, the possibility for the dorsal rhotic to be already ingrained in the phonology or phonetics of the first language for those local adult speakers before they learned Arabic was most likely overlooked. Thus, this was the state of knowledge back then on this topic; and on dorsal rhotics or similar language features.

Variability is a definite characteristic of human speech. No two voices of different individuals are the same. No two repetitions of the same word by the same individual are the same. This variation was first observed and modelled in the turn of the nineteenth century by Paul (1880). On the same line, the study of language change in sociohistorical linguistics centres around answering either of two major questions: a. the actuation enquiry – which seeks to know how innovations emerge in a language; and b. the transition enquiry – how innovations are adopted and expanded in the language.

Another aspect resulted from this general landscape or point view on non-*fuṣḥa* speech patterns, entailed a tendency back in Abbasid and subsequent times, to degrade these forms, or to be considered as *laḥn* – any speech form that diverges from the norm of the (8CA) (Al-Jāḥiẓ ed. Hārūn 1986). Thus, this resulted into an atmosphere of social pressure and stigma towards some colloquial or non-*fuṣḥa* forms. For instance, Al-Jāḥiẓ (ed. Hārūn 1986) sometimes refers to the *luθġā* of Wāṣil Ibn ʿAṭāʾ[40] (d. 748), although it is not in fact described by any capacity in the literature, and how Ibn ʿAṭāʾ still improvised a long

[40] Born in the Arabian Peninsula around 700 CE known as a theologian and jurist.

speech to address the people avoiding the use of the rhotic all together throughout the session. Al-Jāḥiẓ (ed. Hārūn 1986) states that the dorsal rhotic was the least reprehensible 'misarticulation' of the other types, and is considered the most prevalent amongst the great and the good, including men of eloquence and scholars (Montgomery 2018).

Al-Jāḥiẓ ed. Hārūn (1986: 1/137) also refers to that youthful servant females who exhibit *laḥn* and/or *lu*θ*ġā* during that time were perceived by some as 'charming' or 'delightful'; especially if the *laḥn* is a trait of a local *luknah*[41]. Abū Nuwās (756-814 CE.), for instance, also had composed many poems in this respect, as one reported by Ibn Jinnī (ed. Al-Saqqa 1954: 61):

**wa xuđ min kaff-i jāriya-tin waṣīf, maliḥ-u ud-dull-i mal*θ*ūġ al-kalām…*

Then take from the hand of a servant girl of charming sense and deviant speech

Colloquial Arabic enjoys an ethnolectal status in Arabic-speaking societies shaped by substratum features whereby speakers can establish tribal, ethnic, religious, or national affinity. However, written forms not following the canon of 8CA or its offshoot 'Standard Arabic' are often dubbed as 'Mixed Arabic'[42], or 'Middle Arabic'[43] for any text written between 13th- early 20th century. In medieval times "poets have sometimes used the medium of colloquial Arabic to express their feelings" (Versteegh 2014: 170). For instance, some poems of the Iraqi poet Ṣafī d-Dīn al-ḥillī (d. c.1350) have been considered a central source for the reconstruction of the 14th century Iraqi Arabic (Levin 1975). Such poems were taken as specimen for the reconstruction of **r > ġ*, the use of the case ending *-ūn* of the imperfect verb, and the use of the particle *farəd* as determiner or an indefinite article (Levin 1975; Versteegh 2014: 170). Another similar poem comes from the Egyptian poet ᶜAlī ibn Sūdūn Al-Bašbuġāwī (d. c. 868). In one, Ibn Sūdūn mimics the speech of 'a hunchback from

41 "واللحن من الجواري الظراف، ومن الكواعب النواهد، ومن الشواب الملاح، ومن ذوات الخدور الغرائر، أيسر. وربما استملح الرجل ذلك منهن ما لم تكن الجارية صاحبة تكلف، ولكن إذا كان اللحن على سجية سكان البلد. وكما يستملحون اللثغة إذا كانت حديثة السن، ومقدودة مجدولة، فإذا أسنت واكتهلت تغير ذلك الاستملاح. وربما كان اسم الجارية غليّم أو صبيّة أو ما أشبه ذلك، فإذا صارت كهلة جزلة، وعجوزا شهلة، وحملت اللحم وتراكم عليها الشحم، وصار بنوها رجالا وبناتها نساء، فما أقبح حينئذ أن يقال لها: يا غليم كيف أصبحت؟ ويا صبية كيف أمسيت". (Al-Jāḥiẓ ed. Hārūn 1986: 1/137).

42 Ferguson (1959) was first to put this term to use to explain a linguistic structure, and to propose for an Arabic koine. For review on what counts as mixed Arabic see (Den Heijer 2012; and Versteegh 2014).

43 First coined by Fleischer (1888: 155) as *Mittel arabisch* to mean 'common language'. Fück (1955) was first to apply it to a bundle of written non-standardized Arabic ethnolects for Muslims, Jews and Christians (for introduction Blau 1965; Versteegh 2014:97-98). Bellem & Smith (2014) argue against the label 'Middle Arabic' for this style of Arabic as it can be somehow misleading.

Baghdad’ who articulates the *r* as *ġ*, as in **rabbī > ġabbī* ‘my lord’, **šāʕir > šāʕiġ* ‘poet’ (Levin 1975:266).

The earliest attested first-hand evidence for the existence of a dorsal rhotic comes from a short poem by Abū Nuwās where he expresses his affection for a woman he met and identified as from Mosul. He identified that woman as having a “Mosulian” *lu*θ*ġā* originally from *Kitāb Waffiyāt Alaʿiyan* by Ibn-Ḥallikān (ed. Mac Guckin 1868). As translated into English by Mac Guckin, in his words, (Mac Guckin 1868: 645):

> “I swear by the witness of my beloved’s teeth! [B]y the beauty-spot like the point on the kha (خ) which is seen on her cheek when the ringlet is turned aside! [T]hat her Mosulian lisp has fascinated me. The love it inspires has cast me into a swollen sea (of passion). The cheeks of that fair one who speaks with a foreign accent are shaded by scorpions (ringlets) empowered to sting me alone. When she speaks, the deafest of the deaf hearken to the tuneful lisping of her words. She says to me –(she says) when the cup of ebriety is emptied and the tint of the wine displays its fairest colours on her cheeks: “go on gently! For the inebriating liquor which you sip from the vine of my lips will only add intoxication to intoxication.”

Abū Nuwās mimics this woman he identified as from Mosul, who uses dorsal rhotics, in the last verse. Thus, "go on gently! For the inebriating liquor which you sip from the vine of my lips will only add intoxication to intoxication." translates into: **taraffaq fa-šurb-u ul-xamr-i min karam-i riqat-i, jaziduk ʕind-a aš-šurb-i sukr-an ʕala sukr-a:,* with every *r*-sound in the last verse being substituted by a dorsal rhotic recapitulating her speech pattern. Although Abū Nuwās is not a linguist nor a dialectologist, he can be our eyewitness on the state of Maṣlāwī back then. Also, the way he identified the woman as coming from Mosul shows that sociolinguistic differences were also salient at his time; and more importantly that he recognised it as a ‘collective’ *luknah* of Mosul rather than an ‘individual’ *lu*θ*ġā.*

After perhaps the 10th century, Arabic started to acquire new native speakers in diaspora (Blanc 1964: 167, 202). Some of those native speakers started writing in a standardised or colloquial local forms which latter served linguists with features of spoken Arabic in designated periods of time (cf. chapter 6, for more details on the sociolinguistic ecology of Mesopotamian Arabic) (Versteegh 2014: 170; Levin 1975). Sa’adya ibn Yosef al-fayyūmī[44] (882-942 CE) in his commentary of *Sefer Yesịra* in the 10th century refers to the state of rhotics amongst the Jews of Iraq - in that a dorsal rhotic was used in the spoken vernacular of the Jews, but only a coronal rhotic is used in their reading of the Hebrew Scriptures (Blanc 1964: 23-24; Khan 1995; Khan 2018a: 164-165). Khan (1995) adds "[t]his two-fold pronunciation may have been inherited from the Aramaic[45] vernaculars of the Jews in the Middle Ages and would be the descendant of the Aramaic double reš described by Sa'adya." (Khan 1995: 77). Khan (2018a: 164) states that there is an empirical evidence for the occurrence of dorsal rhotics in some medieval 'Judaeo-Iraqi Arabic' texts whereby the letter *reš* and *gimel* interchange (blau 1999: 252).

Jastrow (2006b) suggests that dorsal rhotics date back to the medieval Abbasid period. Youssef (2019) states that ever since the dorsal rhotic became common and it fell in harmony with the inherited /ʁ/ for etymological-*ġ.* One of the hallmarks of *qəltu*-Arabic, limited to the Tigris subgroup; and in the pre-Hilalian varieties of North Africa as spoken in some urban cities, a dorsal rhotic is reported as reflex of OA **r* (Blanc 1964; Abū- Haidar 1991; Jastrow 2006b; Bar-Moshe 2019; Youssef 2019) (cf. section §5.5 & 5.5.1, for further details).

As this part has reached its ends, the next section will now take us through the phonetics and phonology of dorsal rhotics.

5.5 DORSAL RHOTICS: PHONETICS & PHONOLOGY

Dorsal reflexes of OA **r* have been described in the literature as a velar fricative [ɣ] for Muslims, Christians and Jews in Mosul (Maṣlāwī); in Tikrit; Christian Baghdadi Arabic (CBA) and Jewish Baghdadi Arabic (JBA) (for detailed account on JBA, CBA & Maṣlāwī, cf. Blanc 1964; for CBA, cf. Abū-Haidar 1991; for JBA, cf. Mansour 1957; Bar-Moshe 2019; for review, cf. Jastrow 2006a&b; Youssef 2019). Jastrow puts it "Old Arabic /r/ has shifted to a velar fricative /ġ/ (phonetically identical with original /ġ/" (2006b: 416). Thus, this suggests a phonetic merger in dorsal rhotics with an already existing realization of etymological-*ġ*.

Cohen (1912: 27) reports in urban areas in Algeria that in the speech of some Muslims, there is a uvular, or lenited or 'weak' 'lingual' variant of rhotics similar to English

[44] He was born in Egypt and spent most of his life between Iraq and Tiberias.
[45] Aramaic was used as a vernacular amongst the Jews of Iraq until the first half of the eleventh century, although many also spoke forms of Arabic as well (Khan 1995: 77).

/r/; and a uvular rhotic in the speech of some Jews, which still less frequent than amongst the Muslims (Cohen 1912: 27). He describes this dorsal rhotic as similar to etymological-*ġ*, but still distinguishable as etymological-*r* has a 'battements' trilling or vibration, and 'roulement' rolling; where the etymological-*ġ* is described as a lenited continent or a voiced posterior velar spirant. Cohen (1912) suggests two phonemes for etymological-*r.* In the Algerian Arabic spoken in Djidjelli (Jijel), Marçais (1956: 17) reported a lenited dorsal rhotic – more like an approximant articulated by the back of the tongue against the uvula [ʁ̞]. It is phonetically described as similar to the uvular fricative [ʁ] for etymological-*ġ*, but further back with less friction noise. Thus, Marçais (1956) suggests that both [ʁ] for etymological-*ġ,* and [ʁ̞] for etymological-*r* are phonetically distinguishable. Youssef (2019) suggests that in this variety, there is an /r/ phoneme that can be realized as [ʁ̞], and another phoneme that can be realized as/ʁ/ (cf. also Cohen 1912: 27).

In fact, the situation with dorsal rhotics in the Maghrebi varieties of North Africa is muddier and not that clear on whether they merged with etymological-*ġ* in terms of phonetic description. Roux (1925:164) states that etymological-*r* is pronounced 'similar' to etymological-*ġ*; and that it was difficult for him to distinguish between the two. Thus, some scholars suggest a phonetic merger between etymological-*r* and etymological-*ġ* in the northern Moroccan varieties; in the dialect of Taza (Behnstedt and Benabbou 2002: 60); and in the pharyngealized etymological-*r* with etymological-*ġ* in the Jewish Libyan variety of Tripoli Arabic (JLT) (Yoda 2005: 11); while others suggest a small phonetic distinguishable difference in Fez, Tetouan, Chefchaouen and in some Jewish dialects (Aguadé 2003: 78-79); or between, for instance, the Chefchaouen's and Tetouan's dorsal pronunciation of etymological-*r;* and that it did not merge in both with etymological-*ġ* (Rahmouni 2014:29-30; Behnstedt 2003: 165). Behnstedt (2003: 165) states that in other northern Moroccan varieties, such as Tetouan, there is a slight difference between the two sounds, i.e. the dorsal pronunciation of etymological-*r* and etymological-*ġ.* Aguadé (2018) reports that the Jewish and 'sedentary' varieties in northern Morocco exhibit a velar-uvular fricative forms of rhotics. Aguadé (2003: 78-79) states that studies in the linguistic area literature had sometimes equated the dorsal pronunciation of etymological-*r* with the pronunciation of etymological-*ġ*. In the variety of Tetouan, Aguadé (2003) states that the difference between the pronunciation of etymological-*r* and etymological-*ġ* lies in minimal pairs, such as *ġāyb* 'absent' < **ġ,* and *ġāyb* 'curd, cottage cheese' < **r*, whereby the **ġ* token is "a velar-uvular fricative with a multiple vibration” (78-79), whereas the **r* token is a “velar-uvular fricative with a single or [short] vibration” (79).

Zawadowski (1978: 38) reports the dorsal rhotic as a uvular, or ‘burring’, sound that occurs in Algeria, Tunisia, and amongst the urban population of Cherchell, Djidjelli, Constantine, Tlemcen, Nedroma, Fez and Tetouan, and most often in the Jewish ‘subdialects’. He states that it “should not be mistaken for <*ġ*>*”* (Zawadowski 1978: 38). Interestingly, Rahmouni (2014: 30) adds that the dorsal pronunciation of etymological-*r* in Tetouan and Chaouen is substantially different that you can identify whether the speaker is from Chaouen or Tetouan. In her footnotes, Rahmouni (2014) also reports personal comments on the dorsal pronunciation of etymological-*r* in her spoken data recordings from Aguadé, Behnstedt, and Woidich who all agree that tokens of etymological-*r* and etymological-*ġ* are the same. Youssef (2019: 24) suggests that a dorsal rhotic is reported in urban centres in the Maghrebi varieties of Arabic and is sporadic; and that it did not become phonetically identical to *ġayn* i.e. etymological-*ġ.*

In most of these varieties of Arabic, a coronal rhotic, i.e. an alveolar rhotic, still surfaces sometimes conditionally in loanwords: either from other Arabic dialects with coronal rhotics; or from other languages, such as Hebrew, Turkish, Persian, Kurdish, English (cf. §5.5.1, for further details) (cf. Marçais 1956; Mansour 1957; Blanc 1964; Johnstone 1975; Abū-Haidar 1991; Jastrow 2006a&b; Bar-Moshe 2019; Youssef 2019, for review). In JLT, the linguistic situation in regards to loanwords vis-à-vis rhotics is a bit different – for the majority of loanwords from Hebrew or Italian a dorsal rhotic is still used; but there still some few loanwords from both donor languages that surface with a coronal rhotic (Yoda 2005: 12).

In the ‘sedentary’ varieties of Levantine Arabic, there also occurs dorsal rhotics. For instance, Arnold (2004: 36) reports this tendency in the ‘sedentary’ Levantine Arabic as spoken by the ‘Samaritans’ younger generation in the town of Jaffa. This dorsal rhotic is not clearly described besides just being a uvular. In the same language area, in the Jewish variety of Aleppo in Syria, an apical trill is an underlying rhotic in complementary distribution with a conditioned velar fricative, especially in pause (Nevo 1991: 22, 32; Khan 2018a: 164).

Cantineau (1960:76) uses a uvular fricative [ʁ] to phonetically describe the dorsal rhotic as it occurs in CBA. Youssef (2019) uses a uvular fricative [ʁ] to phonetically describe and phonemically represent the dorsal rhotic for all of these varieties in Arabic. Watson (2002: 16) phonetically describes this merger sound as a voiced post-velar fricative. Youssef (2019) also specifically describes this dorsal rhotic as a posterior fricative characterized by a close approximation between, the active articulator, the back of the tongue, and the passive articulator, the velar or uvular point of constriction. Youssef (2019) suggests that both a uvular [ʁ] or velar [ɣ] are equally possible choices since both do not contrast in any Arabic variety.

In JLT, Yoda (2005) reports that for the majority of the Jewish speakers from Tripoli city, the rhotic is realized as a uvular trill [ʀ] or uvular fricative [ʁ]; and 'velarized' uvular trill or fricative [ʀˠ ~ ʁˠ]. He justifies the 'velarized' phonetic outputs by the near minimal pairs /ħʒəʀ/ 'lap' and /ħʒɤʀˠ/ 'stone', or minimal pairs as in *žaġi* 'running' and *žaġ̣i* [46]'my neighbour' (Yoda 2005: 11& 24). He also states that only pharyngealized words for etymological-*r* have phonetically merged with etymological-*ġ*[47]*;* and so are phonetically indistinguishable; but still phonemically separate because they phonologically pattern differently (Yoda 2005: 11-12). There are also a minority of Jewish speakers from Tripoli who use a coronal apical trills [r] and [rˤ]; however, in the Muslim Libyan variety of Tripoli only coronal apical trills [r] and [rˤ] are used (Yoda 2005: 12). D'Anna (2021) reports a voiced uvular fricative [ʁ] in Jewish Libyan varieties of Zāwiya; and perhaps in Zlīten through personal observation.

In an unpublished study on rhotics as they occur in Maṣlāwī, Aldahook (2015) demonstrates from an instrumental acoustic evidence that the pronunciation of <*ġ*> in: dorsal rhotics in Arabic etymological-*r,* etymological-*ġ,* and English etymological-*g* in monosyllabic native words with nucleus allophony of the central vowel [ɑ·] in Maṣlāwī had fully merged into a voiced uvular continuant [ʁ], as in (4a,b,&c, below; Aldahook 2015):

(4) Word-stem set with *ġ*-merger *in* Maṣlāwī

a. **r > ġ*

**raʾs* > *ġa·s*[48] 'head'

[46] The orthographic notation corresponds to his examples and to his notation system of consonants and vowels (Yoda 2005: 5).
[47] Yoda (2005: 11) states that words with etymological-*ġ* are pronounced as uvular trill or fricative [ʀˠ ~ ʁˠ].
[48] This diacritic [·] indicates half-long. For more details on this and on other diacritics refer to the Practical Orthography and Transcription table at the beginning of this thesis.

*ʾraːda > ġa·d '(he) wanted'

*raːħa > ġa·ħ '(he) went'

b. *ġ

*ġaːba > ġa·b '(he) is absent'

* ġaːr > ġa·r 'talus cave'

c. ENG g → ġ

gaːs → ġa·z 'gas'

After this very brief phonetic and somehow phonological description of dorsal rhotics, the next part will thoroughly present and describe the distribution, and phonetic-phonological patterning of dorsal rhotics.

5.5.1 Distribution Of Dorsal Rhotics

As far as Mesopotamian Arabic is concerned, dorsal *r*-sounds have been reported in the Tigris cluster of the *qəltu*-Arabic continuum: in the spoken variety of Mosul (Maṣlāwī) (Jastrow 1979; Youssef 2019), Tikrit (Tikritī) (Johnstone 1975; and Jastrow 1983); the spoken Arabic variety of Christian and Jews in Central, mainly Baghdad, and Southern Iraq (Blanc 1964; Jastrow 2006b, Youssef 2019, for review), and solely in the spoken Arabic of the Jews in the Southern Kurdistan group: (Kirkuk, Tuz Khurmatu & Khanaqin) (Jastrow 2006b: 416). It is attested in CBA (Cantineau 1960; and Abū-Haidar 1991; Youssef 2019), and JBA (Mansour 1957; Bar-Moshe 2019). In these varieties of Arabic, the apical OA **r* becomes a dorsal continuant[49] and phonetically merged in pronunciation with etymological-*ġ* (cf. Blanc 1964: 20-25; Abū- Haidar 1991; Jastrow 2006b: 416; Bar-Moshe 2019; Youssef 2019).

In these varieties of Arabic, a dorsal rhotic is the underlying form, but a coronal rhotic, an alveolar r-sound, still surfaces sometimes in linguistically conditioned cases: (a) in cross-dialectal loanwords as in (5), as in Literary Arabic terms, or words borrowed from other varieties of Arabic: (b) in cross-language loanwords from Hebrew, Turkish, Persian,

[49] It has been described in the literature as a velar or uvular fricative/approximant [ɣ] [ʁ], respectively.

Kurdish or English (cf. Marçais 1956; Mansour 1957; Blanc 1964; Johnstone 1975; Abū-Haidar 1991; Jastrow 2006a&b; Bar-Moshe 2019; Youssef 2019).

Youssef (2019) suggest that Arabic loanwords that exhibit a coronal rhotic, an alveolar r-sound, in Maṣlāwī, and CBA are usually proper names (5a), terms for abstract concepts (5b), religious terms (5c), modern Arabic words (5d), or borrowing from a sister variety of Arabic, especially Muslim Baghdadi Arabic (MBA) (5e) (examples are also taken from Abū- Haidar 1991 for CBA; Tawfiq 2010 for Maṣlāwī; Blanc 1964 and Bar-Moshe 2019 for JBA).

(5) Coronal rhotics in Arabic loanwords (from Abū- Haidar 1991; Tawfiq 2010; Blanc 1964; Bar-Moshe 2019; Youssef 2019)

a.	/ʔibraːhiːm/	‘male name’	/ʃariːf/	‘honourable, male name’
	/ʕəraːq/	‘Iraq’	/ʔərbil/	‘city name’
b.	/taʔaθθur/	‘influence’	/taraːʔʔus/	‘management’
	/rakin/	‘sedate’	/mustaʃaːr/	‘consultant’
c.	/rabb-i/	‘my God’	/rasuːl/	‘prophet’
	/raħiːm/	‘compassionate’	/raħmaːn/	‘merciful’
d.	/sijaːra/	‘car’	/mʊdiːr/	‘manager’
	/rasˤiːd/	‘capital, fund’	/ratiːb/	‘monotonous’
e.	/garaːjib/	‘relatives’	/gədər/	‘pot’
	/mardi/	‘pole for pushing a boat’	/tˤaraf/	‘neighbourhood’

In most Jewish-Iraqi varieties of Arabic, Hebrew loanwords with etymological-ר <r> become coronal rhotic /r/, as in *sēfer* ‘book’, *tōra* ‘bible’, *ráššam* ‘he wrote’ (Khan 2018a: 166; Bar-Moshe 2019: 16). Blanc (1964: 141) reported that the Hebrew rhotic is always coronal in Jewish-Iraqi Arabic except in the proper names: *ġaḥēl* and *ġaḥmīn*. Khan (2018a: 166) demonstrates that there also occurs hypercorrection in some varieties – in the Jewish-Iraqi Arabic of ʿĀna or in the Jewish-Syrian Arabic of Aleppo, the original Hebrew dorsal rhotic is pronounced as a coronal rhotic, thus, *haġˤala* ‘rinsing (of Passover vessels)’ becomes *hirˤāla* and *ʾarˤalä,* respectively. Khan (2018a: 166) suggests that this lack of a dorsal rhotic in the Hebrew component of Jewish Iraqi Arabic could be attributed to an influence form the liturgical reading tradition, analogous to the case of /q/ in the Hebrew component as it occurs in the Jewish varieties of Syrian Arabic.

The other type of loanwords, type (b), that sometimes condition rhotics occurrence to coronal rhotics in the Tigris varieties of *qəltu*-Arabic is cross-language loanwords, as in (6) from Hebrew (6a), mostly in the Jewish varieties of Iraqi Arabic, Turkish (6b), Persian (6c), or English (6d) (cf. Mansour 1957; Blanc 1964; Abū-Haidar 1991; Procházka 2018&2020; Bar-Moshe 2019; Youssef 2019). The coronal rhotic surfaces as an alveolar r-sound (Youssef 2019).

(6) Coronal rhotics in loanwords (from Mansour 1957; Blanc 1964; Abū-Haidar 1991; Procházka 2018&2020; Bar-Moshe 2019; Youssef 2019)

a.	/toːra/	‘bible’	/sefər/	‘book/bible’ ~ Aram
	/raʃʃam/	‘he wrote’	/braːxa/	‘blessing’
b.	/qoːndara/~/koːndra/	‘shoe’	/parda/	‘curtain’
	/ʃarbat/	‘sherbet’	/firʃa/ ~ /firt͡ʃa/	‘broom/brush’
c.	/nafar/	‘person’	/t͡ʃarx/	‘wheel’
	/t͡ʃarpaːja/~/t͡ʃarpaːji/	‘bedstead’	/t͡ʃardaːx/	‘hut, cabin’
d.	/radjo/	‘radio’	/taːjir/	‘car tire’
	/breːk/	‘brake’	/ʤiːgaːra/	‘cigarette’

In the phonetic and phonological literature of Maṣlāwī, CBA and JBA, there have been attempts in establishing some minimal pairs either between the allophones [r] and [ʁ] of rhotics in etymological-*r* lexical items (7b) (Mansour 1957), or contrasting etymological-*r* words with etymological-*ġ* (7a) (Tawfiq 2010; and Youssef 2019). Youssef (2019) suggests that this pattern shows that they should be taken as separate phonemes for this Uvular-r type group. On similar grounds, Mansour (1957) also is in favour of the two phonemes in words with etymological-*r* in JBA and suggests that this contrast was more established by recent Literary Arabic loanwords in JBA cooccurring with the already available same words with a basic different meaning in the older pronunciation [ʁ].

(7) Minimal pairs involving etymological-*r* and etymological-*ġ* words (from Mansour 1957; Tawfiq 2010; and Youssef 2019)

a.	[jị-sˤḅụṛ]	‘he forbears’	[jị-sˤḅụʁ̣]	‘he paints’	< **r* vs.**ġ*
	[rạːja]	‘flag’	[ʁ̣ạːja]	‘destination’	< **r* vs.**ġ*
b.	[ṛạṃạðˤaːṇ]	‘male name’	[ʁ̣ạṃạðˤạːṇ]	(lunar month)	< **r*
	[rạkkib]	‘he let climb’	[ʁạkkib]	‘he assembled’	< **r*
	[qạddir]	‘he estimated’	[qạddiʁ]	‘he measured’	< **r*
c.	[farrạq]	‘he distinguished’	[faʁʁạq]	‘he separated’	< **r*
	[fạrr]	‘he threw’	[fạʁʁ]	‘he served (food)’	< **r*
	[ʁạjjar]	‘he changed’	[ʁạjjaʁ]	‘he dressed up	< **r*

Tawfiq (2010: 34-35) suggests that the words in the left column of (7a) do not surface as dorsal rhotics so to “avoid confusing” them with the words on the right column of (7a). Youssef (2019) suggests that what Tawfiq is showing has to do with semantic restriction against lexical duplicates in Maṣlāwī. However, Tawfiq (2010) illustrates that there is an exception of this case in the word [sˤạːʁ] as this lexical form can be etymologically/r/ to mean ‘become’, and /ʁ/ to mean ‘devised’, and can be only understood from the context.

Another aspect of some interest in studying rhotics is to observe how rhotics behave in *imāla* ‘vowel raising’ of the feminine suffix [-a]. By studying both Maṣlāwī and CBA, Youssef (2019) suggests that *imāla* surfaces as [a] after a plain or pharyngealized [r], and pharyngealized or dorsal consonants such as [ʁ] (8a). However, there are two exceptions to *imāla* as it occurs in Maṣlāwī, CBA, and JBA: (a) *imāla* surfaces as [i] right after a dorsal rhotic [ʁ] in a proceeding stressed syllable with a front vowel (8b); (b) *imāla* does not occur in loanwords ending with /a/ (8c) (Youssef 2019).

(8) Allomorphy of the feminine suffix [-a] vis-à-vis rhotics (from Youssef 2019; Bar-Moshe 2019)

a.	/maʁaqa/	'sauce'	/xamiːra/	'yeast'
	/maʁa/	'woman'	/ʁaxiːsˤ-a/	'cheap-F.SG'
b.	/ʔibʁi/	'needle'	/xabiːʁ-i/	'expert-F.SG'
	/kbiːʁ-i/~/gbiːʁ-i/	'big-F.SG'	/faqiːʁ-i/	'poor-F.SG'
c.	/sˤoːda/	'soda'	/doːndirma/	'ice cream'
	/sətˤra/	'Jacket'	/sijaːra/	'car'

Abū-Haidar (2004), has conducted a study on the spoken variety of Rabīᶜa (RA), in a semi-isolated area, in the region of Jabal Sinjar 'Sinjar mountain', a *qəltu* dialect that belongs to the varieties of Mosul branch of the Tigris group, and reported that dorsal rhotics for the reflexes of OA **r* as in Mosul do not occur. Thus, *ġəḥtu* in Maṣlāwī, but *rəḥtu* 'I went' in RA; *aġnab* in Maṣlāwī, but *arnab* 'rabbit' in RA (Abū-Haidar 2004: 5).

As far as Levantine Arabic is concerned, Arnold (2004), in his study of the sedentary Levantine Arabic as spoken in and around the ancient town of Jaffa (part of Tel Aviv), reports a dorsal reflex of OA **r* in the speech of the younger generation of "Samaritans" who grew up in Holon. Arnold (2004) attributes this recently attested, presumably, superstratum Hebrew dorsal-*r* in Jaffa as an innovation put forward by the younger generation while the tendency in the older generation is categorical apical-*r*. Thus, *ʀāḥ* 'he walked away'; and *šiʀeb* 'he drank' (Arnold 2004: 36). A similar situation occurs in the Jewish variety of Aleppo whereby the underlying rhotic is coronal, but a dorsal fricative occurs in conditional distribution especially in pause (Nevo 1991: 22, 32; Khan 2018a: 164).

There also a similar situation in the old pre-Hilalian varieties of North Africa whereby a dorsal rhotic is reported in some urban centres[50], but not identical to the pronunciation of etymological-*ġ* (Youssef 2019). As far as Maghrebi Arabic is concerned, a form of a dorsal rhotic has been recognized by Moroccans as the "(r) from Fez" (Stroomer 2004: 293; see also Cantineau 1960: 49). Freeman (2017) in his empirical study of the spoken Arabic in Fès has reported an apical trill or tap, apical continuant, and dorsal sonorant or rhotacized vowel similar to English "burred /r/". Marçais (1956: 16-17) relates this tendency to old urban centres in Tunis, Algeria, Fez, Meknes, and also Constantine. Marçais (1977: 10) generally reported a uvular fricative as a reflex of OA **r* in urban centres in Morocco back then.

Stroomer (2004) also reported a similar dorsal r-sound in the city of Tetouan. Moscoso (2003: 215) reports dorsal rhotics as a feature of women speech in Chaouen. Herrero (1996) reports this tendency in Tetouan as a characteristic and gender marker of women's speech as well. Dorsal rhotics have been considered a characteristic of women speech in Chaouen Arabic, although on a smaller scale some men still exhibit this tendency, too (Moscoso 2003: 215; Rahmouni 2014: 30). Stroomer (2004) suggests that this dorsal r-sound also functions as a gender marker associated with female speech in Meknes. Roux (1925) has observed this tendency in the speech of some families, especially females in Meknes; stating it is almost identical to the pronunciation of the etymological-*ġ*. Al-Wer (2014) hypothesizes that, although it cannot be verified whether this tendency was truly exclusive for women in Meknes, this looks like a snapshot of a sound change in progress perhaps in its early stages when was first noted by Roux in 1925 which later became a hallmark of some varieties in the Maghreb. Rahmouni (2014) states that dorsal rhotics are a hallmark of the Chaouen urban dialect that distinguish it from the neighbouring rural dialects.

A dorsal trill [ʀ] or fricative [ʁ] have been reported in the 'sedentary' JLT (Yoda 2005: 11; Khan 2018a: 164). D'Anna (2021) conducted a phonological and morphological study on the Jewish Libyan variety of Yefren through three female speakers and reports a voiced

[50] This occurs in the cities of Tunis in Tunisia; Constantine, Cherchell, Algiers, Nedroma, Tlemcen and Djidjelli (Jijel) in Algeria (Cohen 1912; Marçais 1956; Youssef 2019); Fez, Meknes, Tetouan, Chefchaouen or Chaouen, Taza, as well as in some Jewish dialects in Morocco (Heath 2002; Aguadé 2003 & 2018; Hachimi 2005; Youssef 2019); and the Jewish Libyan varieties in Tripoli, Zāwiya, and perhaps in Zlīten (Yoda 2005; D'Anna 2021).

alveolar trill [r], and a pharyngealized counterpart [rˤ] next to a pharyngealized or post-velar consonants. He also reports a voiced uvular fricative [ʁ] in Zāwiya, and perhaps in Zlīten through personal observation. He states that some Jewish speakers from Yefren and those from Benghazi who are not categorical-*ġ* speakers seem to stigmatize the uvular fricative [ʁ] (D'Anna 2021: 14).

A different scenario, however, comes from urban areas in Algeria, whereby a dorsal rhotic is found in the speech of some Muslims; and in less frequency in the speech of some Jews (Cohen 1912: 27). Later, Marçais (1956) has also reported this trend, as a uvular spirant for /r/, to occur only in the town of Djidjelli (Jijel), Eastern Kabylia in Algeria, and nowhere else in Eastern Kabylia.

After this concise review on the distribution of dorsal rhotics, the next part will take us through the phonological processes common in the occurrence of dorsal rhotics.

5.5.2 Phonological Processes in Dorsal Rhotics

The next three subsections (§5.5.2.1; 5.5.2.2 & 5.5.2.3) will present three phonological processes connected to dorsal rhotics in different varieties of Arabic. The first subsection will present a process of total assimilation in dorsal rhotics in the vicinity of the dorsal consonants /q/ and /x/ in the Tigris cluster of Mesopotamian Arabic. The next subsection will offer a review for a process of vocalization in dorsal rhotics which commonly occurs in the Tigris subgroup of *qəltu*-Arabic. The last subsection will provide a review for a process of dissimilation which occurs in dorsal rhotics in the vicinity of etymological-*ġ*.

5.5.2.1 Assimilation of dorsal rhotics

There sometimes occur a process of total assimilation in the etymological-*r* words that surface with a dorsal rhotic [ʁ] in the vicinity of the dorsal consonants /q/ and /x/ in the Tigris cluster of Mesopotamian Arabic (Blanc 1964: 21; Abū-Haidar 1991: 36; Bar-Moshe 2019: 18 Youssef 2019: 26). This tendency was noted by Blanc (1964), Abū-Haidar (1991), Bar-Moshe (2019) and Youssef (2019) to trigger total assimilation of resulted consonant sequences /qʁ/ and /xʁ/ to surface as [qq] and [xx] as in (9), respectively. Most of the examples that show total assimilation occur regressively.

(9) Total assimilation of a dorsal rhotic [ʁ] to /q/ or /x/ in Maṣlāwī (9a), JBA (9b) and CBA (9c) (from, Blanc 1964; Abū-Haidar 1991; Tawfiq 2010; Youssef 2019; Bar-Moshe 2019)

a. [ʕạqqạbi] 'scorpion' [ʔaqqạʕ] 'bald'

b. [ləxxi] 'the other' F.SG [ʔaxxạs] 'dumb
[qqeːtu] 'I read' PST. [qqib]~[aqqạb] 'near' base ~ Comp.
[qad-aqqạ] 'I'm reading' [qqạː] 'read!' Imp.

c. [ʔaxxạs] 'dumb' [l-əxxi] 'the other' F.SG
[ʕạqqoːqạ] 'frog' [ʔaqqạːm] 'numbers'
[wạqqạ] 'paper' [ʕạqqạbi] 'scorpion'

Blanc (1964: 21-22) clarifies that the examples in (9b) are a manifestation of complete assimilation and that [ʁ] does not surface in these examples even in careful speech. He demonstrates this point by some lexical items that show an alternation and variation between an assimilated and non-assimilated forms that occur JBA, as in [wạqqạ] ~ [wạʁqạ] 'paper'; and [maqqạ] ~ [maʁqạ] 'sauce'. He also shows that there some examples where assimilation does not occur in JBA as it would be expected, as in [qʁuːn] 'horns' and [bəʁqạːn] 'pitchers'. In CBA, Blanc (1964: 21-22) explains that a coronal rhotic surfaces in the verb form 'to read', and that there is an epenthetic-a between /q/ and /ʁ/ in the word 'near' which means assimilation fails to take place in these forms. Moreover, he adds that there are also some other examples where assimilation did not take place in CBA, such as /ʔaqʁab/ 'nearer' and /ʕaqʁabi/ 'scorpion' - he attributed that to the possibility because these were cited forms and elicited.

Now after this brief presentation on the process of full assimilation of dorsal rhotics, the next part will explore the phonological process of vocalization as it occurs to dorsal rhotics.

5.5.2.2 Vocalization of Dorsal Rhotics

Vocalization as a phonological process is manifested in many different ways in the Tigris subgroup of Mesopotamian Arabic. Youssef (2019) suggests that this occurs in the etymological-*r* words that surface with a dorsal rhotic [ʁ] in the vicinity of the dorsal sounds

/uː/, /ħ/, /k/, /q/, /x/, and /ʁ/; except for any word that contains morphologically number ‘four’, as we will see later in (10b) exclusively in Maṣlāwī. Vocalization seems gradient and so it takes place in different intervening stages: into [w]-gliding [ʁ] → [w], or in later stages of vocalization whereby the adjacent vocalic element is compensatory lengthened or reduced into centralized vowel [aʁ ~ uʁ ~ ʊʁ ~ w][51] → [oː/uː/ɑː/] or [ə] (cf. Blanc 1964; Jastrow 1979; Tawfiq 2010; Bar-Moshe 2019; Youssef 2019). For instance, Youssef (2019) suggests that in words like [fuʁħaːn] ‘happy’, [quʁuːn] ‘horns’, or [ʔakbaʁ kaððaːb] ‘biggest liar’ the dorsal rhotic [ʁ] can be perceived with little to no audible velar constriction. Similarly, Blanc (1964: 22) states that in an example like the JBA /bəʁqạːn/ ‘pitchers’, and the CBA or JBA /fəʁħaːn/ ‘glad’ there is no audible ‘velar’ constriction in *<ġ>,* and in turn comes across as somehow close to a [w]. In (10) below, a labio-dorsal glide [w], or a long back rounded vowel [oː] or [uː] can occur as forms of vocalization in Maṣlāwī[52] (10a-b), JBA[53] (10c), and CBA[54] (10d).

(10) Dorsal rhotics vocalization in Maṣlāwī (10a&b), JBA (10c) and CBA (10d)

a.	*ġurbāl*	>	/ʁuʁbeːl/	→	[ʁuːbeːl]	‘sieve’
	xurqa	>	/xuʁqa ~ xoʁqa/	→	[xoːqɑ]	‘tatter’
	qurṣa	>	/quʁsˤa ~ qoʁsˤa/	→	[qoːsˤɑ]	‘flat bread’
	xurfān	>	/xuʁfeːn~xuʁfaːn/	→	[xuːfeːn ~ xuːfaːn]	‘sheep’ Pl.
	ʕruq	>	/ʕʁuq ~ ʕʁoq/	→	[ʕoːq]	‘bread’
	arqaq	>	/aʁqaq/	→	[ɑːqɑq]	‘softer’
	nifraħ	>	/nəfʁaħ/	→	[nəfwɑħ]	‘we rejoice’
b.						
	ʔarbaʕa	>	/aʁbaʕa/	→	[(ʔ)oːbaʕɑ[55] ~ ʔarbaʕɑ]	‘four’
	ʔarbʕiːn	>	/ʔaʁbʕiːn/	→	[(ʔ)oːbʕiːn ~ ʔarbaʕiːn]	‘forty’

[51] The order of the intervening stages does not suggest directionality, but rather the potential shapes of the syllable subject to vocalization.
[52] cf. Blanc 1964; Ibrahim 1969; Jastrow 1979; Tawfiq 2010; Ahmad 2018; Youssef 2019.
[53] Blanc 1964; Youssef 2019; Bar-Moshe 2019: 18.
[54] Abū-Haidar 1991.
[55] The vocalized tokens for the number ‘four’ and its derivatives, such as fourteen, forty, four hundred or Wednesday are considered “old-fashion” and I would assume are rarely used today (Blanc 1964: 22; Youssef 2019: 26).

ʔarbʕa: > /ʔaʁbʕa:/ → [(ʔ)o:bʕɑ: ~ ʔarbiʕɑ:ʔ] 'Wednesday'

c. *farħa:n* > /fəʁħa:n/ → [fəʁħɑ:n ~ fəwħɑ:n] 'happy or glad'

ma aʕrəf > /ma aʕʁəf/ → [mɑˤʁəf ~ mɑˤəf] 'I don't know'

tˤarqa > /tˤaʁqa/ → [tˤɑʁqɑ ~ tˤɑ:qɑ] 'fright'

l-ba:riħa > /l-bo:ħi/ → [əlbo:ħi ~ bo:ħi] 'yesterday'

d. *l-ba:riħa* > /mbeʁħa/ → [mbeʁħɑ ~ mbe:ħɑ] 'yesterday'

Youssef (2019: 26) attributes vocalization in these examples to speech rate, and so in careful speech vocalization sometimes does not occur. He also shows that the vocalization to [o:] in words that have the "digit 4" in Maṣlāwī (10b) are outdated feature and the modern pronunciation of these forms has re-introduced the [ar] sequence, as shown in (10b). Blanc (1964) also puts forward the hypothesis that these realizations of the vowel [o:], as a subsequent change, are a result of the nucleus development that occurred in the coronal-*r* in the first place yielding this chronology of the root **arb* > *aġb* > *awb* > *ōb* from OA. Blanc (1964: 186) proposes a chronological development for the recent realization of *ʔəmbēhˤā* in CBA with the intermediate stages of the stem **lbērihˤā* > *lbēɣhˤā* > *mbēhˤā*.

Similarly, in Djidjelli (Jijel) Algerian Arabic, Marçais (1956: 17) demonstrates that the dorsal rhotic is sometimes not pronounced, i.e. lenited or vocalized, when it occurs at the end of a lexical word, and so it surfaces with [a]-vocalic element, as in [tu:ᵃ] 'bull', [bi:ᵃ] 'a well' or [sˤạḅᵃ] 'patience' (see Youssef 2019: 27, as well).

This was a synthesis on the process of vocalization in dorsal rhotics, the next part will present another phonological process connected to dorsal rhotics that is process of dissimilation.

5.5.2.3 Dissimilation of Dorsal Rhotics

In the process of dissimilation, a segment becomes different in one or a set of features to neighbouring segments. Youssef (2019) shows a tendency for dorsal rhotics to not occur in the vicinity of etymological-*ġ* words with either a back vowel, or pharyngealized vowel (11a). However, they still can cooccur if the two root consonants, etymological-*ġ* and dorsal rhotic, are separated by a palatal glide /j/ or a front vowel (11b). This tendency was found to occur in Maṣlāwī, CBA and JBA. The following examples were taken from Youssef (2019); and can be also found in Tawfiq (2010), for Maṣlāwī; Abu-Haidar (1991), for CBA; and Blanc 1964, for JBA.

(11) Dissimilation in (a) and (co)occurrence in (b) of [ʁ] (from Abu-Haidar 1991:10; Youssef 2019: 27)

a.	/barʁuːθ/	'flea'	/farraʁ/	'he emptied'
	/ʁarb/	'west'	/ʁaːra/	'raid'
	/ʁuraːb/	'crow'	/roːʁaːn/	'patent leather'
	/ʁariːb/	'strange'	/raʁwi/	'foam, lather'
b.	/ʁiʁi/	'glue'	/ʁeːʁ/	'other'
	/zʁajjaʁ/	'small'	/ʁajjaʁ/	'he changed'

Blanc (1964: 20) however, does not see the proximity to etymological-*ġ* to result into tolerance or avoidance in the cooccurrence of [ʁ] within the root e.g. /ʁeʁbiːl/ SG and /ʁeʁabiːl/ PL. 'sieve' in JBA. He demonstrates that there are some instances whereby these roots split into doublets in JBA, as in (12).

(12) Root split and doublets as they occur in JBA (from Blanc 1964: 20)

/ʕaʁabi/	'Arabic'	/ʕrubi/	'a villager'
/faʁʁ/	'he poured'	/farr/	'he threw'
/ʁajjaʁ/	'he changed clothes'	/ʁajjar/	'he changed'
/ħd͡ʒaːʁa/	'stone'	/ħad͡ʒar/	'Jewel'

After this brief presentation on dissimilation in the case of dorsal rhotics, the next part will provide a survey of the geographical distribution of rhotics and thus proposes a micro-typology and classification of rhotics in Arabic.

5.6 Micro-typology of Arabic Rhotics

One of the earliest attempts in drawing some typological and/or classification of rhotics in Arabic was manifested by Cohen's (1912) sketch in making an outline of the linguistic features between Muslim Algiers and Jewish Algiers whereby dorsal rhotics are found mostly in Muslim Algiers, and in less frequency in Jewish Algiers who use more coronal rhotics. Blanc (1964) highlighted in a similar attempt, along with the *qəltu-gələt* differentiation, the situation of the communal dialects of Baghdad and the dialect of Mosul in their rhotic patterns: coronal rhotics in MBA, and dorsal rhotics in CBA, JBA and Maṣlāwī. Jastrow (2006b) in his linguistic synopsis on Iraq, claimed dorsal rhotics to occur exclusively in the Tigris sup-group of *qəltu* Arabic; and in the southern Kurdistan group.

In his study of Arabic rhotics, Youssef (2019) classified rhotic phonological patterns as they occur in Arabic into four major micro-typology groups (cf. Figure 5.1, below, Youssef 2019): (a) the split-r dialect group; (b) the emphatic-r dialect group; (c) the plain-r dialect group; (d) the uvular-r dialect group. His typological sketch is based on the phonology of rhotics and not their phonetics. The split-r dialect group (a) and the uvular-r dialect group (d) have two contrastive rhotic phonemes plain-pharyngealized; coronal-dorsal, respectively. The emphatic-r dialect group (b) and the plain-r dialect group (c) have one rhotic phoneme; type (b) is underlyingly pharyngealized; and type (c) is underlyingly plain and dorsal.

Figure 5.1: The distribution of the four major types of Arabic rhotics (from Youssef 2019)

The split-r group type (a), mainly in Africa, - which is characterized by a plain-pharyngealized /r/ ~ /rˤ/ contrast, evident in the varieties of Maghrebi Arabic, the Egyptian Arabic as spoken only in Sudan and Egypt, Nigerian and Chadian Arabic, and also Anatolian Arabic only in south-eastern Turkey. The varieties of Maghrebi Arabic includes: Algerian, Tunisian, Libyan, Moroccan, and the Ḥassānīya variety of Mauritania. The Egyptian varieties include Egyptian and Sudanese Arabic, excluding Juba Arabic in South Sudan. Anatolian Arabic is only in southeastern Turkey, which include Mardin, Siirt, and Şırnak Arabic. The split-r group has a historical plain rhotic which has split into two separate phonemes: plain /r/ and pharyngealized /rˤ/. The pharyngealized /rˤ/ has gained phonemic status through processes of lexical and morphological diffusion (Youssef 2019).

The emphatic-r dialect group type (b) – which is categorized by an underlying pharyngealized /rˤ/ with an allophonic plain [r], is attested only in Levantine Arabic as spoken in Syria, Palestine, Jordan and Lebanon. The pharyngealized /rˤ/ and plain [r] are constricted in the alveolar region with tap and trill manner and are in complementary distribution (Youssef 2019).

The plain-r group type (c) is marked by a phonemic plain /r/ and a pharyngealized [rˤ] which occurs in complementary distribution. It is evident in Mesopotamian *gələt*-Arabic in Iraq, Kuwait, northeast Syria and Iran. It also includes Peninsular Arabic as Yemeni, Hijazi, Najdi, Omani, and the other varieties of Arabic of the Persian Gulf. This group also have the Arabic varieties spoken in Malta (Maltese), Cyprus (Cypriot), Uzbekistan (Uzbekistani), Juba (Jubin) and Nubia (Ki-Nubi). In the Mesopotamian *gələt*-Arabic, and Peninsular Arabic the /r/ phoneme has plain [r] and pharyngealized [rˤ] as an alveolar tap and trill in complementary distribution. The last varieties maintained only plain /r/.

The uvular-r group type (d) exhibits an underlying uvular fricative phoneme /ʁ/ with an alveolar tap-trill /r/ phoneme. It is evident in Mesopotamian *qəltu*-Arabic in the Tigris and southern Kurdistan groups as spoken in and around the areas of Tikrit, Mosul and Kirkuk. It also includes the Iraqi varieties of the Jews and Christians in Baghdad and Southern Iraq, and in some urban dialects of Maghrebi Arabic. In the Mesopotamian Arabic, it is characterized by a uvular rhotic that merges with etymological /ʁ/. In Maghrebi Arabic, the uvular r did not merge in pronunciation with etymological /ʁ/ (Youssef 2019).

After this discussion of the typology of rhotics in Arabic, the next part of this chapter will present a sum up of this section on dorsal rhotics.

5.7 Summary

Evidence for existing Arabic dorsal rhotics dates back to Abbasid times (Al-Jāḥiẓ ed. Hārūn 1986; Jastrow 2006b). An overwhelming part of the Arabic grammar study tradition in retrospect uses prescriptive approaches to language description. Such treatments had marginalized speech patterns potentially peculiar to substratum areal features. After around the 10th century, Arabic started to acquire new native speakers in the newly established societies in diaspora. Some of those native speakers started writing in the colloquial local forms which later served linguists with features of spoken Arabic in designated periods of time. More importantly, such pieces of evidence helped in retrieving information about dorsal forms of rhotics.

Dorsal reflexes of OA *r* are part of a bundle of hallmark features for the Tigris subgroup of *qəltu*-Arabic of the phylum Mesopotamian Arabic, and in the southern part of the Kurdistan group. They also occur in some varieties of Levantine Arabic. They are also reported in North African varieties of Arabic that cluster together with areal linguistic features: (Morocco) in Fez and Meknes and marginally in Tetouan, and observed in the speech of Muslims in Eastern Kabylia (Algeria) strictly in the town of Djidjelli (Jijel).

Lexical items that exhibit dorsal rhotics of etymological-*r* show instances of total assimilation in the vicinity of dorsal consonants. This is reported in the Tigris group of Mesopotamian Arabic. A process of vocalization also takes place in the Tigris supgroup of *qəltu*-Arabic. This occurs for dorsal rhotics in the vicinity of dorsal sounds. Similarly, dorsal rhotics are sometimes vocalized into an [a] element when they occur at the end of the lexical word.

Another process attested in dorsal rhotics as they occur in Maṣlāwī, CBA and JBA is the process of dissimilation. Dorsal rhotics avoid occurring in the vicinity of etymological-*ġ* words that contain a pharyngealized vowel, or back vowel. They still, however, cooccur when the two root consonants are separated by a palatal glide /j/ or a front vowel. These phonological processes are old as well as the historical sound changes of rhotics that led to root splits and doublets.

Rhotics in Arabic can be classified in their phonological patterning into four major micro-typological groups: (a) the split-r dialect group; (b) the emphatic-r dialect group; (c) the plain-r dialect group; (d) the uvular-r dialect group (Youssef 2019).

CHAPTER 6

THE BASIS FOR THIS STUDY: JEWISH BAGHDADĪ-BAṢRĀWĪ ARABIC

6.0 INTRODUCTION

The main focus of this chapter is to provide a historical, sociological and linguistic overview of Mesopotamia and the Jewish populations of Iraq. This chapter will also establish the language genealogy of Jewish Baghdadī-Baṣrāwī Arabic and its affiliation in the Mesopotamian Arabic language phylum.

Thus, section (§6.1) will present a brief linguistic and sociohistorical information about the Jewish Baghdadī-Baṣrāwī variety of Arabic. Section (§6.2) will present the sociohistorical and linguistic aspects of Mesopotamia. Section (§6.2.1) will offer a concise review for the Jewish community in Mesopotamia. Section (§6.2.1.1) is a presentation on the sociolinguistic history of Baghdad and its Jewish community. Section (§6.2.1.2) will review Baṣrā and its Jewish community. Section (§6.3) will provide a synthesis on the research methodology and data collection. Section (§6.3.1) will present information on the data and language consultants. Section (§6.4) will provide a brief sum up of this chapter.

6.1 JEWISH BAGHDADI-BAṢRĀWĪ ARABIC: LINGUISTIC PROFILE

Jewish Baghdadī-Baṣrāwī Arabic (JBBA) is used in this study to refer to the spoken Arabic of the Jewish population of Baghdad and Baṣrā. In terms of (basic) word order, JBBA is (SV-VS)O and so is head-initial. In terms of morphology, JBBA is an agglutinating language.

Jewish Iraqis, in general, have been always di-triglossic when they were in Iraq. JBBA was the language of the home and the language of communication with their Jewish fellows in the wider Iraqi community. They also used Muslim Baghdadi Arabic as the language of communication with the general Iraqi community. Those who attended school also learnt Modern Standard Arabic, which was used as the language of education and formal settings. Many Jews since 1950 left Iraq and settled in many different countries, but the majority settled in Israel due to the “Ezra and Nehemya” departure operation in 1950-1951 – which alone secured the withdrawal of more than 120,000 Jews from Iraq to Israel (Bar-Moshe 2019) (cf. §6.2.1.1, for more details). Today (as of March 2021), there are only around 4 Jews still left in Iraq (Faraj & Benhaida 2021).

The Mesopotamian Arabic language group comprises two major types: *qəltu*-Arabic and *gələt*-Arabic (Blanc 1964). JBBA is a variety of (North) Mesopotamian Arabic under the *qəltu*-Arabic language phylum (Blanc 1964; Jastrow 2006b). The *qəltu* varieties of (North) Mesopotamian Arabic has three daughter varieties: (**a**) Tigris group, that includes the spoken Arabic of Mosul (Maṣlāwī) and its surroundings (including Jews, Muslims, Christians and Yezidis), the spoken Arabic of Tikrit and its surroundings, and Jewish Baghdadi-Baṣrāwī Arabic, and Christian Baghdadi Arabic as both spoken in Baghdad and southern Iraq; (**b**) constitutes the Euphrates group: which includes the spoken Muslim and Jewish Arabic in ᶜĀna and Hīt, the latter recently developed a morphological merger into *qələt* instead of *qəltu* (Holes 2018; Khan 2018a); and (**c**) includes the Kurdistan group, which comprises the spoken Jewish Arabic in north Kurdistan as in Sendor, ᶜAqra, and Arbil, and in south Kurdistan as in Kirkuk, Tuz Khurmatu, and Khanaqin (Jastrow 2006b). Figure 6.1, below presents a schematic outline for Mesopotamian Arabic language family and the subgrouping of JBBA.

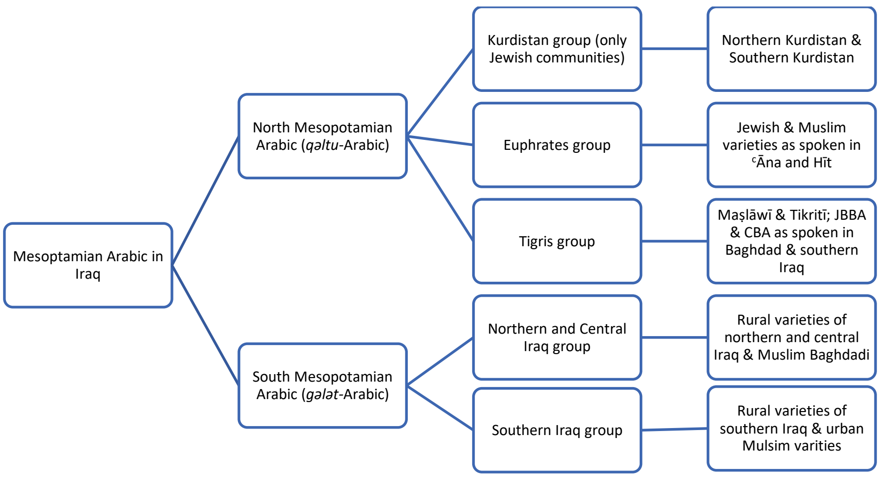


Figure 6.1: Mesopotamian Arabic language family as spoken in Iraq and JBBA subgrouping (Blanc 1964; Jastrow 2006b)

In this section, we describe JBBA as belonging to the Tigris subgroup of *qəltu*-Arabic. The next section will introduce Mesopotamia in a broader sense and present a linguistic and sociohistorical background to the area.

6.2 SOCIOHISTORICAL & LINGUISTIC BACKGROUND: MESOPOTAMIA[56]

This land, in general, is identified by two names: *Mesopotamia*[57] *and Iraq*[58]. The toponym *Mesopotamia* is derived from Ancient Greek <*Μεσοποταμία*> ‘between rivers’ which is a calque from <[illegible]> *māt birīt nārim* ‘between the rivers’ in Akkadian, which also in turn semantically corresponds to <ܒܝܬ ܢܗܪ̈ܝܢ > *beth nahrayn* ‘land of rivers’ in Syriac, and <ܐܪܡܢܗܪ̈ܝܢ > *Ārām Nahrayn/Naharaim*[59] in Classical/Old Syriac. It is also < میان رودان > *miyân rudân* in Old Persian, and <بلاد الرافدين> *bilād-o-rrāfidayn* ‘the land of the two rivers’ in Arabic. All of which refer to the Euphrates and Tigris rivers.

The etymology of the word *Iraq,* however*,* is a bit more controversial than that of Mesopotamia. According to Harper (OED): 1979), one proposal suggests a Sumerian end origin of the name *Uruk* < *uru* meaning ‘city’ in Akkadian. Another proposal attributes the word Iraq to the Middle Persian *eraq* ‘lowlands’. Some Arabists suggest that the word is derived from Arabic and it means ‘well-watered, fertile and deeply-rooted’.

Mesopotamia has a long history some of which is obscure and still not well-known which is demonstrated in its elaborate demographic ethnic groups. Evidence for linguistic and ethnic mixture dates back to at least the end of the fourth millennium BC which is manifested in an underlying language of proto-cuneiform writings, mainly in Sumerian, from Babylonia. The ethnic groups in Mesopotamia were mainly speakers of Semitic languages such as Amorite, Aramaic and Akkadian, but there were also speakers of less known languages such as Hurrian, Cassite and Subartuan.

The oldest written language attested in (South) Mesopotamia is the language isolate Sumerian. Sumerian, then, although it had close contact with Akkadian, was gradually replaced by Akkadian as a *lingua franca*. After 2000 BC, two varieties of Akkadian started to diverge laying out what we recognize as Assyrian and Babylonian later on. Old Babylonian c.1500 was spoken in southern Mesopotamia, western Iran, along the Euphrates and up to

---

[56] This review relied on (Eph’al 1974; Nissen 2006; Müller-Kessler 2006; Harper (OED) 1979-2021; Streck 2006; Wilhelm 1983; Wigoder 1986; Wikipedia 2021).

[57] First coined by the Greek historian Polybius during the Hellenistic period in the second century BCE to designate the piece of land East of the Euphrates in North Syria (Wigoder 1986). The term was used for the first time by the historian Arrian of Nicomedia to refer to the land later in his historical account for the campaigns of Alexander the Great.

[58] Officially since 1920 and attested from the 6th century. Other less common and old names that refer to the area: *Shinar, Sankra, Kardinyash* which all refer to South Mesopotamia (Ghanima 1924).

[59] This term was mainly used by the Jews (Smith 2007: 388).

northern Syria. Middle Babylonian c.1000 reached even a wider geographical area: it was used as a language of diplomacy and communication between Babylonia, Assyria, Palestine, the Hittites of Asia, Syria and Egypt. Old Assyrian, however, (up until c.1750) was used in trading in Kanis in eastern Asia Minor and Assyria. There extremely less is known about Middle Assyrian (C.1500-1000). By then, Aramaic started to gradually emerge and dominate the entire region in the Near East.

Inscriptions in North Mesopotamia and Syria exhibit the oldest forms of Old Aramaic, some of which were Aramaic-Assyrian-Luwian bilingual/trilingual variety inscriptions, 10th-8th century BC. From the 8th century BC, Aramaic started to gradually substitute Akkadian as a *lingua franca* around the Middle East. There are also some reports about the existence of some ‘Arabs’ in ‘walled towns’ in western Babylonia around the eighth century BC. The Achaemenids used a variety of Aramaic as an official language for public administration 6th-5th century BC. Evidence of language divergence in Aramaic began perhaps around the 3rd or 2nd century which resulted into two language areas: Eastern varieties of Aramaic, in Hatra and Palmyrene; and Western varieties of Aramaic, in Nabataean and Qumranic. From the 3rd to the 7th or 8th century, this East-West language situation continued to also include: the eastern varieties; Babylonian-Jewish Aramaic, Syrian, and Mandaean; and the western varieties; Samaritan-Aramaic, Christian-Palestinian, Palaestinian-Jewish and Galilaean. By 630-790 CE, the Arabs conquered Mesopotamia and Arabic gradually replaced Aramaic as a *lingua franca*.

There are some sporadic pieces of evidence that highlight some use of (Old) Arabic in Mesopotamia before the rise of Islam. For instance, there are Nabataean inscriptions that exhibit some features of Old Arabic (Versteegh 2014: 53-54). Procházka (2018: 260) notes that the existence of Arabic goes back to three or four centuries before the Arab seventh-century conquest. Most of the parts in what is known as *al Jazīra* were Aramaic-Arabic bilingual Christian tribal Arabs before the arrival of the Arab army. It is also presumed that there might have been some bilingual or even trilingual Arabs in Aramaic and/or Persian in the sedentary clusters in archaic sites as in Hīt, Anbār, al-Ḥīra, and Tikrīt (Procházka 2018: 260; Morony 2005: 221). Some of the Arab tribes already in the region before the arrival of Islam were *Bakr, Asad, Iyād, Tamīm, Tanūkh, Ṭayyiʾ, al-Namir, Taghlib* and *Ibn Wāʾil* (Procházka 2018: 260).

The turning point for Mesopotamia and the evident established use of a superstrate Arabic in a society primarily speaking Aramaic, while Pahlavi was used as an administrative language during the Sasanian times, however, occurred after the Arab conquest of Mesopotamia, particularly South Mesopotamia in (630-636 CE) (Blanc 1964: 167; Owens 2006; Versteegh 2014). Al-Ṭabarī (839-923) in his volume *Tārīkh al-Rusul wa l-Mulūk* mentions that 30% of the tribes that conquered and camped in Transoxania in late seventh century were from *ʕAbd al-Qays* and *Azd*. North Mesopotamia, however, witnessed two stages of 'Arabicization'. The first stage was shaped by a conquest by an army marched out of Kufa in 641 CE, when Mosul inhabitants was mainly a Nestorian Christian community, perhaps bi- or tri-lingual speakers of a variety of Aramaic and Persian, and there were some settlements of Jews, presumably Aramaic-Hebrew-Persian bilinguals or even trilinguals (Magidow 2013: 206; Kennedy 2007: 137); the second stage was formed by waves of settlements of Bedouin, particularly the tribe of *Azd*, migrating from Arabian Peninsula (Magidow 2013: 206). Owens (2006) designates the period between 630-790 CE as the era of pre-diasporic Arabic.

Before Arabic became an established *lingua franca*, there existed a long period of bi- or multi-lingualism amongst the already existing native and local populations, which in some cases are still evident today, as for the speakers of (neo)-Aramaic in Northern Mesopotamia (Holes 2018: 26). Adult local populations learned Arabic as a second language from the new native speaker residents who were neighbours, marriage spouses, and co-religionists (Holes 2018: 27). Arab tribes who came from the Arabian Peninsula settled mostly in the south of Mesopotamia in the garrison cities Kufa and Baṣrā, and on smaller scale in the North in Mosul, which was mostly inhabited by *Azd* and around the city by *ʕAnaza* and *Taghlib* (Orthmann 2002: 108; Morony 2005: 236-250; Procházka 2018: 260).

Later on, the first systematic grammatical documentation of 8^{th}-century Arabic (8A), widely known later as *alfuṣḥa* 'the most eloquent and refined Arabic', started around the middle of the eighth century in Southern Mesopotamia (Holes 2018: 6). The local populations most likely continued speaking varieties of Aramaic until they were Arabized, around the 10^{th} century (Blanc 1964: 167, 202). During these times, varieties of different types of Arabic started to emerge as the local populations started coining a form of Arabic that was influenced by second language learning processes, and also by bilingualism. Thus, hypothetically, there must have been a case whereby the local ethnic groups developed a local variety of Arabic influenced by substrate/adstrate languages. Moreover, Jews and Christians[60] alike each developed their own in-group or exclusive variety of Arabic (Abu-Haidar 1991; Blanc 1964; Versteegh 2014). Jews developed their own in-group variety, who were perhaps already bi-or trilingual in Aramaic-Persian and Hebrew, the latter is their language of reading literary works and practicing religion (Versteegh: 2014). Christians also developed their own which was also shaped by tri- or bilingualism in Aramaic-Persian and Syriac, the latter was the language of liturgy (Blanc 1964; Abū-Haidar 1991; Sharqāwī & al-Sharkawi 2010; Versteegh 2014).

Kurdish[61] tribes took over the east of the Tigris in Mesopotamia and the south east of Anatolia in the first half of the 10th century and then, not long after, the Turkoman[62] tribes raided those areas in the 11th century (Ripper 2000: 261–5; Procházka 2018: 261). The Mongol conquest of Mesopotamia in February 1258 and later by Tamerlane in 1400-1 resulted into a devastating destruction and sociopolitical divide which reshaped the linguistic landscape of the region. It has been estimated that around a 100,000 were murdered in this sack of Baghdad which lasted over a month by the Mongol alone (Holes

---

[60] According to (Abū-Haidar 1991:1-2), the Christians in Mesopotamia got their independence from the Byzantine Church before the 5th century A.D. and they were predominantly speakers of Aramaic. Then, in the 5th century they adopted the Nestorius doctrine. The church of Nestorian prospered until the 16th century A.D. Later on, there were two main churches: the Chaldean church (united with Rome); and the Nestorian church. Other Christian sects includes: Orthodox Christians, Greek Orthodox, Greek Catholic, Latin Catholic, Jacobites and Protestants. There was a Christian community in Baṣrā, some of whom of Arab descent, that dates back to the times of Umar Caliphate (c. 634-644). Baghdad had most of the Christian churches in Mesopotamia; just before the 1st Gulf War, there were around 100 churches. Christians in central or northern Mesopotamia were speakers of Arabic or neo-Aramaic, whereas there were mostly speakers in Arabic in the south. The liturgical language of the churches in Mesopotamia was Syriac. There also an Armenian-speaking community in Baṣrā and Baghdad; their forefathers left the Caucasus and Turkey and settled in the major cities in Mesopotamia at the outset of the 20th century. There were about 1 million Christians in an official census in 1987, 750000 of whom were Chaldean, as reported by (Abū-Haidar 1991:1).

[61] Information about the Kurds before the Arabic conquest is very pauce. However, hypothetically, Iranian languages speakers have been in contact with different varieties of Aramaic since the 5th century BC (Öpengin 2020:460). In the 7th century, the Kurdish community were inhabiting the areas from Mosul to the north of Lake Van and from Hamadan to the Jazira region which covers the areas around the intersection of nowadays Turkey, Iran and Syria (James 2007:111, Öpengin 2020:460). In the 16th century, Kurdish developed a literary tradition, which was heavily influenced by the Arabic and Persian lexicons, but was restricted to writing even for centuries later (Öpengin 2020:461). Today, speakers of varieties of Kurdish are estimated around 25-30 million speakers (Öpengin 2020: 459).

[62] According to (Bulut 2007), Turkomans speak a variety of Turkic languages. Turkoman settlements, who were perhaps speakers of an ancient eastern Turkic variety, in Mesopotamia date back to the 1st century of Islam (644-744 CE). They first came to southern Mesopotamia as *ġulmān* 'military warriors' for the Omayyad Caliphate. The numbers of Turkic *ġulmān* with military capacity increased from 2000 in 673 CE to around 20000 in the Abbasids times in 755 CE. Then, a stable influx of Turkic immigration to Mesopotamia took place for the next 200 years. Recent estimations of Turkomans are not clear: Turkish sources estimation 3 million, Iraqi sources 600,000.

2007: 130). Hulagu spared the Christians in his raid over Baghdad and the southern parts of the country was de-urbanized as a result (Holes 2007: 130). Southern Mesopotamia and Baghdad were slowly re-populated (Holes 2007: 130). This reshaping of the political area also has continued following the Ottoman conquest in December 1534 (Holes 2018; Procházka 2018). Many of the towns in southern Mesopotamia were influxed by recent Bedouin settlements in late Ottoman periods: Al-Nasiriyya in 1870, Amara in 1862, Ramadi in 1880, and Kut in the mid 19th century (Holes 2007: 131). The population of Baghdad at the beginning of the 19th century was perhaps around 100,000 (Holes 2007: 131). The influence of these events, for instance, can be observed in the traces of evidence of adstratum influence, on the phonological and lexical levels, from Turkish and, to lesser degree, form Kurdish and Armenian in the varieties of Arabic spoken in Northern Iraq (Procházka 2018: 286). Thus, all of these chain of events resulted into a pre-1258 *qəltu*-Arabic situation in southern Mesopotamia amongst the Non-Muslims, and a pre-1258 *qəltu*-Arabic continuum, which was not interrupted by the Mongol conquest, in northern Mesopotamia amongst the sedentary and Non-Muslim population and a *gələt*-type that was reintroduced by the Bedouins into the social fabric post-1258 (Holes 2007, 2018).

In his study of Baghdadi Arabic, and from few non-Baghdadi speakers in Mesopotamia, Blanc (1964) offered a foundation for a language typology in Mesopotamia; whereby the varieties of Arabic spoken in this sociopolitical area can be distinguished by local reflexes of OA **qultu* yielding two types: *qəltu*-Arabic and *gələt*-Arabic. Blanc (1964) also observed that the same *qəltu-gələt* patterns in other parts of Mesopotamia. However, the divisions beyond the city of Baghdad include a geographical as well as religious differences. This in turn led Blanc (1964: 181) to split Mesopotamia on the basis of two language areas corresponding roughly to the geographical parts bordered by sides of the two rivers: Upper Mesopotamia and Lower Mesopotamia, to cover the upper areas parallel to the two rivers, Tigris and Euphrates, and those from Tikrīt to the Persian Gulf, respectively. Thus, the two main linguistic groups exist within these broad lines. The *qəltu* varieties are spoken by the non-Muslim population of Lower Mesopotamia and the sedentary population, Muslims and non-Muslims, of Upper Mesopotamia. The sedentary population refers mainly to the settled people in Mosul, ʻĀna, Tikrīt and Hīt. The *gələt* varieties are spoken by the Muslim population, sedentary and non-sedentary, of Lower

Mesopotamia, and by the non-sedentary populations in the rest of the area (Blanc 1964: 5-6).

Now after this broad synthesis on the sociolinguistic history of Mesopotamia, the next section will present a narrower historical outline of the Jewish community in Mesopotamia.

6.2.1 SOCIOHISTORICAL & LINGUISTIC BACKGROUND: THE JEWISH COMMUNITY IN MESOPOTAMIA

Mesopotamia is demographically as diverse as its many names. One of those ethnic groups in the region are the Jews of Mesopotamia. The existence of the Jews in Mesopotamia began when Salmanassar V, the king *Ululayu* of Babylon (727-722 BC), conquered the state of Israel in the northern part of Palaestina in 722 BC; while Judah maintained its political independence in southern Palaestina under the Assyrian control (Nissen 2006). In 596/597 BC and 587-586 BC, Jerusalem or *Urusalimmu* was conquered by Nebuchadnezzar and the independence of Judah was ended which resulted into the population being enslaved and exiled to Babylonia (Nissen 2006; Fuchs 2011). In the last centuries before the common era and 1st centuries CE, there existed a case of diglossia in Hebrew-Aramaic in Israel (Henshke 2018: 644). Hebrew as a spoken language was gradually replaced by Aramaic, and in the 2nd century, Hebrew started to decline as a spoken language and was restricted to learning or praying until its revival in late 19th century (Henshke 2018: 644).

The earliest historical reference to the Jews of Mesopotamia can be attributed to the 12th century (around 1170) merchant, traveller and Rabbi Benjamin Tudela[63] (Khan 2018b: 13). Tudela states, as also reported by Khan (2018b), that the Jews of this area spoke the language of the Targum – a variety of Jewish Aramaic. The Jews of Mesopotamia used a variety of Aramaic as a spoken language before the Arabic conquest (khan 2018a: 148). All Jewish Aramaic-speakers in Mesopotamia were bilingual or trilingual (Khan 2018b: 15). In fact, attested written sources of a distinctive[64] Jewish varieties of Aramaic date back to the first half of the 1st millennium CE (Khan 2018b: 9). This, perhaps, continued in the countryside until the tenth century, although the Jewish community in urban centres in

[63] From (Adler 1904) who cites Asher's work on Benjamin's notes. This monograph provides the text, translation and also commentary.

[64] There is an archaic communal divide between Jewish and Christian varieties of Aramaic that dates back to the first half of the 1st millennium CE, which is also still manifested into neo-Aramaic varieties spoken today (Khan 2018b:9).

Mesopotamia started speaking Arabic way before then (Khan 2018a). This is due to the fact that the Jewish Academic centres of Sura and Pumbeditha were located in the countryside where Aramaic for a longer time was used as a spoken language (Fenton 1990: 464; Khan 2018a: 149). In the 17th century, speakers of Jewish neo-Aramaic started writing their language in Hebrew alphabets (Khan 2018b: 29). Jewish neo-Aramaic continued to be used in Kurdistan until the 20th century, and there are still some older generation speakers today in Israel (Khan 2018b:9). In Israel, the neo-Aramaic-speaking Jews fall into three social groups: (a) Nash Didan, who are from Northwestern Iran and mainly from Urmi, (b) Kurdistani Jews, and (c) Aramaean Jews, from Iranian Kurdistan, (Khan 2018b: 16).

The earliest attested record of written Iraqi 'Judeo-Arabic'[65] dates back to eighth or ninth century (Khan 2018a: 149). The language system of 'Iraqi Judeo-Arabic' is characterized by linguistic features from 8th - 15th century *alfuṣḥa*, colloquialism, hyper- and hypo-corrections, and historical pseudocorrections standardization (Sharqāwī & al-Sharkawi 2010: 99; Hary 2018: 35). It is also characterized by being written in Hebrew alphabets with varied conventions in 'Judeo-Arabic' orthography, the use of the style of the *šarḥ*[66], and lexical and grammatical borrowings from Aramaic and Hebrew (Hary 2018: 35). The Gaon Sa'adya ibn Yosef al-fayyūmī (882-942 CE) translated the Pentateuch into *classical Judeo-Arabic* in the 10th century, which to a large degree follows the canon of 8th-10th century *alfuṣḥa* Arabic with some colloquialism and pseudocorrections (Hary 2018: 42).

After the expulsion of Jews from Spain in 1492, a huge number of them settled in the Ottoman Empire and developed intense contact with the Muslim world, whereby many Jews felt the need for more space and exclusion from their Muslim and Christian neighbours (Hary 2018: 44). The Jews settled in urban centres and only a few were working in agriculture until recently like the Jews of Sendor in northern Mesopotamia (Jastrow 1991; 1993). The diverse regions and ecologies within Mesopotamia have shaped the different varieties of 'Iraqi Judeo-Arabic' and these Jewish vernaculars have no common origin (Khan 2018a: 161). *Later Judeo-Arabic* which started from the 15th to the 19th century was shaped by the social isolation of the Jews and much more colloquialism in-fluxed the written

[65] The term 'Judeo-Arabic' and its correlates have been already introduced in Chapter 1 (cf. §1.1, & footnote 2, for more details).

[66] An account of literary translations of liturgical and Jewish religious manuscripts from Aramaic and Hebrew into 'Judeo-Arabic' (Hary 2018: 35).

language and the tradition of *šarḥ* (Hary 2018: 42). At this stage and the next at around the 20th century, *Contemporary Judeo-Arabic* prospered in some dialectal centres which set the ground for the development of the different varieties of 'Judeo-Arabic': Egyptian Judeo-Arabic, Iraqi Judeo-Arabic, Syrian Judeo-Arabic, Yemenite Judeo-Arabic, and Maghrebi Judeo-Arabic (Hary 2018: 42-43).

References and information about the Jews of Mesopotamia before any official census can be taken from travellers' notes of visitors who reported about the Jews in the area, such as: Benjamin Tudela in around 1170, Pedro Teixeira in 1604-1605, Carsten Niebuhr in 1766, and Israël Joseph Benjamin in 1846-1851. The number of Jews considerably declined after the 16th century. Khan (2018b: 13) attributes this decline to a likely forcible conversion in the 19th century of some Jews in some areas to Islam. In 1920, an official estimation of the population of Iraq collected by the British mandate shows that the Jews of Iraq were estimated at 87,448 distributed in 15 cities and towns, the most in Baghdad 50,000 and the least in Karbala 160 individuals (Alrubaiy 2017: 622). There were Jewish Iraqi settlements in: Baghdad, Baṣrā, Mosul, Arbil, Amarah, Samarra, Diyala, Kūt, Diwaniya, Al-Shamiya, Hillah, Dulaim, Kirkuk, Sulaymaniyah, and Al-Muntafiq, as reported by the 1920 British census (Ghanima 1924: 184: Alrubaiy 2017: 145). The varieties of 'Judeo-Arabic', in general, are considered endangered today and close to extinction (Hary 2018: 37).

After this brief presentation on the Jewish community in Mesopotamia, the next part will discuss Baghdad and its Jewish community.

6.2.1.1 Sociohistorical & Linguistic Background: Baghdad and the Jewish Community[67]

The city of Baghdad, *baġdād* in Arabic, known also by *Madīnat al-Salām* 'city of peace', the latter first coined by *Abū Ja^{c}farAl-Manṣūr,* was founded in the eighth century CE (762 CE) as the political and cultural centre for the Abbasid Caliphate and for the Islamic world. It was established on an area with a cluster of settlements near *al-Madā'in*[68], such as *al-Karkh* (known also as an ancient Sassanian site, mainly inhabited by Aramaic Christians[69],

[67] This review relied on the following sources: (Magidow 2013; Duri, A.A 2012, H. Kennedy and ʿAbbās Zaryāb 2020).
[68] Also known as the ancient Sasanian capital of Ctesiphon (H. Kennedy 2011).
[69] Some labels the inhabitants as Aramaic-speaking Nabateans (review, H. Kennedy and ʿAbbās Zaryāb 2020).

suggested to be founded by *Šāpur II)*. Earliest attested evidence and reference to the name and the area of Baghdad was as *Bagdadu* and it can be found in a prehistoric legal document at the time of Hammurabi (1800 BC) written in a variety of Akkadian. There some presuppositions that 'Baghdad' may have been derived from the Old Persian *Baga-* 'God' and *dad* 'given/gift'. Other proposals, however, attributes the origin of the name to Aramaic which means 'the home/enclosure of sheep'

At the time when Baghdad was founded, most of its inhabitants were from southern Mesopotamia, some postulations are that the Arabic-speaking Muslims were mostly from Kufa, and that the Christians and Jews were from the pre-Islamic site al-Ḥira, all of whom were assumed to have spoken with *ʔimāla* (Magidow 2013: 206, 261; Procházka 2018: 264). Arab (Bedouin) Muslims were most likely a minority at this time. New converts to Islam also started to establish their affiliation with the Bedouin Muslims (Morony 1984: 431). Thus, this gradually developed into a religious divide into the legal system in Mesopotamia, which gave rise to communal dialects at large. Morony (1984: 273) also notes that "assimilation was most complete for individuals who were removed from their former social contexts and integrated as individuals into a new society". Blanc (1964) conducted an exhaustive study on Baghdadi Arabic which is the first successful attempt that highlight and demonstrate the ethnolectal differences in Mesopotamia.

Magidow (2013: 196) hypothesizes that three hundred years before the Arab conquest, religious affiliation became a marker of identity in Mesopotamia. After Blanc's (1964) study, the Mesopotamian area became known as a language area where all of the varieties of Arabic spoken in this region can be distinguished prominently and classified by the realization of q ~ g and the inflectional suffixes of the 1st person singular perfect –tu ~ -t yielding two labels for these varieties: *qəltu* vs. *gələt*, both as dialectal reflexes of OA **qultu* 'I said'. *qəltu* is a hallmark of non-Muslim, and sedentary Northern Iraqi Arabic varieties until today. However, Iraqi Judeo-Arabic speakers in Hīt show a tendency different from other Iraqi Judeo-Arabic *qəltu* speakers in Mesopotamia. That is, they have developed an innovated form *qələt* as a merger between the 'sedentary' hallmark *qəltu* and the 'Bedouin's' *gələt* (Holes 2018; Khan 2018a). Khan (2018a) attributed this case to the openness of this Karaite Jewish community to integration and assimilation into the bigger Hīt society.

Blanc (1964: 168) attributes this development and the current distribution of the *qəltu* vs. *gələt* to a process of re-bedouinization, who are speakers of *gələt*, of central and southern Mesopotamia with a succeeding waves of sedentarization of the Bedouins in rural regions. The speakers of *qəltu* varieties, on the other hand, continued using a variety of Arabic used in Abbasid times either because of their ethnolectal in-group isolation, as in the case of Jewish and Christian Iraqi varieties, or because they were further north away from the dominant Bedouin new settlers, as in the case of Mosul. Jastrow (2006:414) notes also that this influx of Bedouins in urban centres: Baṣrā, Kūfā and later Baghdad, where the *qəltu* was the major spoken variety, led their earlier Muslim fellows to change to the *gələt* variety later on.

The invasion of the Mongols in February 1258 and later by Tamerlane in 1400-1 have resulted into a devastating destruction and depopulation of Baghdad (Holes 2018: 22). It was manifested by wide slaughter of the Muslim population in Baghdad, the Jews and Christians were mostly left at large. This in turn has also led to a long-term change into the demography of Baghdad later on in the next 500 years by a large-scale influx of newcomers (*gələt*-Bedouin Muslim speakers) who settled there and were different from the previous Muslim speakers who were, similar to Jewish Baghdadis and Christian Baghdadis, spoke a *qəltu*-type 'sedentary' variety (Blanc 1964: 168-71; Holes 2018: 22-24). This then shows two *qəltu*-type varieties, Jewish Baghdadi and Christian Baghdadi, that preserved and carried on the pre-1258 linguistic situation, and a *gələt*-type that was introduced into the complex after 1258. Holes (2018: 23) describes this 'macro' language change as triggered by *force majeure.* A 17th century map of Baghdad shows a Christian quarter '*naṣāra'* in the East of the Tigris, and a Jewish quarter *ḥārat al-yahūd* in the north (Holes 2007: 131).

Jew and Christian speakers of Baghdadi Arabic have long been 'diglossic or bi-dialectal'. One of those language varieties is used exclusively in-group (Jewish Baghdadi amongst the Jews, or Christian Baghdadi Arabic amongst Christians), and another default variety (Muslim Baghdadi) used in public and in inter-religious interactions. This highlights that Muslim Baghdadi Arabic has become the default and dominant language variety, at least in Baghdad (Holes 2018: 26). The last Mamluk governor made the life of Jews in Baghdad difficult which in turn forced many wealthy Jews to leave to India and Iran (Bar-Moshe 2019: 5). In the 18th and 19th century, many Jewish Baghdadis settled in Calcutta, Bombay, Singapore, Shanghai, and Hong Kong (Bar-Moshe 2019: 5). By the mid-19th century, the estimated ratio for the communal population in Baghdad was 7 Muslims for every 2 Jews and for every 1 Christian (Holes 2007: 131). The British seized control over the sea routes in the Indian ocean, and the trade line from India going through Baṣrā to Europe and Africa (Bar-Moshe 2019: 6). This in turn brought more Jews back in Baṣrā and Baghdad for these economic opportunities. At the beginning of the British mandate, more job opportunities flourished such as the public service which attracted more skilled Jews in this sector (Bar-Moshe 2019: 6). By 1920, the population of Baghdad was estimated at 200,000: 135,000 Muslims, 50,000 Jews, and 15,000 Christians (Blanc 1964: 8; Holes 2007: 131). According to (Bar-Moshe 2019: 6), in June 1941, a devastating pogrom erupted in the city of Baghdad, became known as the *Farhud,* against many Jews. This led in estimation to the murder of 179, and injury of 2118 Jews, and many properties belonging to the Jews were looted. After the State of Israel was established in 1948, an operation known as "Ezra and Nehemya" was launched in 1950-1951 that secured the departure of 120,000 Jews from Iraq to Israel. Later on, the number of Jews in Baghdad decreased until 1971 only 350 Jews remained. By the year 2005, only a few were still in Baghdad.

The next section will now take us to the city of Baṣrā and will present historical outline to the Jewish community.

6.2.1.2 Sociohistorical & Linguistic Background: Baṣrā and the Jewish Community[70]

The city of *Baṣrā*, known also by *al-fayḥa'* was founded as a *miṣr* in Arabic 'garrison town' around 635-638CE by approximately one thousand warriors mostly from Hijaz. Later, there were massive waves of migration from central and eastern Arabia that settled in Baṣrā. The name of the city of Baṣrā is, etymologically, derived from Arabic *al-Baṣrā* which could mean 'the over-watcher, or the land with little white stones' while some other scholars derived the word from *basriyatha* or *basriyi* 'settlement or place of huts' in Aramaic[71].

Baṣrā lies in the southern and Iraq main port on the *šaṭṭ al-ᶜArab.* Historically, there some presuppositions that Baṣrā was perhaps built on the site of the ancient Teredon (Diridotis/ Iridotis). However, right before the Arab military camp was built on site, there was a little ruin *al-khurayba* in Arabic. This ruin was part of *Vahi<u>sh</u>tābā<u>dh</u> Arda<u>sh</u>ēr*, an old

[70] This review relied on the following sources: (Sassoon 1927; Magidow 2013; Pellat, Ch. and Longrigg, S.H 2020; Toral-Niehoff 2020)
[71] Yaᶜqub Sarkis cited in (Abdullah 2001:9) argues for pre-Islamic Aramaic origin of the area name Baṣrā

Persian (military) settlement. The area where Baṣrā today stand can be divided into two parts: Old Baṣrā, known as the area around the Zubayr village; and the New Baṣrā which dates back to the 18th centaury nearby the archaic town al-Ubulla/Ubulla.

The earliest evidence that refers to a Jewish settlement in Baṣrā dates back to *Umayyad* Caliphate/regime in the 7th century. There was a canal, one of nine others, near Baṣrā called *Nahr al-yahūd* 'the river of the Jews' in Arabic. It is also suggested that some Jews settled first in Ubulla and then in Baṣrā. There were some religious scholars, such as Simeon Kayyara[72], merchants, such as Jacob Ben Aaron[73], physicians and translators such as, *Māsarjawayh*[74], and even astrologists, such as – Misha Ben Abra[75], amongst the Jewish community in the town. The earliest reference that describe a Jewish population in Baṣrā dates back to 1170CE as noted by the merchant, traveller and Rabbi Benjamin Tudela.

In the 10th century, the last Gaon Joseph Ben Jacob settled in Baṣrā after the closure of the academy of Sura. Evidence of communication between the Jews of Baṣrā and Baghdad are manifested in exchange of letters with questions on religious matters to the heads of the Yeshivah and other Gaons in Baghdad. There also existed a Rabbinate and a Karaite community in Baṣrā. In the 11th centaury, many Jews relocated out of Baṣrā elsewhere and some also emigrated as a result of civil wars in Mesopotamia. The oldest piece of evidence pointing to a synagogue (synagogue of *Ezra*) in Baṣrā dates back to the 13th centaury.

During the 18th century the community started to prosper again. In 1824, it was reported by Rabbi *David D'beth Hillel* that there were 300 Jewish families who were mainly merchants and artists. According to Sassoon 1926, there were four synagogues that were confirmed by Rev. M. Viscar on his visit to Baṣrā in 1847. In 1854, a devastating plague affected the town reducing the number of the Jewish families from 300 to 30. By the 18th and 19th centuries, during the rule of *Da'ud Pasha*, numerous Jewish merchants emigrated to India.

The community started to prosper again during the British mandate in the early 1900s and many Jews worked as clerks and translators during both WWs. In 1920, an official

[72] From Sabkha an area around Baṣrā.
[73] A Jewish minister of finance and Wali of Baṣrā in 1775 at the time of Suliman Pasha (Sassoon 1927:434)
[74] Also (Māsarjīs) a Jewish (and perhaps of Persian descent as his name ending suggests [-wayh]) physician in Umayyad times and most likely the first to translate a medical book 'Waterfall' into Arabic (Dietrich 2012).
[75] In Abbasid times also known as Mashaalah.

estimation of the Jews in Baṣrā collected by the British mandate shows there around 10,537 Jews in Baṣrā and the surrounding areas (Alrubaiy 2017: 608). Anti-Jewish campaigns in Baṣrā began to appear in 1948 and a lot of Jews emigrated or fled to Israel and other countries in the 1950s. By 1968 there were fewer than 500 Jews living in Baṣrā. The next part will present information about the fieldwork of this study.

After this sociological, historical and linguistic background on Baṣrā and its Jewish community, the next part will present a synthesis for the research method used for collecting and analysing the data on Jewish Baghdadī-Baṣrāwī Arabic.

6.3 Research Methodology

The data used in this study come in two parts: (a) data collected from the Timan corpus[76] of spoken data of Jewish Iraqi Arabic that was recorded, digitized and archived in ELAR[77]; (b) data from fieldwork conducted from a distance from Sep 2020 – Nov 2020[78].

The Timan corpus has interviews that were conducted in the UK, Israel and Canada. All of the interviews were in casual speech mode on historical accounts and different aspects of everyday life. The language consultants[79] were born in Baghdad between 1914-1929. All of the native speakers left Iraq after 1950, and the last two speakers left in 1974. The data used from the Timan corpus in this study were gathered from the speech of ten native speakers (5 females and 5 males). All of the sound files were examined through ELAN 5.7[80],

[76] I am so grateful for Mr. Eli Timan for letting me use his recordings, and for sending some more recordings through email. I am also thankful to him for producing and verifying the pronunciation of lexical words when needed. See appendix for some of his notes and for some of the words he reproduced for this study.
[77] From the corpus of spoken data recorded by Eli Timan, documentation of the Iraqi Judeo-Arabic spoken language, 2006 - 2007 [computer file]. London: Endangered Languages Archive (ELAR) [distributor], November 2010. http://elar.soas.ac.uk/deposit/timan2008jewishiraqi
[78] Ethical Approval Reference: MLAC-2020-07-21T12:30:22-jfnh44. Much gratitude and appreciation for Mr. Eli Timan for introducing me to the native speakers of JBBA: M5 & M6, and for facilitating the first online meetings with language consultants of JBBA. For further details on the metadata of the language consultants refer to Table A. in the Appendix.
[79] I am so grateful again for Mr. Eli Timan for providing and verifying the metadata for the language consultants.
[80] ELAN was used as part of my pilot to explore the rhotics in Timan's recordings and the non-conventional first-hand transcription he provided which was very helpful for me to familiarize my linguistic instinct with JBBA.

Audacity 2.3.3[81]., and PRAAT[82] 6.1.42.[83] The lexical items with etymological-*r* and etymological-*ġ* have been identified and then were isolated for further examination, and/or elicitation from the native speaker(s) if needed, with careful phonetic transcription. The words gathered were nouns, adjectives and inflected verbs. This study uses PRAAT to acoustically analyse the spectrograms of the target words to identify details of rhotics in Jewish Baghdadī-Baṣrāwī Arabic.

The second part of the data was obtained from fieldwork at distance with two native Jewish Baghdadī-Baṣrāwī Arabic speakers. Due to the global COVID-19 pandemic, the interviews were conducted and recorded via a web-conferencing software technology – Zoom Version: 5.5.5. Simultaneously, another recording was also conducted by using an (iOS or Android) application: (Awesome Voice Recorder Version 8.0._). This application was installed on the language consultants' mobile phones. Then, the language consultants were asked to initiate the recording through this application at the beginning of the Zoom's meetup sessions utilizing their own phone's internal microphone or an external microphone in some cases. All sound files were digitized through the application unidirectionally to Waveform Audio File Format (.wav) on 44,100KHz or 48,000KHz and 16-bit.

This fieldwork at a distance relied on the one-to-one interview method in casual/natural speech mode, and citation speech mode in careful elicitation of isolated tokens. All the sessions took place with another Jewish Baghdadi native speaker (M0) in attendance for translation to English and to contribute with some elaboration or clarification if needed. The content of the interviews was focused on sociocultural norms with designated semantic fields to elicit lexical items needed through stimulation and/or translation of the target words from the English language or Modern Standard Arabic to Jewish Baghdadī-Baṣrāwī Arabic. Thus, the assigned semantic fields were close ended and carefully selected, including: children rhymes, children games, proverbs, kinship terms, traditional medicine, myths & superstitions, city names in Iraq & areas of Baghdad, animal terms, means of transportation, ordinal and cardinal numbers, colour

[81] Audacity was used for more technical work: for reviewing long recordings, checking quality, file format, isolating tokens, etc.

[82] PRAAT was the main application used for extracting, reading/studying, analyzing, and plotting the tokens in their acoustic shapes.

[83] Boersma, Paul & Weenink, David (2021). Praat: doing phonetics by computer [Computer program]. Version 6.1.42, retrieved 15 April 2021 from http://www.praat.org/

terms, ethnic groups, food, taboo words, swear words, jewelleries, and fields of loanwords from English such as car parts. As is the case with the corpus, etymological-*r* and etymological-*ġ* lexical items were identified and then isolated for further examination and/or elicitation with careful phonetic transcription.

This was a synthesis for the research method used for collecting and analysing the raw data on Jewish Baghdadī-Baṣrāwī Arabic. The next part will present a synopsis about the nature of the data collected, and the metadata for the language consultants of Jewish Baghdadī-Baṣrāwī Arabic.

6.3.1 DATA[84] AND LANGUAGE CONSULTANTS[85]

As we mentioned earlier, the data comes from two sources: the Timan corpus, and the fieldwork of this study (cf. § 6.3, for more details). The first interview was recorded on the 10th of July, 2006 in London with a couple who speak Jewish Baghdadī Arabic: male 1 (M1) was born in Baghdad in December 1921 and his spouse female 1 (F1) with no declared date of birth. The second interview was conducted in Israel in the 22nd of April, 2008 with a female 2 (F2) who speaks Jewish Baghdadī Arabic and was born in Baghdad on the 14th of Feb, 1921, and left Iraq in February 1951. Her level of education was elementary. The third interview was recorded in Israel with a male 2 (M2) who speaks Jewish Baghdadī Arabic and was born on the 15th of April, 1929 in Baghdad and left Iraq in 1950. He speaks Jewish Baghdadī Arabic natively, Muslim Baghdadi Arabic, and Modern Standard Arabic. He also learned Classical Hebrew for practicing religion and Modern Hebrew as a second language in his early 20s. He is university-level educated and also learned formally (in school) English, French, and Persian. The fourth interview was conducted with a male 3 (M3) who was born in Baghdad in September 1926 and left Iraq in March 1951. He speaks Jewish Baghdadī Arabic and Hebrew. He also learned English and French while in Baghdad. He earned a BA in Law from the University of Baghdad. He worked in Journalism all of his life while in Baghdad, and then after he emigrated to Israel. The fifth interview was with a male (M4) who speaks Jewish Baghdadī Arabic and was born in Baghdad on the 14th of Feb, 1921. His level of education was secondary. He learned English in school, and later on self-learned Russian

[84] Ethical Approval Reference: MLAC-2020-07-21T12:30:22-jfnh44. For more details on the raw data of the Timan's corpus, and the fieldwork refer to the Appendix.
[85] Refer to Table A. in Appendix for more details on the language consultants.

and improved his knowledge of English. After emigration, he did his Master's on Iraqi Maqam music and published two books. The sixth interview was with a female (F3) in London. She was born in Amara in 1922 and spent half of her life in Baghdad. She is secondary school educated. She speaks Jewish Baghdadī Arabic natively, and she has relative knowledge in Classical Hebrew for practicing religion. She learned in a formal setting basic English and French.

The seventh interview was with a female (F4) in St. Catharines, Canada in August 2006. She was born in Baghdad in 1914 and left to Baṣrā when she was 4 years old and settled there in 1918. Thus, F4 was a native Jewish Baṣrāwī Arabic speaker. F4 is secondary school educated at Jesuit School where French was taught. She left to India 1941 right after the *Farhūd* incident took place in Baṣrā and stayed in India for 3 years. She then returned back to Baṣrā and to her house in 1944. F4 moved to Baghdad and stayed there until around 1972 before she left Iraq. She speaks Jewish Baghdadī Arabic with a hint of some Baṣrāwī influence. The eighth interview was conducted in May 2008 also with native Jewish Baṣrāwī Arabic male speaker (M7). M7 was born on the 18th of Nov, 1949 in the city of Basra. He earned all of his education in Basra. In 1966, he studied at the University of Basra B.S Electrical Engineering and finished his degree in four years. In 1971, he left Iraq with his family smuggled to Iran. He Speaks Arabic, Hebrew and English, but the varieties of these languages is not certain. The last interview was conducted with a female (F5). F5 was born in Baghdad in 1944. She is a native Jewish Baghdadī Arabic speaker. She lived in Baghdad most of her life and went to the Jewish school while there. She escaped from Baghdad on the 6th of Dec, 1970 through Kurdistan to Iran and then to Israel.

The data from the fieldwork of this study conducted from a distance recorded via a web-conferencing software technology (cf. § 6.3, for more details). The data were gathered from two native Jewish Baghdadī-Baṣrāwī Arabic speakers: (a) male 5 from Tel Aviv (M5) and (b) male 6 (M6) from Washington DC. M5 was born and raised in Baghdad in 1952. M5 and his parents speak Jewish Baghdadī Arabic natively. They all have knowledge of Biblical Hebrew for practising religion. They speak Jewish Baghdadī Arabic in their home and with their Jewish extended family and Jewish friends. They also speak Muslim Baghdadi Arabic (*gələt*-Arabic) with the wider Baghdadi or Iraqi community. M5 received his education (preschool – high school) in Baghdad. In school, M5 learned reading and speaking in French from the age of 4-13 years and English from 11-18 and half years. M5 emigrated to Israel in 1971 when he was 19 years old. After his arrival, he learned Modern Hebrew in 1971 in Israel. His children speak Jewish Baghdadī Arabic, and his grandchildren are learning Modern Standard Arabic in school in Israel.

The second native speaker is a male (M6) who was born in Baṣrā in 1932 and was 88 years old at the time of the interview. His family is deeply rooted in southern Iraq or Baṣrā and so are his ancestors. His mother was born in Hillah and his father was born in Diwaniya. M6's parents, and grandparents spoke Jewish Baṣrāwī Arabic in their home and with their Jewish extended family and Jewish friends. They also speak Muslim Baghdadi Arabic with the wider Baṣrāwī or Iraqi community. M6 learned to speak *gələt*-Arabic more likely before the critical period because they had an illiterate maid in their house who happened to be a marsh Arab or Maʻdān who spoke with a *gələt* variety. By the age of 5 years, M6 learned French in the first 4 years of his education at the Alliance school. Modern Standard Arabic and British English were the language of his general education. M6 also learned relative degree of knowledge in Biblical Hebrew for practicing religion at the age of 12 years. By the age of 17 years, he learned Modern Hebrew. In 1951 and when he was 18 and half years, M6 and his family emigrated together to Israel. He studied in Tel Aviv in the school of Law and Economics. In 1966, M6 emigrated to the United States of America to purse his postgraduate education. After he finished his PhD and post-doctorate years, he returned to Israel for three years and then emigrated back again to the US and settled there. During his settlement in the US, he worked for the International Bank for 30 years before his retirement.

The interviews elicited Jewish Baghdadī-Baṣrāwī Arabic data from different semantic fields, customs and traditions. Thus, this includes sociocultural norms associated with the society of Jewish Iraqis, such as: children rhymes, children games, kinship structure, proverbs, traditional medicine, myths and superstitions, types and names of jewelleries and Jewish Iraqi folklore. The semantic fields investigated were: kinship terms, names of cities in Iraq & names of areas in Baghdad, animal terms, means of transportation, ordinal and cardinal numbers, colour terms, identifying ethnic groups, terms for types of food, taboo words, swear words, and a field of loanwords such as car parts.

The total number of tokens analysed in this study is around 957T. 460T of these tokens come from the Timan's corpus and from the speech of 10 individuals (5 male and 5 females). The remaining tokens, 497T come from the speech of two speakers, with also some voluntary tokens for review from the speech of M0 (three males in total).

After this presentation on the data and metadata for the rationale of this study, the next part will offer a summary of this chapter on Jewish Baghdadī-Baṣrāwī Arabic.

6.4 Summary

This chapter focused on the language sample, JBBA, as used for the understanding and analysing rhotics of Arabic. This chapter also described the area of Mesopotamia; and synthesized a historical, sociological and linguistic synopsis for the Jewish populations of Iraq. This chapter offered a brief language description of JBBA; and established the language genealogy of Jewish Baghdadi-Baṣrāwī Arabic as a member of Mesopotamian Arabic. This chapter also presented the research methodology for this study of rhotics on JBBA. The data used in this study came in two parts: from a language corpus in ELAR, and from fieldwork conducted from a distance. This section described the semantic fields used in the elicitation sessions, and details of the language consultants.

Chapter 7

JEWISH BAGHDADĪ-BAṢRĀWĪ ARABIC RHOTICS: PHONETIC & PHONOLOGICAL DESCRIPTION

7.0 INTRODUCTION

This chapter focuses on the articulatory and acoustic aspects of rhotics in JBBA. It also provides the systematic distribution of rhotics. This also includes syllable shapes and consonant sequences that rhotics pattern with in natural speech. This part of study outlines the rhotic manner of articulation. Phonetic rhotic manners will be defined and described from an articulatory and acoustic perspectives. This chapter will also synthesize the distribution of these variants of rhotics as they occur in the prosodic word domain.

This study proposes that rhotics in Arabic can be classified into two macro groups (cf. §7.1, below). This classification is informed, justified and supported by phonetic internal structure of coronal and dorsal rhotics; and by phonological processes and distributional restrictions exclusive in both types (cf. chapters §5, 7 and 8, for presentation of phonological processes).

Section (§7.1) offers a synopsis for rhotic variation in Arabic; and phonetic and phonological justification for the CORONAL- DORSAL typology and classification; and their distribution. Section (§7.1.1) presents the CORONAL- DORSAL analogy, and phonetic justification for both labels. This section also provides further support for this classification from phonological patterning of rhotics in both types. Section (§7.2) presents a synthesis of JBBA and rhotics in MA. Section (§7.2.1) offers a synopsis for the phonetic manners of rhotics in JBBA, and the phonetic types and distribution of rhotic variants. This section also proposes a *lenition spectrum* for rhotics in JBBA which projects a tendency towards 'simplification' in rhotics either by *opening* and/or *reduction*. Sections (§7.2.1.1-7.2.1.6) present the phonetics and phonology of rhotic variants in JBBA. Section (§7.2.1.7) offers a sketch for consonant clusters which rhotics cooccur with. Section (§7.2.1.8) provides a synthesis on English loanword phonology of rhotics in JBBA and Maṣlāwī. Section (§7.2.2) offers a phonetic model that unifies both CORONAL and DORSAL-TYPE rhotic variants into one trajectory that mirrors both articulatory and acoustic properties which all governed by two subprocesses of lenition: (i) *reduction*; and (ii) *opening*. This model also has crosslinguistic implications to rhotics. It does not look at rhotic variants as separate entities (Sebregts 2015; Rennicke 2015), but as a part of broader holistic overlapping systems, the CORONAL-DORSAL analogy, that can be modelled by connecting and integrating the two processes of lenition (i) *reduction*; and (ii) *opening*. Section (7.3) will present a recap for this chapter on Arabic rhotics as they occur in JBBA.

7.1 RHOTIC VARIATION IN ARABIC

Rhotics in Arabic are phonetically heterogenous and exhibit variation in manner of articulation and could surface as: trills (cf. §7.2.1.1), taps (cf. §7.2.1.2), fricatives (cf. §7.2.1.3), approximants (cf. §7.2.1.4), retroflexes (cf. §7.2.1.5), and vocalized (cf. §7.2.1.6); or could be also a combination of a fused manner in some phonetic internal outputs in finer phonetic details, such as a trill-fricative (cf. §7.2.1.1, for details), fricative-approximant (cf. §7.2.1.3, for details), vocalized-approximants or even reduced-centralized vocalic input (cf. §7.1.2.6, for details).

The most common variants of a rhotic realization in Arabic are ‘hypothetically’ a voiced coronal (alveolar) taps and approximants, since we do not have enough systematic instrumental phonetic studies on rhotics in Arabic. However, we know from the literature on Arabic phonetic studies that the most common variant of a rhotic realization in Arabic is a voiced alveolar tap (cf. Watson 2002). Moreover, coronal trills can be linguistically predictable: (i) from a higher-level in the syntax-phonology interface, as in full assimilatory processes, such as the definite article particle [l-] assimilation to word-initial rhotics; and (ii) in morphological templates in lexical word-medial gemination of the shape CVrrVV(C)(V) as in /marraːt/ ‘sometimes’; or in lexical word-final postvocalic position gemination of the shape CVrr as in /farr/ ‘(he) ran/threw away’ (Blanc 1964: 20; Youssef 2019; and cf. §5.5.1 & 5.5.2.3, for some examples). This tendency, however, does not entail that coronal trills are always systematic[86]; especially in the varieties of Arabic with an underlying dorsal rhotic; a

[86] Coronal trills still surface in the Tigris subgroup varieties of Arabic in cases of loanwords and proper names (cf. 5.5.1, for more details).

dorsal fricative [ʁʁ] or approximant [ʁ̞ʁ̞] is the common variant or surface form as 'geminate'; and the least common is a dorsal trill [ʀʀ].

Rhotics in Arabic can be constricted in two major areas of articulation: coronal and dorsal. The label used for these two broad areas of articulation would also serve as a basis for a phonetic-phonological classification for rhotics in Arabic. This classification and grouping supports a macro linguistic typology for rhotics in Arabic; and builds on the quadruple micro typology for rhotics in Arabic proposed by Youssef (2019). Thus, this study suggests two macro groups: (a) CORONAL-TYPE RHOTIC; and (b) DORSAL-TYPE RHOTIC.

Now turning to the classical question whether rhotics belong to a phonetic or phonological class, and if so, in what way(s). The state of the art in research on rhotics crosslinguistically turns not much attention to the query of class in the phonetics of rhotics – due to their phonetic variability. Thus, instead, most recent research proposals focused on the phonology and behaviour of rhotics in an attempt to establish this unity; and thus suggested an underspecification or unspecification for the phonological structure and phonetic content of rhotics (see Youssef 2019, for Arabic; and Chabot 2019; Natvig 2020, crosslinguistically).

For Arabic, Youssef (2019) states that [ʁ] variants of rhotics behave like 'fricatives' and not like 'sonorants'; thus he proposed that [ʁ] is not sonorant in Maṣlāwī, and in his own data on CBA. His supporting evidence comes from the assimilation of coronal rhotics in word initial to the definite article particle /l/ (Youssef 2019: 12& 27-28); and coronal 'sonorant' assimilation, as in /ji-ʃtiɣal rassaːm/ → [ji-ʃtiɣar ṛassaːm] 'he works as a painter' (Youssef 2019: 28). There are some points we can raise here:

(i) First, it is not quite clear how we could phonologically abstract 'sonority' from a 'place' changing processes of assimilation; and for the same token, in regards to the active total regressive assimilation of the definite article particle [l-] whereby it commonly occurs in Arabic by an initial 'sonorant' and 'obstruent' [CORONAL] consonant triggers. At the same time, Abu-Haidar (1991: 110) on CBA, states that all consonants can assimilate to the definite article particle except the glottal consonants [ʕ] and [ʔ], as in *l-ʕəməġ* 'the age', *l-ʔdab* 'manners or toilet'. Moreover, in the case of dorsal rhotics, an example provided is *əġġəjjāl* 'the man' (Abu-Haidar 1991: 101). In fact, a similar tendency has been also reported in the JLT; but only dorsal rhotics of etymological-*r* are assimilated; and not etymological-*ġ*, thus, [əʀʀɑːħɑ] 'the rest', but [əlʀˠɑːbɑ] 'the forest'; [ɣʀˠʀˠɑːʒəl] 'the man', but [əlʀˠɑːʀʌq] 'the deep one' (Yoda 2005: 198). Pursuing this further, in JBBA, where the active total regressive assimilation process of the definite article particle [l-] is 'optional', only etymological-*r* undergoes this process and never etymological-*ġ,* thus, in (13):

(13) Word initial etymological-*r* and etymological-*ġ* behaviour in regards to the definite article particle [l-] (from Timan's and own data)

a. Dorsal rhotics of etymological-*r*

[əʁʁ̞əd͡ʒɑːl] ~ [əl-ʁ̞əd͡ʒɑːl]	'the man'	[əʁʁ̞ᵊsˤɑ̠ːsˤɨ]~ [əl-ᵊʁ̞sˤɑ̠ːsˤɨ]	'the grey color'
[əʁʁ̞iħi] ~ [əl-ʁ̞iħi]	'the smell'	[əʁʁ̞ɑ̞qqi̠] ~ [əl-ʁ̞ɑ̞qqi̠]	'water-melon'
[əʁʁ̞eħɑ·n] ~ [əl-ʁ̞eħɑ·n]	'the basil'		

b. Etymological-*r* in loanwords[87]

[ərriħ]	'the wind'	[ərrˤʉ̞sˤɑ̠ːf̞ɑ]	(an area in Baghdad)
[ərrujal]	'the royal'	[ərrɑʃiːd]	(street name)

c. Etymological-*ġ*

[əl-ʁ̞ɑ̠ːbɑ]	'the forest'	[əl-ʁ̞ɑ̠·məq]	'the dark (color)'
[əl-ʁ̞ɑ̠ːsəl]	'the washing'	[əl-ʁ̞eːmae̞]	'the cloud' SG.

As a result, if this process is taken as a testing ground for the 'sonority' of variants of rhotics, and/or by the counter-evidence thereof or for 'non- sonority'; the dorsal rhotic assimilates to the definite article in three varieties of Arabic: CBA, JLT, and JBBA, from two different language areas.

(ii) Moreover, if we take this type of assimilation again as an empirical evidence for the 'sonority' of the coronal-r, this hypothesis will not hold when not triggered by, for instance, examples like [əl-jəsɑ̠ːr] 'left (side)'; [əl-wʊʁ̞̊θ] 'inheritance' in JBBA[88], whereby the palatal glides [j] and [w] are more sonorous than /l/ and /r/, and yet the process was not triggered. Thus, although the palatal glides [j] and [w] do not assimilate to the definite

[87] For what counts as 'loanword' and more demonstration and examples (cf. 5.5.1 & data in (5)).
[88] Timan's & Own data.

article in Arabic, it does not deny their membership to the [sonorant] class; or as being more ‘sonorous’ than ‘liquids’, and ‘rhotics’.

(iii) As ‘sonority’ is not well-defined phonetically and phonologically, taking solely one process of assimilation to make generalization on a subset of sounds cannot be warranted, unless it is ‘exclusive’, or showing a common tendency. Let us now go back to the /ji-ʃtiɣa**l** **r**assaːm/ → [ji-ʃtiɣa**r** **r̩**assaːm] ‘he works as a painter’[89] example. If we take this type of assimilation, ‘coronal sonorant assimilation’, again as an empirical evidence for the ‘sonority’ of the coronal-r, or a counter-evidence for the ‘non-sonority’ of dorsal rhotics, this hypothesis will not hold as true if triggered by coronal or non-coronal ‘obstruent’ segments across the morphemic boundary. Thus, let us consider the following examples: /ʔaħma**r** **ʁ**aːməq/ → [ˀɑħmɑ̠**ʁ̩**‿**ʁ̩**ɑ̠·məq] ‘dark red’; or/laː **t**ədiːʁ baːl/ → [la**dd**i·ʁ baːl] ‘do not worry’ in JBBA[90]. These examples show a non-coronal dorsal rhotic assimilation, and coronal obstruent assimilation.

(iv) Supporting evidence for the ‘sonority’ of dorsal rhotics is the active phonological process of vocalization of dorsal rhotics in the Tigris subgroup of Mesopotamian Arabic; and in Jijel Algerian Arabic. Vocalization seems to occur almost always in the prosodic word coda position due to phonetic neutralization. Vocalization is gradient, because it is subject to ‘speech rate’, ‘inter-speaker’, and ‘intra-speaker’ variation. Below in (14) is some instances of dorsal rhotic vocalization in Maṣlāwī (14a); JBBA (14b); CBA (14c); and Jijel (14d) (referred to already in §5.5.2.2, (10)).

(14) Dorsal rhotics vocalization in Maṣlāwī (14a[91]), JBBA (14b[92]), CBA (14c[93]), and Jijel (14d[94]) (cf. §5.5.2.2.; (10), for more examples, and details)

a. *nifraħ*	>	/nəfʁaħ/	→	[nəfwɑħ]	‘we rejoice’
b. *farħaːn*	>	/fəʁħaːn/	→	[fəʷʁ̩ħɑːn ~ fə̠whɑːn]	‘happy or glad’
c. *l-baːriħa*	>	/mbeʁħa/	→	[mbeʁħa ~ mbeːħa]	‘yesterday’
d *t̲awr*	>	/tuːʁ/	→	[tuːᵃ]	‘bull’

[89] Youssef 2019.
[90] (Own data).
[91] Blanc 1964; Ibrahim 1969; Jastrow 1979; Tawfiq 2010; Ahmad 2018; Youssef 2019.
[92] Blanc 1964; Youssef 2019; Bar-Moshe 2019.
[93] Abū-Haidar 1991.
[94] Marçais 1956.

Therefore, this study suggests that the dorsal rhotics do not differ from coronal rhotics phonetically and phonologically in respect to ‘sonority’; and that both also follow the tendencies attributed to ‘sonorants’ in Arabic[95]. Thus, both coronal rhotics, and dorsal rhotics share this property – being [SONORANT].

Thus, now, let us turn to the distribution of the (a) CORONAL-TYPE RHOTIC; and (b) DORSAL-TYPE RHOTIC across the varieties of Arabic.

a) CORONAL-TYPE RHOTIC:

Phonetically, coronal-r varieties of Arabic exhibit an alveolar, dentialveolar or postalveolar rhotic variants in different positions in the prosodic word. Rhotic variants include: trills, taps, fricatives, and approximants; and in rare instances retroflexes. There, for certain, still some other variants in finer phonetic details but not as common as these main five manner of articulation in rhotics.

The CORONAL-TYPE RHOTIC group (cf. §5.2) includes: the Maghrebi varieties of Arabic as spoken in Algeria, Tunisia, Libya, Morocco, and Mauritania; Egyptian Arabic as spoken in Sudan and Egypt; Nigerian Arabic; Chadian Arabic; and Anatolian Arabic as spoken in Mardin, Siirt, and Şırnak. These varieties of Arabic are characterized by a plain-pharyngealized /r/ ~ /rˤ/ contrasts. This group of varieties of Arabic has been characterized by Youssef (2019) a split-r group type mirroring the two phonemic contrasts /r/ ~ /rˤ/ established by minimal pairs. The pharyngealized rhotic has gained a phonemic status in this group of varieties in Arabic through processes of morphological diffusion and lexical diffusion (cf. Youssef: 2019). However, the status of this contrasts is still until today not quite absolute (cf. for further notes, for instance, Heath 2002; Freeman 2019, on Moroccan Arabic; Watson 2002; Youssef 2013, on Cairene Egyptian Arabic).

The CORONAL-TYPE RHOTIC group also includes: Levantine Arabic as spoken in Syria, Palestine, Jordan and Lebanon. These varieties are characterized by an underlying pharyngealized /rˤ/ with an allophonic plain rhotic in complementary distribution. This

[95] For instance,the phonotactic patterns of rhotics are similar to sonorants: a. close to a syllable nucleus especially in complex onsets and complex codas; b. merging with adjacent vowels; c. alternating with other rhotic variants; and d. although not common, is having a syllabic allophone [r̩] (see Youssef 2019; Khattab 2002, for more details). Patterning with the other classically known Arabic sonorants in phonological processes, e.g */hal #raʔajt/ → [har #raʔajt] ‘did you see?’, */min #raʔajt/ → [mir #raʔajt] ‘who did you see?’ (cf. ch. 5; and 7.1, for more details).

group has been labelled the pharyngealized-r type group by Youssef (2019). This allophonic plain rhotic is, although opaque, almost, a productive and regular de-pharyngealized phone by product of processes of palatalization: vowel raising, known widely in Arabic as *imāla*, and by adjacency to palatal consonants /ʃ, ʧ, ʤ, j/. This de-pharyngealized allophone also irregularly occurs nearby the coronals /θ, t, d, s, z, n/ (cf. Younes 1994 & Herzallah 1990, on Palestinian Arabic; and Youssef 2019, for review).

The CORONAL-TYPE RHOTIC group also includes: Mesopotamian *gələt*-Arabic as spoken in Iraq, Kuwait, northeast Syria and Iran; Peninsular Arabic as spoken in Yemen, Hijaz, Najd, Oman, and the other varieties of Arabic of the Persian Gulf; and the Arabic varieties spoken in Malta (Maltese), Cyprus (Cypriot), Uzbekistan (Uzbekistani), Juba (Jubin) and Nubia (Ki-Nubi). This group is characterized by a phonemic plain /r/, and a pharyngealized [rˤ] which is in complementary distribution in Mesopotamian *gələt*-Arabic, and Peninsular Arabic. The remaining are characterized solely by a plain rhotic in Ki-Nubi, Jubin, Uzbekistani, Cypriot and Maltese Arabic. This group has been labelled the plain-r type group by Youssef (2019). What confirms that rhotics in this group are underlyingly plain and not pharyngealized is empirical evidence from the patterning of rhotics with labialization in MBA whereby the rhotic distribution with labialization is less widely established than in pharyngealized and back consonants (cf. Blanc 1964; Youssef 2019). Also, a common tendency in this group, non-pharyngealized rhotics can surface within the same syllable before front vowels [i/iː] or palatal glide [j] (cf. Youssef 2019). Thus, in this group, a pharyngealized rhotic more likely occurs in a limited environment – nearby a pharyngealized or back consonants (cf. Johnstone 1967; Prochazka 1988; Watson 2002; Youssef 2019).

b) DORSAL-TYPE RHOTIC:

Phonetically, dorsal-r varieties of Arabic exhibit dorsal (velar-uvular) rhotic continuant variants as an underlying rhotic phoneme, with a phonetic coronal-r that surfaces sometimes in loanwords from different Arabic varieties or different languages (cf. §5.5.1, for examples and details). There is no systematic distribution to linguistically determine where the coronal-r occurs. This is due to the fact that a language with a DORSAL-TYPE RHOTIC system, say JBBA, is, in reality, a mirroring rhotic system that runs parallel and corresponds to a CORONAL-TYPE RHOTIC system in a different language (variety); and a language with a DORSAL-TYPE RHOTIC system always crosslinguistically cooccur with coronal variants, but not vice versa (cf. §7.1.1 & 7.2.1, for more details; and §2.2 for review). Dorsal rhotic variants include: trills, taps, fricatives, approximants, and vocalized. There are, for certain, still some other variants in finer phonetic details, but not as common as these main five manners of articulation in dorsal rhotics (cf. §7.2.1, for more details).

The DORSAL-TYPE RHOTIC group (cf. §5.5) includes: Mesopotamian *qəltu*-Arabic – the Tigris cluster that comprises: Maṣlāwī, Tikrītī, Christian Iraqi Arabic and Jewish Iraqi Arabic in Central, mostly Baghdad and its surroundings, and Southern Iraq, mostly Basra and its surroundings; and the spoken Iraqi Arabic of the Jews in the Southern Kurdistan group: Kirkuk, Tuz Khurmatu, and Khanaqin (cf. §5.5.1, for more details). This group is characterized by a phonetic merger in the pronunciation of the dorsal rhotic with the pronunciation of etymological-*ġ* words; and for this reason both cannot be phonetically distinguishable (cf. §5.5 & 5.5.1, for review).

The DORSAL-TYPE RHOTIC group, moreover, includes a 'sedentary' variety of Levantine Arabic as spoken by the younger generation 'Samaritans' in the town of Jaffa and its surroundings; and in the Jewish variety of Aleppo in Syria (cf. §5.5.1, for more details). In this subgroup, phonetically, the dorsal rhotic is not explicitly described in this language area. For instance, Arnold (2004: 36) describes the dorsal rhotic as a uvular 'Zäpfchen' and uses the IPA symbol [ʀ], but does not explicitly provide any phonetic description for its manner of articulation. In the Jewish variety of Aleppo, an apical trill is an underlying rhotic in complementary distribution with a conditioned velar fricative, especially in pause (Nevo 1991: 22, 32; Khan 2018a: 164).

The DORSAL-TYPE RHOTIC also includes the old pre-Hilalian varieties as spoken in some urban centres in North Africa (cf. §5.5.1, for review). This includes: the cities of Tunis in Tunisia; Constantine, Cherchell, Algiers, Nedroma, Tlemcen and Djidjelli (Jijel) in Algeria; the Jewish and 'sedentary' varieties in northern Morocco in Fez, Meknes, Tetouan, Chefchaouen or Chaouen, Taza; and the Jewish Libyan varieties in Tripoli, Zāwiya, and perhaps in Zlīten (cf. §5.5.1, for more details). In this group of dorsal-r varieties, the dorsal rhotic is phonetically constricted within the dorsal region; but the 'impressionistic' assignment for the point of articulation for dorsal-r is divided. One view suggests a phonetic merger between etymological-*r* and etymological-*ġ* (cf. Zawadowski 1978: 38; Behnstedt and Benabbou 2002: 60; Yoda 2005: 11; and notes from Aguadé, Behnstedt, and Woidich; cf. §5.5; or not explicitly as Roux 1925); and another view suggests a small phonetic, but distinguishable difference in the pronunciation of the dorsal rhotics of etymological-*r* across the northern Moroccan varieties of Arabic, as, for instance, between Chefchaouen and Tetouan (Rahmouni 2014: 29-30; and cf. §5.5); or a small distinguishable difference between etymological-*r* and etymological-*ġ* (Cohen 1912; Marçais 1956; Aguadé 2003: 78-79; Behnstedt 2003: 165; Youssef 2019: 24, for review). All of these variations and/or views of the dorsal rhotic, and etymological-*ġ* are always, however, within the velar-uvular points of constriction, with different descriptions for the manner of articulation (cf. §5.5, for more details).

Thus, this study is proposing two macro groups: (a) CORONAL-TYPE RHOTIC; and (b) DORSAL-TYPE RHOTIC. After this brief presentation on their distribution, the next part will present supporting pieces of evidence which justify this grouping.

7.1.1 THE CORONAL-TYPE & DORSAL-TYPE ANALOGY

The phonetic question that might naturally come to mind is: why not ‘alveolar-type’ and ‘uvular’[96] or ‘velar-type’. First of all, studies that reported a dorsal rhotic have an ‘impressionistic’ assignment for the point of articulation of dorsal rhotics within the dorsal region, either ‘velar’ or ‘uvular’, in the varieties of Arabic (cf. §7.1b; and 5.5 & 5.5.1, for review). The only study, to the best of my knowledge, that confirms the point of articulation of dorsal rhotics to be uvular from an instrumental or acoustic evidence is aldahook’s (2015) on Maṣlāwī Arabic. However, we cannot draw generalizations from such findings in this study on other dorsal rhotics which occur in other varieties of Arabic. Thus, until we get more precise and narrower phonetic description of dorsal rhotics; the level of the label ‘DORSAL-TYPE RHOTIC’ is a plausible choice for now and for these reasons.

As far as whether using the label ‘alveolar-type’; and the alveolar region vis-à-vis Arabic rhotics are concerned, it seems from the reported literature on rhotics, which also some of which is ‘impressionistic’, that they are generally constricted within the alveolar region (cf. §5.1_, for review). However, in ECA Shaheen (1979) has reported a ‘frictionless’ continuant rhotic, which Youssef (2019) characterizes as well, as either an alveolar approximant [ɹ] or a postalveolar retroflex [ɻ]. Thus, we do not know where in the (post)

[96] Youssef (2019) uses the label ‘uvular-r dialects’ to characterize and group the varieties of Arabic with dorsal rhotics.

alveolar region these variants of rhotics occur. Another example comes from the Fessi variety of Moroccan Arabic where Hachimi (2007) phonetically described a post-alveolar approximant [ɹ] as a variant of rhotics. There also a similar case in the Damascene variety of Levantine Arabic where Ismail (2007) outlines a palato-alveolar approximant [ɹ], and a retroflex approximant [ɻ], as variants of rhotics. Youssef (2013), also reports plain dental flap or trill [ɾ ~ r] and a pharyngealized counterpart [ɾˤ~ rˤ] in ECA. Similarly, Al-Shahrani (1988: 26) also states that there is a dental flap and a pharyngealized alveolar flap in Šahrānī Arabic as spoken in southwestern today's Saudi Arabia.

Thus, this synthesis highlights two issues: there is an evident 'oversimplification' or sometimes non-clarity in the description of 'place' of articulation vis-à-vis rhotics; and the reference 'post-alveolar' or lack of 'place' phonetic description of rhotic retroflexes in Arabic. As a result, solely a higher-level categorization, i.e. CORONAL-TYPE RHOTIC, for the rhotics region of articulation can solve this descriptive issue; and for this reason, this label is plausible choice to classify the collective sporadic descriptions, although not exhaustive, which may include: dental, (dental)alveolar, alveolar, (post)alveolar, into a uniform label – 'CORONAL-TYPE RHOTIC' in these varieties of Arabic.

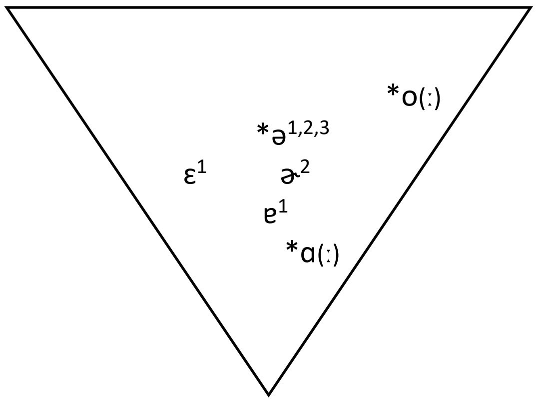
In theory, using a higher-level characterization for the CORONAL-TYPE & DORSAL-TYPE ANALOGY would be 'front' and 'back', respectively. Using the label 'front' to categorize CORONAL-TYPE rhotics would involve the 'Labial' region. However, since in Arabic there are no labiodental rhotics such as [ʋ] or any other potential rhotic constricted in the labial region, 'front' cannot be an ideal choice – as it includes the labial area of articulation. Labialization 'lip rounding' of some variants of rhotics is a 'manner' of articulation and not a 'place' of articulation; this can be analogous to, for instance, the labial-velar glide [w] where it is constricted by approximating the 'back of the tongue' to the 'velar' region' and with cooccurring 'lip rounding'; whereas, for instance, the labiodental rhotic [ʋ], the lower lip is involved in the process of articulation with the upper teeth. Thus, a labialized velar [w] would perhaps be a better phonetic description. On the other hand, if we use 'back' to categorize DORSAL-TYPE rhotics that would also include pharyngeal and glottal points of articulations – collectively laryngeals. In Arabic, there are no rhotics to be known to be constricted in those areas of articulation. Thus, the label 'CORONAL-TYPE' which is used in this study to phonetically categorize dental alveolar, alveolar or palato-alveolar rhotics; and the label ‘DORSAL-TYPE’ which is used to characterize velar and uvular rhotics are phonetically justified.

THE CORONAL-TYPE and DORSAL-TYPE ANALOGY also has a crosslinguistic implications. It, for instance, solve the issue of ‘place’ for rhotic retroflexes. Some studies treat retroflexes as complex sounds and sometimes are not assigned a ‘place’ of articulation (cf. §2.1 & Table 2.1; see also Wiese 2001& 2011; Chabot 2019: 13; and Labrune 2021: 3, for instance). Retroflexes exhibit two coarticulatory gestures, and this coarticulation is perhaps a basis for this perplexity. Utilizing the term ‘retroflex’ cannot define a ‘place’ of articulation; it is rather a manner of constriction, and it occurs in a specific ‘place’ or ‘area’ in the oral cavity. As for Arabic rhotics, retroflex rhotics are articulated in the postalveolar or palato-alveolar regions (cf. Ismail 2007; Youssef 2019). Crosslinguistically, all possible rhotic retroflexes are articulated within the coronal region (cf. §2.2.5; also Hamann 2003). Thus, a CORONAL-TYPE rhotic label also comes with its own merits in such cases. Table 7.1 below is a recreated table from Chabot (2019: 13); and Labrune (2021: 3); and adding this study’s rhotics, using the higher-level characterization for regions of rhotic articulation: LABIAL, CORONAL, DORSAL and LARYNX. Also, in Table 7.2 below, is the attested vocalic rhotics in JBBA (cf. §7.2.1.6, for more details); and what has been reported in the literature of rhotics in Dutch (Sebregts 2015); and Brazilian Portuguese (BP) (Rennicke 2015).

Table 7.1: Attested consonantal rhotics in the languages of the world (cf. Chabot 2019: 13; Labrune 2021: 3; and in JBBA*)

	LABIAL	CORONAL		DORSAL		LARYNX
Trill		rˤ* r			ʀ	
Retro. Trill			r̠/ɽ̊			
Tap/Flap		ɾˤ* ɾ			ʀ̆*	
Retro. Flap			ɽ			
Fricative		ʃ ʒ		x ɣ	χ ʁ	h ɦ
Retro. Fricative			ʂ ʐ			
Approximant	ʋ	ɹˤ* ɹ		ɰ w*	ʁ̞*	
Retro. Approx.			ɻ			
Lateral Flap		ɺ				
Retro. Lat. Flap			ɺ̣			

Table 7.2. Attested vocalic rhotics in JBBA* (cf. also for Dutch[1], Sebregts 2015: 281; and for BP[2], Rennicke 2015: 239, and for British English[3], Scobbie 2006)



Another supporting evidence that justifies this binary macro groupings of Arabic rhotics into Coronal-Type rhotic; and Dorsal-type rhotic lies in not only their phonetic makeup, but also in their phonological patterning (15), and exclusive participation in phonological processes (cf. §5.2.4; 5.5.2; 7.1 & ch.8). Phonologically, the Dorsal-type rhotic varieties spoken in Iraq, specifically JBBA, Maṣlāwī & CBA, exhibit a phonemic coronal-dorsal rhotic contrast, split and phonetic mergers as in (15) below; unlike the Coronal-Type rhotic group. The splits occur in etymological-*r* as in JBBA (15a), and as in Maṣlāwī & CBA (15b); near splits or root splits in JBA (15c); or in etymological-*r* and etymological-*ġ* contrasts as in JBBA (15d), and in Maṣlāwī & CBA (15e); or as mergers in etymological-*r* and etymological-*ġ* as in JBBA (15f), and in Maṣlāwī & CBA as in (15g).

The phonemic split examples in (15a-b) below have made some scholars like Mansour (1957); and Youssef (2019); and not explicitly as Blanc (1964) to treat the rhotic as two phonemes /ʁ/ and /r/; while others like Tawfiq (2010); Ahmad (2018) and not explicitly Jastrow (1979) & (2006a&b); and Abū-Haidar (1991) had treated [ʁ] as an allophone of an underlying /r/. The split examples below in (15a&b) most likely have emerged out of (re)introducing /r/ in the same words to serve a new meaning through the medium of Literary Arabic (Standard Arabic). These doublets then coexisted with the older lexical form reserving the older pronunciation [ʁ] (Mansour 1957; cf. §5.5.1, for more details). This hypothesis can be supported by the example /ramaðˤaːn/ (male name) in (15b), as it can be easily determined by its recent history, and the novel use of this lexical form as a proper male name.

The data in (15) below show the coronal-dorsal rhotic split, contrast, and mergers in etymological *r ;& *ġ (from Blanc 1964; Mansour 1957; Tawfiq 2010; Youssef 2019; and own data).

(15) a. JBBA **r* split: (Timan's & Own data)

/faʁʁ/	'he poured'	/farr/	'he threw/ran away'
/ʁajjaʁ/	'he changed clothes'	/ʁajjar/	'he changed'
/faʁʁaq/	'he separated'	/farraq/	'he distinguished'
/barraː/	'outside (of Karrada)'	/baʁʁaː/	'outside'
/waʁda/	'flower'	/wardi/	'pink'

b. Maṣlāwī & CBA **r* split: (Tawfiq 2010 & Youssef 2019)

/ʁamaðˤaːn/	(lunar month)	/ramaðˤaːn/	(male name)
/ʁakkib/	'he assembled'	/rakkib/	'he let climb'
/qaddiʁ/	'he measured'	/qaddir/	'he estimated'

These examples below (15c) from (Blanc 1964: 20) show root splits whereby only the root of the lexical words exhibit near contrast and opposition with a different meaning. The lexical set show words on the right column below that maintain a coronal rhotic, and words on the left column that maintain a dorsal rhotic. We cannot be certain about the history of these words as these examples are not circulated elsewhere in the literature of JBA. However, we can solely speculate that there is a high probability that the words on the right column have been introduced at a later stage, and perhaps through the medium of Standard Arabic or MBA. The Jewish community in Iraq, in general, is sedentary (cf. §6.2.1, for details). Thus, the chances of acquiring a word like /ʕrubi/ 'a villager' from the other communal groups via either MBA or Standard Arabic is high, as is the case also for /ħadʒar/ 'jewel'.

c. JBA **r* root split: (Blanc 1964: 20)

/ʕaʁabi/	'Arabic'	/ʕrubi/	'a villager'
/ħdʒaːʁa/	'stone'	/ħadʒar/	'jewel'

There also a handful list of established contrasts between etymological-*r* and etymological-*ġ* in the literature of Maṣlāwī, CBA and JBA (cf. §5.5.1, for more examples). The examples in (15d-e) below are minimal pairs and a manifestation of phonemic contrasts in JBBA (15d), Maṣlāwī and CBA (15e). The *ġanna* 'he sang' ~ *ranna* 'is ringing' pair is subject to a merger *ġanna ~ ġanna*[97] which does not seem complete yet, and only one speaker (M5) seem to opt for an oppositional paradigm for these lexical pairs (see 15d, below).

d. JBBA **ġ & *r* contrasts: (Own data)

/ʁamz/	'wink.Pl'	/ramz/	'symbol'
/ʁanna/	'he sang'	/ranna/	'(my ear) is ringing'

e. Maṣlāwī & CBA **r* & **ġ* contrasts: (Tawfiq 2010 & Youssef 2019)

/rasuːl/	'prophet'	/ʁasuːl/	'laundry'
/raːja/	'flag'	/ʁaːja/	'goal/destination'
/jəsˤbər/	'he forbears'	/jəsˤbəʁ/	'he paints'

All of the examples below are phonetic mergers and mostly semantically context dependent. It seems they have aroused out of levelling by transfer, i.e. the merger took place after the lexical diffusion process occurred, whereby phonemic or, in fact, phonetic distinction had dissolved through phonetic neutralization. Mergers are always a good indication of identical or near-identical phonetic outputs that arise from historical sound changes and chain shifts. For instance, the pair *ġanna* 'he sang' ~ *ġanna* 'is ringing' in (14f) show feasible free variation with the form /ranna/ '(my ear) is ringing' in one of the JBBA speakers (M5) (15d). This /ranna/ '(my ear) is ringing' token emerged with (M5) to resolve a semantic conflict after consulting and introducing the second merged token *ġanna* 'he sang' to (M5). (M5) had to review his outputs in these pairs many times in different contexts which shows that both tokens are perceptually identical; and for this reason, for solely (M5), to be considered a near-mergers. Thus, (M5) was a sole contributor to the /ranna ~ ʁanna/ contrasts in (15d). The *sˤāġ* 'devised' ~ *sˤāġ* 'he went/became' merger is more stable than the previous example, as in [sˤɑ̠·ʁ̞ əððɑhɑb] 'he casted the gold' ~ [sˤɑ̠·ʁ̞ əlwɑqət] 'time

[97] Own data.

passed'. The last instance for the mergers in (15f) is *zāġət* 'she visited' ~ *zāġət* (*ʾēnu*) 'rubbernecked' does not also show variation, as in [zɑ̪·ʁ̞ət zo·d͡ʒa] 'she visited her husband' ~ [zɑ̪·ʁ̞ət ʕenu] 'he rubbernecked'. Similarly, the sole token of a merger that occurs in Maṣlāwī (15g) is similar to JBBA, and is also homophonic as reported by Tawfiq (2010); and can be only understood from the context.[98]

f. JBBA **ġ & *r* mergers: (own data)

/ʁanna/	'he sang'	/ʁanna/	'(my ear) is ringing'
/sˤaːʁ/	'devised'	/sˤaːʁ/	'he went/became'
/zaːʁət (ʕenu)/	'rubbernecked'	/zaːʁət/	'she visited'

g. Maṣlāwī **ġ & *r* mergers: (Tawfiq 2010)

/sˤaːʁ/	'devised'	/sˤaːʁ/	'he went/became'

Thus, what we have provided so far in (15) is a phonological evidence that supports our proposal that the DORSAL-TYPE RHOTIC group behave and pattern differently on the phonetic and phonemic levels from the CORONAL-TYPE RHOTIC group (cf. §5.1 & 5.2, for more details on CORONAL-TYPE RHOTIC).

The situation in regards to the phonetics and phonology of dorsal rhotics in the old pre-Hilalian varieties as spoken in urban centres in North Africa is not quite clear (cf. §5.5. & 5.5.1, for review). Still, however, the dorsal rhotic is articulated within the dorsal region, but the disagreement in the literature is on the exact phonetic description of the dorsal rhotic; and whether this dorsal pronunciation had actually merged with that of etymological-*ġ* (cf. §5.5., for more details). Thus, there are those who are proponents of a phonetic merger between etymological-*r* and etymological-*ġ*, (cf. Zawadowski 1978: 38; Behnstedt and Benabbou 2002: 60; Yoda 2005: 11; and notes from Aguadé, Behnstedt, and Woidich; cf. §5.5; or not explicitly as Roux 1925); or those who see a small, but yet a distinguishable difference between etymological-*r* and etymological-*ġ* (Cohen 1912; Marçais 1956; Aguadé 2003: 78-79; Behnstedt 2003: 165; Youssef 2019: 24, for review).

[98] Own data.

From a theoretical and formal perspective, uvular and velar fricatives do not contrast in any variety of Arabic (Paradis & LaCharité 2001: 278). Moreover, what have been phonetically characterized as 'velar' fricatives for etymological-*ġ* in some varieties of Arabic (cf. Herzallah 1990, for instance), have always patterned with uvulars, pharyngeals and laryngeals, and not with pre-uvular segments (cf. Paradis & LaCharité 2001: ch.2&6, for more details and examples). Thus, from a formal and phonological stand point, Paradis & LaCharité (2001) suggest treating Arabic 'velar' fricatives as 'uvulars' phonologically. Thus, baring these phonological and statistical realizations, without an instrumental and physiological evidence; the hypothesis that the uvular rhotic did not merge in pronunciation with etymological /ʁ/ in Maghrebi Arabic (Youssef 2019), would be quite challenging to accommodate just on face value.

A point in favour of the phonetic merger and neutralization is a process of total assimilation of dorsal rhotics in the vicinity of the dorsal consonants /q/ and /χ/ in the Tigris cluster of Mesopotamian Arabic (cf. §5.5.2.1, for details; and (9), for some examples). Consonant sequences such as /qʁ/ and /χʁ/ surface as [qq] and [χχ], respectively. Below in (16) are some instances of total regressive assimilation of a dorsal rhotic [ʁ] for etymological-*r* to [q] or [χ].

(16) Total assimilation of a dorsal rhotic [ʁ] to /q/ or /χ/ in Maṣlāwī (16a), JBBA (16b) and CBA (16c) (cf.(9); and §5.5.2.1 for more details and examples)[99]

a.	/ʕaqqabi/	'scorpion'	/ʔaqqaʕ/	'bald'
b.	/aqqa/	'I read'	/l-əxxi/	'the other' F.SG
c.	/ʕaqqoːqa/	'frog'	/ʔaqqaːm/	'numbers'

Thus, now, this part had provided some pieces of evidence that support our proposal for the macro typology of the DORSAL-CORONAL-TYPE RHOTIC groups which is grounded in phonetic content, and phonological behaviour (cf. ch.5 for an outline, and more details). Thus, rhotics in Arabic can be typologically classified into two major macro groups: (a) CORONAL-TYPE; and (b) DORSAL-TYPE. This phonetic and phonological macro grouping builds on

[99] For Maṣlāwī, from Tawfiq 2010; for CBA, from Abū-Haidar 1991, also, Youssef 2019; for JBBA, from Bar-Moshe 2019, and Blanc 1964.

the quadruple micro-typological categories proposed by Youssef (2019). This classification is informed, justified and supported by phonological patterning (cf. (13); (14); (15); and (16)) and exclusive participation in historical sound changes, such as the phonemic coronal-dorsal rhotic contrast, split and phonetic mergers; and a cluster of exclusive phonological processes due to neutralization, such as vocalization to a non-front glide [w], or non-front vocalic outputs (cf. ch. 5; and ch. 7, for more details); and the process of total assimilation of a dorsal rhotic [ʁ] to /q/ or /χ/ (cf. ch. 5; and ch. 7, for more details); and also by distributional restrictions, as in processes of dissimilation and assimilation exclusive in both types (cf. ch. 5; and §7.1.1). However, the CORONAL-TYPE and DORSAL-TYPE, together, are unified in their formal representation by an identity element in the base of their phonological expression (cf. ch. 8, for more details).

The next parts (§7.2., and 7.2.1) will present an introduction to the next sections on the phonetic variants of rhotics (§7.2.1.1-7.2.1.6); and how this variation occurs in JBBA.

7.2 Rhotics in JBBA

This section will present rhotic variants in Jewish Baghdadi and Baṣrāwī Arabic (JBBA). There will also be a presentation of active phonological processes present in JBBA rhotics in the next chapter (cf. §8, for further details).

As we have seen, rhotics in MA can be constricted in two major places of articulation: (a) Coronal; (b) Dorsal. Those two designated major places of articulation also represent the widely distributed rhotic variants area of articulation in the varieties of MA. Thus, classification of rhotics typology in this language area can be derived from those two major types: (i) CORONAL-TYPE rhotic language, that includes: *gələt*-Arabic - Bedouin Muslims in Mesopotamia and Anatolia, and the sedentary Muslims in Lower Mesopotamia; and *qəltu*-Arabic - Euphrates group: ᶜĀna and Hīt (Jews and Muslims), and in the Northern Kurdistan group (Sendor, ᶜAqra, Arbil); (ii) a DORSAL-TYPE rhotic language, that includes: *qəltu*-Arabic – the Tigris cluster that includes Maṣlāwī, Tikritī, Christian and Jewish Iraqi Arabic in Central and Southern Iraq, and the spoken Arabic of the Jews in the Southern Kurdistan group (Kirkuk, Tuz Khurmatu, and Khanaqin).

The next section will introduce the variants of rhotics available in JBBA. It will also present the distribution of these rhotic variants.

7.2.1 Distribution of Variants of Rhotics in JBBA

JBBA is a DORSAL-TYPE rhotic language. This entails that the default and widely distributed rhotic variants in JBBA emerge from a dorsal, 'uvular', point of articulation. There exists fourteen distinctive, allophonic, 'dorsal' variants that can occupy a rhotic sound position in the syllable structure in JBBA (cf. Figure 7.2a; and 7.2b). Ten of these are constricted in the 'uvular' region: JBBA speakers exhibit fricatives [ʁ][100]; and more often approximants [ʁ̞] as their phonemic default rhotic. There is an allophonic trill [ʀ], and tap [ʀ̆] that occur as an inter-speaker variants in JBBA (cf. Figure 7.2a). There are three dorsal vocalic rhotic variants [oː], [ɑː], and [ə] that show relative degree of different lengths as part of the vocalization continuum (cf. Figure 7.2b). Moreover, there is a labialized dorsal approximant glide [w] that could also occupy a rhotic position; and is a part of this vocalization continuum as a 'linker' between dorsal rhotic consonants; and rhotic vowels (cf. §7.2.1.6, for more details).

There are also non-categorical variants of coronal rhotics that surface in JBBA, which includes: trills, approximants, taps, and in very rare cases retroflexes (cf. Figure 7.1a; and 7.1b). The central cause for the many variants of rhotics in JBBA, and the crucial factor in the historical sound changes and active phonological processes involving rhotics lies in processes of *lenition*. This echoes similar findings on the development, and patterning of rhotics, as in Dutch (Sebregts 2015); and BP (Rennicke 2015). This study proposes a *lenition spectrum* for dorsal and coronal rhotics as they occur in JBBA characterized by two subprocesses of lenition: (i) *reduction* (cf. Figure 7.1a; and 7.2a); and (ii) *opening* (cf. Figure 7.1b; and 7.2b). This schematic representation for the stages of both aerodynamic and lingual constrictions of rhotics highlights the potential directionality towards 'simplification' in rhotics either by *opening* and/or *reduction*. Both processes were found to be informed by historical and active processes of lenition rooted in naturalization, coarticulation or assimilation in Arabic in general, and in JBBA in particular (cf. §7.1.1; and ch. 5, for more details).

[100] A superscript will be used to demonstrate an absolute dorsal (uvular) fricative rhotic; and [ʁ] is also used to indicate a fricative manner but not as with much prominence in frication.

Figure 7.1a. *Lenition spectrum of coronal rhotic reduction in JBBA*

Relative Quantity & Quality of Trilling ~ Tapping

rrˤ → rˤ → rr$^{(H)}$ → r$^{(H)}$ → r̥ → ɾˤ → ɾ$^{(H)}$ → ɾ̥

Figure 7.1b. *Lenition spectrum of coronal rhotic opening in JBBA*

Rel. Quantity & Quality of Trilling ~ Frication ~ Approximation

rrˤ → rˤ → rr$^{(H)}$ → r$^{(H)}$ → r̥ → ɹɹˤ → ɹˤ→ ɹ$^{(H)}$ → ɹ̥ → ɻ

Figure 7.2a. *Lenition spectrum of dorsal rhotic reduction in JBBA*

Relative Quantity & Quality of Trilling ~ Tapping

ʀʀ$^{(H)}$ → ʀ$^{(H)}$ → ʀ̆$^{(H)}$ → ʀ̥̆

Figure 7.2b. *Lenition spectrum of dorsal rhotic opening in JBBA*

Trilling ~ Frication ~ Approximation ~ Vocalization

ʀʀ$^{(H)}$ → ʀ$^{(H)}$ → ʁʁ$^{(H)}$ → ʁ$^{(H)}$ → ʁ̥ → ʁ̞ → w → o(:) → ɑ(:) → ə

This study treats 'quality' of rhotics such as 'pharyngealization' (cf. Figure 7.1a; and 7.1b) and 'frication' (cf. Figure 7.1a; and 7.1b; 7.2a; and 7.2b) as a phonation quality conditioned by prosodic factors such as the position in the prosodic word: 'strong' or 'weak'; or whether the rhotic sound is subject to coarticulatory processes that overlap with neighbouring sounds causing an allophonic or 'coloured' coarticulatory gesture(s). Word-initial position is considered 'strong position' whereby the identity and the quality of the rhotic sound is least affected by coarticulatory or assimilatory processes; and to some extent onset position (cf. §4.1, for more details). Intervocalic position gemination is also considered a strong position for rhotic phones whereby the 'quantity' and the 'quality' of rhotics is at its peak. However, word-final and coda positions are 'weak' positions where most lenition processes take place for rhotics, such as devoicing (§7.2.1.1-7.2.1.5, for more information), or vocalization (cf. §7.2.1.6, for more details); and in some cases also frication (cf. §7.2.1.3, for further explanations).

There are two positions in the literature in regards to 'pharyngealization'; one that regards pharyngealization as a floating prosodic feature supplemented by both the consonantal and vocalic systems; the second that treats pharyngealization as a segmental feature that occurs solely in words containing a pharyngealized sound (cf. §5.2.2; 5.2.4.1, for review). This study leans more towards the first view because pharyngealization in Mesopotamian Arabic, in general, and in JBBA in particular, seems to phonetically show a coarticulatory gesture, and backing effect on adjacent vowels similar to /q/ and /ʁ/; and phonologically patterns with /q/, /k/, /χ/ and /ʁ/ (ch. 5, for details). Moreover, pharyngealized rhotics in JBBA were found to not exhibit long-range pharyngealization, or labialization which occurs within the prosodic word (cf. §5.2.4.1, for details).

Retroflex rhotics in JBBA were found to have a fusion of a rhotic continuant approximant constriction and an ə-like element which causes sometimes an un-lowered F2; which makes a retroflex stand out from all of the other variants of rhotics in their F2 patterns (cf. §7.2.1.5). Articulatorily, Hamann (2003) demonstrates that the approximant retroflex shows no evidence for a forward coarticulatory tongue gesture during its closure unlike the other two types of retroflex rhotics: flap [ɽ] and trill [r̠]. In Dutch, for instance, retroflex approximants in coda alternates with fricatives and alveolar approximants; but a bunched approximant alternates with uvular trills (Scobbie and Sebregts 2010). In English, Scobbie (2006) shows that the schwa-like coda is acoustically similar to the vowel-retroflex sequences. In BP, Rennicke (2015) also demonstrates that retroflexes alternates with a centring diphthong; and that there is a 'link' between retroflex approximants and schwas. Thus, this is why the retroflex occupies the last cell in the lenition spectrum of the approximant coronal rhotic *opening* continuum (cf. Figure 7.1b). Retroflex rhotics still, however, show a lowered F3 similar to all other approximant variants; and a higher F1 value, which is their unifying factor with all rhotic variants.

The next part will present the articulatory and acoustic properties of rhotics in (Arabic) varieties in general from empirical evidence in JBBA.

7.2.1.1 Trills

Trills, articulatorily, are the most complex and vulnerable variants of rhotics. This complexity arises from the number of requirements needed for trills to be successfully constricted (cf. §2.2.1, for details). Crosslinguistic evidence on trilling shows that they require aerodynamic control, stiffness and positioning of the active articulator, i.e. the tongue, the right amount of air pressure, and repetitive closing and opening in the constriction of the air flow

(Ladefoged & Maddieson 1996; Solé 2002; Sebregts 2015: Rennicke 2015). Trills, both coronal (alveolar), and dorsal (uvular), are articulatorily characterized by an aerodynamic ‘vibration’ and *trilling pattern* (cf. §7.2.2, for details). Trilling is caused by a stiff placement of the tongue tip/blade against the alveolar ridge in the coronal-r; and of the tongue dorsum against the uvula in the case of dorsal-r restricting the air flow in a narrow aperture whereby the uvula vibrates.

Acoustically, trills are characterized by *repetitive closure phases* in their formant structure, similar to a formant structure in a ‘single closure phase’ to that of a ‘single tap’, as in Figure 7.3 below; which is the shortest trill token in this study. The arrows highlight the ‘closing phases’ and the ‘repetitive occlusions’ of a coronal trill.

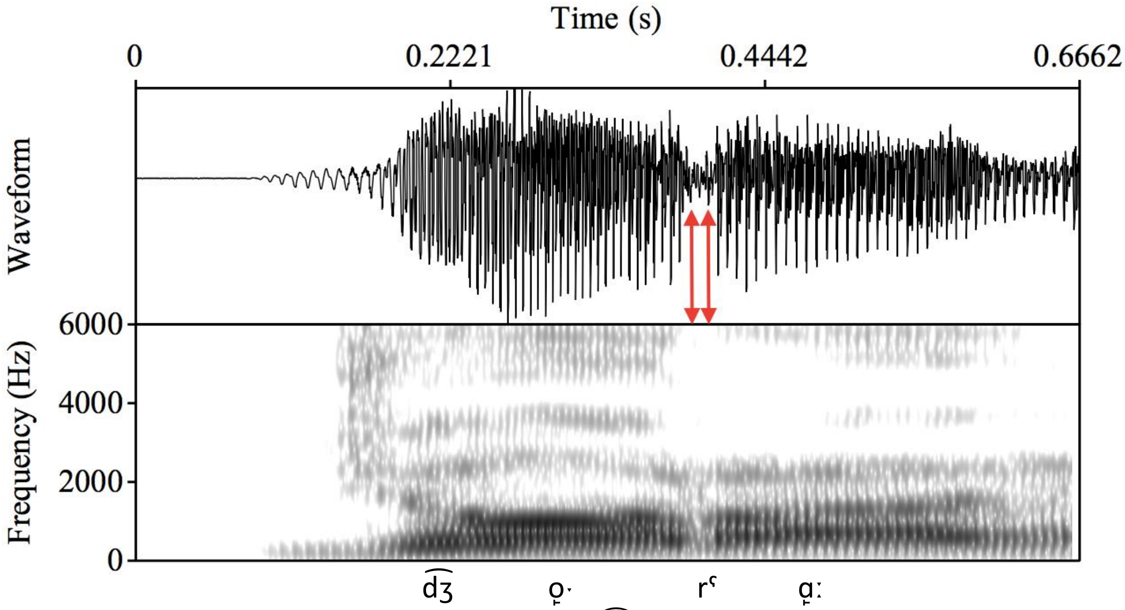


Figure 7.3[101]. Spectrogram & waveform of the word [d͡ʒo̞·rˤɑ̞ː] ‘handkerchief’ by (M5) with marked closure phases for CORONAL-TYPE trill (0.068242ms)

A dorsal trill in JBBA demonstrates also a similar formant structure, but was found to be longer in duration with way more ‘rapid’ and ‘condensed’ occlusions or closures as in Figure 7.4 below; compare the same word with coronal-r token in Figure 7.5. This can be explained by the narrower aperture at the back of the mouth where the uvula is; and the size of the uvula which exercises the vibration (see also Solé 2002, for more information and details). The third formant was found to be higher in uvular trills with average (+3000Hz)

[101] The arrows point to the closing and opening phases in the trill. This token is from my own data.

than in alveolar trills (+2100Hz). Both of these observations were also echoed in similar findings put forward by Lindau (1985); Sebregts (2015); and Rennicke (2015).

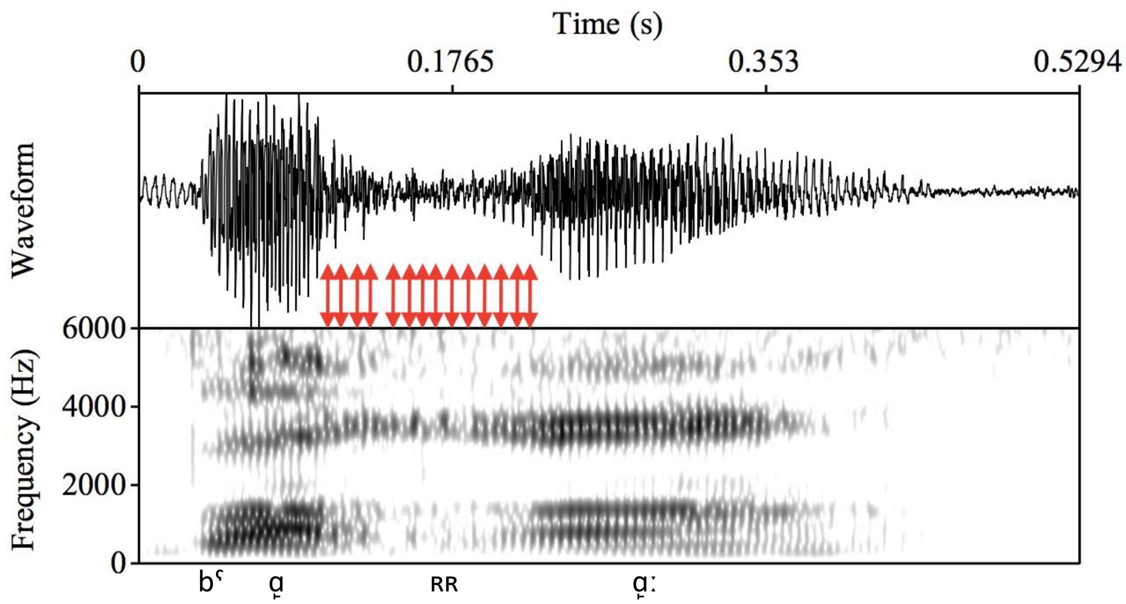


Figure 7.4[102]. Spectrogram & waveform of the word [bˤɑ̱ʀʀɑ̱ː] ‘outside’ by (F3) with marked closure phases for DORSAL-TYPE trill (0.127564ms)

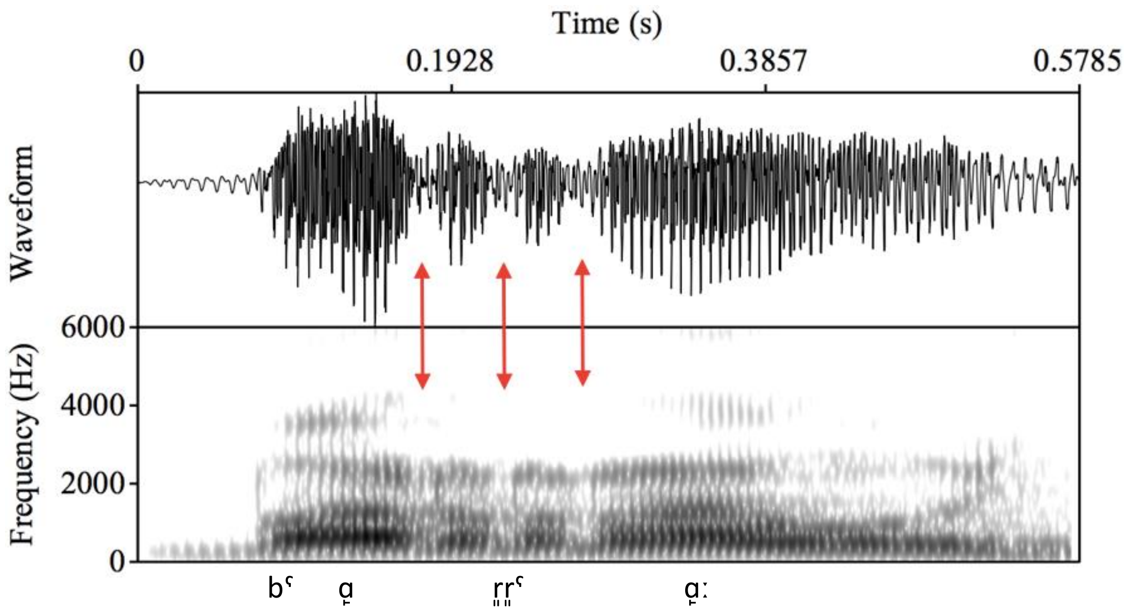


Figure 7.5[103]. Spectrogram & waveform of the word [bˤɑ̱r̤ˤr̤ˤɑ̱ː] ‘outside’ by (M5) with marked closure phases for CORONAL-TYPE trill (0.111398ms)

Trills, in general, prefer word-medial position. They are at their longest in duration in this position, as a geminate, as demonstrated in Figure 7.4 (0.127564ms), and Figure 7.5

[102] The arrows point to the rapid closing and opening phases in the trill. This token is from Timan’s data.
[103] The arrows point to the closing phases in the trill. This token is from my own data.

(0.111398ms) for the word [bˁɑ̞ʀʀɑ̞ː] ~ [bˁɑ̞r̤r̤ˁɑ̞ː] ‘outside’, respectively. The trill can range between 2 occlusions to over 11 occlusions; especially in dorsal (uvular) trills. The second longest in duration occurs when a lexical word-initial coronal rhotic trill assimilates to the definite article /l/, yielding instances similar to [ər.rʊ̞mmɑːn][104] ‘pomegranate’, [ər.ru.jal] ‘the royal’, [ər.rˁʉ̞sˁɑ̞ː.f̞ɑ] (area in Baghdad), [ər.rɑ̞ʃiːd] ‘Alrashid st.’, [ər.riːħ][105] ‘the wind’ in JBBA. See Figure 7.6 below for a demonstration of an intervocalic or lexical-word initial coronal rhotic trill assimilation in [ər.rʊ̞mmɑːn] ‘pomegranate’.[106]

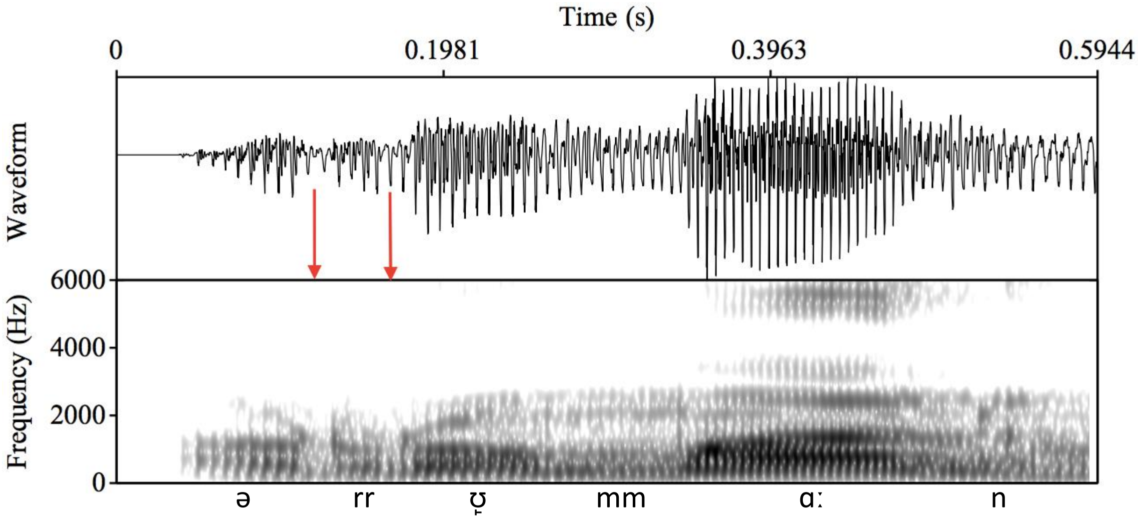


Figure 7.6[107]. Spectrogram & waveform of the word [ər.rʊ̞mmɑːn] ‘pomegranate’ by (M5) with marked closure phases for CORONAL-TYPE trill (0.083398ms)

A shorter type of trills also occurs in stressed onsets of the syllable shape [rɑ̞ ~ ʀɑ̞] as in [ʕɨ·rˁɑ̞ːqi̞ːjaː] ‘Iraqi’ F., or [əl-ʀɑ̞qqi] ‘water-melon’. In coda, there is a high probability for the trill to devoice[108], as in: [giːr̥] ‘stick shift’, [ħariːr̥] ‘silk’, or [əl-me̞nsˁʉ̞ːr̥] (area in Baghdad) (cf. §4.8 & 8.2.1.3 for further details on rhotic devoicing). The trill could also become a fricative in final consonant sequences with fricatives, as in [qʊ̞ʀᴴʃ] (unit of curreny) (cf. §7.2.1.3, for fricatives); or become partially devoiced or with weakened articulation, as in

[104] A more common tokens of this word is [ʁəmmɑːn] and [əl-ʁəmmɑːn].
[105] As a loanword from MSA in literary genre; otherwise the native word equivalent would be [əl-ʁiːħ] rarely used; or the more native and often used is [hawɑ] ‘wind’.
[106] Timan’s & own data.
[107] The arrows point to the closing phases.
[108] The diacritic of either down circle [̥] and up circle [̊] are used to indicate devoicing.

[əl-kɑ̟r̪χ] (area in Baghdad). Below in Figure 7.7 is a demonstration of /r/ in [giːr̥] ‘stick shift’.[109]

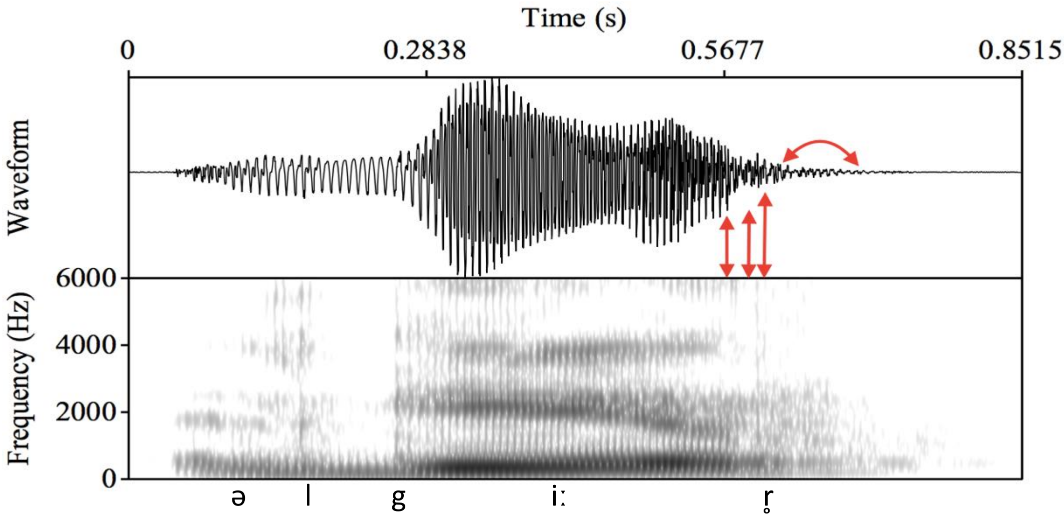


Figure 7.7[110]. Spectrogram & waveform of the word [giːr̥] ‘stick shift’ by (M5) with marked closure phases and ‘relative degree’ of devoicing towards the end of the word for CORONAL-TYPE trill (0.114611ms)

Coronal trills are predictable: (i) from a higher-level in the syntax-phonology interface, as in full assimilatory processes, such as the definite article particle [l] assimilation to word-initial rhotics, as in (17a), below; and (ii) in morphological templates in lexical word-medial gemination of the shape CVrrV(C)(V), as in (18a); or in lexical word-final postvocalic position gemination of the shape CVrr, as in (18b).

(17) Assimilation of the definite article particle [l-] to a CORONAL-TYPE trill (17a) & DORSAL-TYPE trill (17b); and lack of assimilation in *etymological-*ġ* in (17c)[111]

a. CORONAL-TYPE trill

[ərriħ]	‘the wind’	[ərrˤʉ̠sˤɑ̟ːf̪ɑ]	(an area in Baghdad)
[ərrujal]	‘the royal’	[ərrɑʃiːd]	(street name)

[109] Timan’s & own data.

[110] The three adjacent arrows point to the closing and opening phases, and the last arrow points to the extent of the trilling phase focusing on the waveform and the faint phonation towards the end of the word.

[111] Timan’s & Own data.

b. DORSAL-TYPE trill

[əl-ʀɑ̟qqi][112] 'water-melon'

c. *Etymological-ġ

[əl-ʁ̞ɑ̠ːbɑ] 'the forest' [əl-ʁ̞ɑ̠·məq] 'the dark (color)'

[əl-ʁ̞ɑ̠ːsəl] 'the washing' [əl-ʁ̞eːmae̞] 'the cloud' SG.

The previous set of examples exhibit the second longest instances of trilling phases (17a-b). It is also worth noting that coronal trills surface in loanwords in JBBA[113]. This is the case not only in JBBA, but also in all the varieties of Arabic with an underlying dorsal rhotic. The common tendency in JBBA, and in full assimilatory processes, is a dorsal fricative [ʁʁ] or approximant [ʁ̞ʁ̞] as 'geminate'. A dorsal trill [ʀʀ] is also plausible as an inter-speaker variant.

The longest types of trills in JBBA: (i) the morphological structure CVrrV(C)(V) that results in word-medial gemination, in (18a); and (ii) the shape CVrr that results in word-final postvocalic position gemination, as in (18c).

(18) Lexical word-medial gemination (18a-b); and Lexical word-final postvocalic gemination (18c) in JBBA[114]

a. CORONAL-TYPE trill

[bˤɑ̠rrˤɑ̠ː] 'outside (of Karrada)[115]' [hɑluma d͡ʒɑrrɑ̟ː] 'etc.'

[ətχɑ̟rrʌ̹d͡ʒ] 'he graduated' [mɑrrˤɑ̟ːt] 'sometimes'

[bɑ̟rrˤɑ̟ːd] 'air cooler' [χɑ̠rrˤɑ̠·b̚] ' he ruined'

b. DORSAL-TYPE trill

[bˤɑ̠ʀʀɑ̠ː] 'outside'[116]

---

[112] This token is subject to inter-speaker variation. The most common tokens for the realization of this word is [əʁʁ̞ɑ̟qqi̠] ~ [əl-ʁ̞ɑ̟qqi̠].

[113] Coronal trills surface in the Tigris subgroup varieties of Arabic in cases of loanwords and proper names (cf. 5.5.1, for more details).

[114] Timan's & Own data.

[115] An area in Baghdad.

[116] This token is subject to inter-speaker variation. The most common realization of this word is [bˤɑ̠ʁ̞ʁɑ̠ː].

c. Word-final CORONAL-TYPE trill gemination

[qɑ̰ʁʁ̞] ‘pumpkin’

Now after this presentation on the articulatory, acoustic and distribution of trills, the next part will take us through the phonetics and phonology of rhotic taps.

7.2.1.2 Taps

Trills are prone to simplification by *reducing* complexities on the aerodynamic and lingual configurations, and that in turn lead to two different outputs: one of which is the *continuation pattern* as we will see later in fricatives, approximants, retroflexes and vocalics; and another, which is the core of this part, that leads into involving a simpler *lingual control* leading to a *tapping pattern* (cf. §7.2.2, for further details). There are two variants of taps that occur in JBBA: one is coronal [ɾ]; and the other is dorsal [ʀ̆] which is an inter-speaker variable. The tongue tip/blade, the active articulator, is placed against the passive articulator, to cause a very quick contact with the alveolar ridge to produce what is known phonetically as a (coronal) tap [ɾ] (cf. Figure 7.8 below).

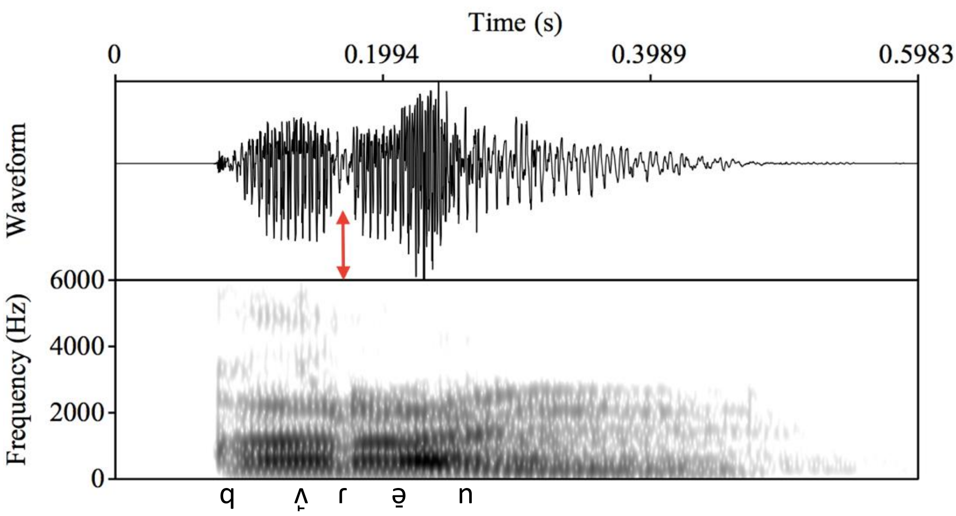


Figure 7.8[117]. Spectrogram & waveform of the word [qʌ̰ɾə̰n] ‘horn’ by (M5) with CORONAL-TYPE tap (0.017ms)

The dorsal tap [ʀ̆] is produced with a quick stroke by the back (dorsum) of the tongue against the back (closer to the uvula) of the roof of the mouth (cf. Figure 7.9 below). The

[117] The red arrow points to the closer phase for the tap in the waveform and in the spectrogram. Token from my own data.

term 'tap' and 'flap' are sometimes used interchangeably in the literature to describe the one contact of the tongue tip against the alveolar ridge, but there is a critical difference articulatorily between the two (cf. §2.2.2 for more details).

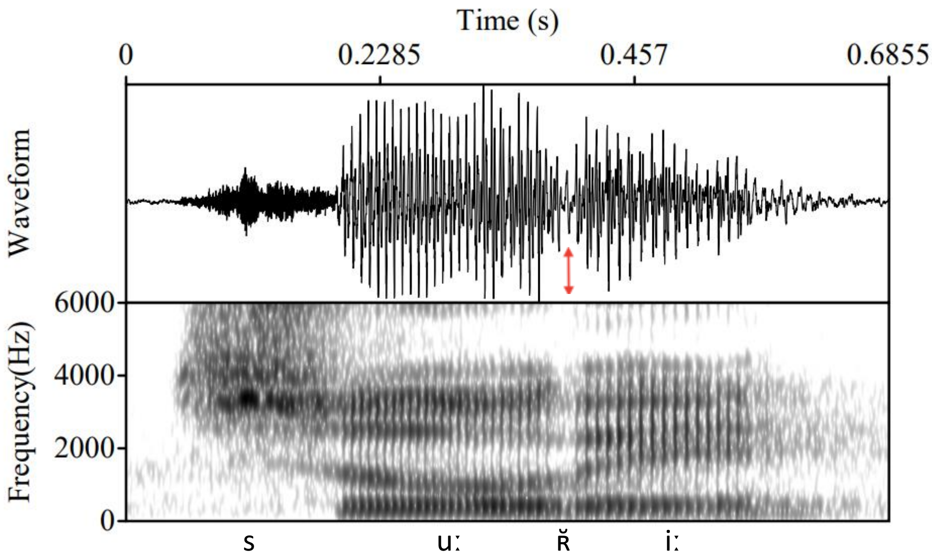


Figure 7.9[118]. Spectrogram & waveform of the word [suːʀ̆iː] 'Syrian' by (M7) with DORSAL-TYPE tap

Acoustically, taps are characterized by the appearance of a single *ballistic flick* cutting through all the main 3-5 formants – a stop-like closure or an empty/faint sound bar, or blank segment in the spectrogram (cf. Figure 7.8 & Figure 7.9). There is a long standing debate on whether a tap is in fact a short or single occlusion(s) of a trill. Sebregts (2015) for instance, is a proponent of the short trill explanation of a tap; and he suggests that the tap to be a lenited form of the trill in Dutch. On the other hand, however, Rennicke (2015) suggests that the tap and trill are fundamentally different acoustically: taps are constricted with a single 'ballistic flick gesture', while trills with a maintained and 'prolonged posture' (cf. Catford 1977; Barry 1997). There are also some interesting crosslinguistic and typological realizations. One is, since there is a crosslinguistic evidence for contrastive trill-tap in some languages of the world, e.g. many varieties of Spanish; there still no crosslinguistic evidence of contrasts between a tap and a single contact trill. This is on the same line with Sebregts (2015) argument. Another, which is acoustic, is that both show a stop-like formant structure on one occlusion (cf. Figures 7.3-7.9, above). Thus, both facts tell us that taps and trills must be very similar on the perceptual and auditory levels (cf. §2.2.1 & §2.2.2, for more details).

---

[118] The red arrow points to the closure phase in the tap in the spectrogram and in the waveform.

The distribution of the tap variants in JBBA is common; and can occupy different syllable shapes and positions. Taps in JBBA disfavour word-initial position, but can more often fill an intervocalic onset position, as in (19) below:

(19) Intervocalic onset position CORONAL-TYPE taps (19a); and DORSAL-TYPE taps (19b)[119]

a. CORONAL-TYPE taps

[əl-qṵːɾi] 'the teapot' [lo̠·ɾi][120] 'lorry' [χɑ̱ɾɐz] 'beads'

[fəɾən] 'oven' [dɑ̠ɾɑ̠g] 'glove box' [ʃɑːɾəʕ] 'street'

[tɐhᵊɾiːb] 'smuggle' [mɑ̝dɑːɾɪs] 'schools' [bˁɑ̠hɑ̠ːɾi] 'a shade of grey'

b. DORSAL-TYPE taps

[bɑ̠̝ʀ̆ɑ̠ːʔɑ̠] 'innocent' [tɑd͡ʒəʀ̆ibi] 'trial'

[ʕɑ̠bbˁɑ̠ːʀ̆ɑ̱] 'ferry' [ħəʀ̆iːjɑ] 'freedom'

There also quite less instances where the tap occupies a prevocalic onset position, as in (20):

(20) Prevocalic onset position CORONAL-DORSAL TYPE taps[121]

[ʁ̝ʊtɾˁɑ̠ː] 'male headscarf/head cover' [məzɾʌf] 'driller'

[kɑ̠hɾɑ̠bɑ̠] 'electricity' [ʕəbɾˁɑ̝ːni] ~ [ʕəbʀ̆ɑ̱ːni] 'Hebrew' Adj.

[ʔɪstəmɾɑ̝ːr] 'continuous'

Alveolar taps also occur as a second member towards the nucleus in initial consonant clusters of the type [tɾ̻-/tˁɾ-], as in (21):

(21) Initial consonant clusters [tɾ̻-/tˁɾ-] of CORONAL-TYPE taps[122]

[dɑkɑːtɾ̻ɐ] 'doctors' M.PL. [dɑkɑːtɾ̻ɑːt][123] 'doctors' F.PL.

[pɑ̠̃ntˁ̙ɾõ̠ːn][124] 'pants'

[119] Timan's & own data.

[120] Even in different conjugated forms such as [lo̠·ɾijeːn] 'two lorries', [lo̠·ɾijɑːtʰ] 'lorries' PL. the alveolar tap still remains intact.

[121] Timan's & own data.

[122] Timan's & own data.

[123] Also, [diktoːɾɑːt] 'doctors' F.PL.

[124] Taps are still maintained in these forms: [bˁɑ̠̃n.tˁ̙ɾõ̠.neːn] 'two pants' and [bˁɑ̠̃n.tˁ̙ɾõ̠.nɑ̱ːt] 'pants' M0: [p]

What seems to be the least favourable environment for taps in JBBA is the coda or word-final positions, as in (22).

(22) Coda or word-final CORONAL-TYPE taps (22a); and (22b) DORSAL-TYPE taps[125]

a. CORONAL-TYPE taps

[səɾ̥dɑːb] ‘basement’ [wɑɾ̥di·] ‘pink’

[tˤɛɾ̥ʃi] ‘pickles’

b. DORSAL-TYPE taps

[sɑ̱miːʀ̥̆] (proper name) [ʕəʃʃɑ̱ːʀ̆] ‘area in Basra’

Thus, we can see that devoicing in taps can occur in word-final or coda positions, and also in consonant sequences with voiceless sounds. Below is two examples of devoicing in taps, a CORONAL-TYPE tap (cf. Figure 7.10), as in [dɑkɑːtɾ̥ᴴɐ] ‘doctors’ M.PL.; and a DORSAL-TYPE tap (cf. Figure 7.11), as in [sɑ̱miːʀ̥̆] (proper name).

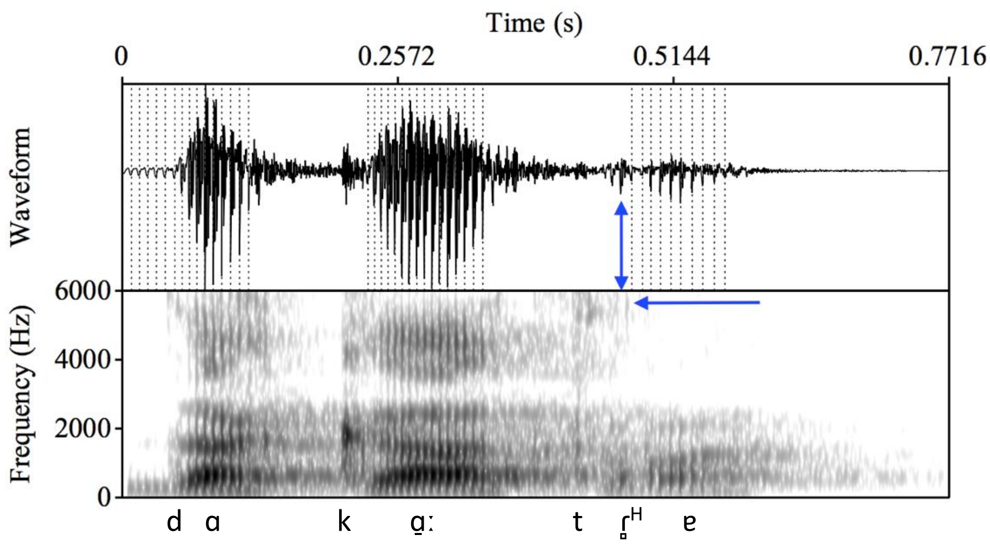


Figure 7.10[126]. Spectrogram & waveform of the word [dɑkɑːtɾ̥ᴴɐ] ‘doctors’ M.PL. by (M5) with CORONAL-TYPE tap-fricative (0.036ms)

[125] Timan’s & own data.

[126] The blue arrow pointing to the left shows the random energy, and the double-sided arrow shows the closure phase of the tap in the spectrogram and the waveform.

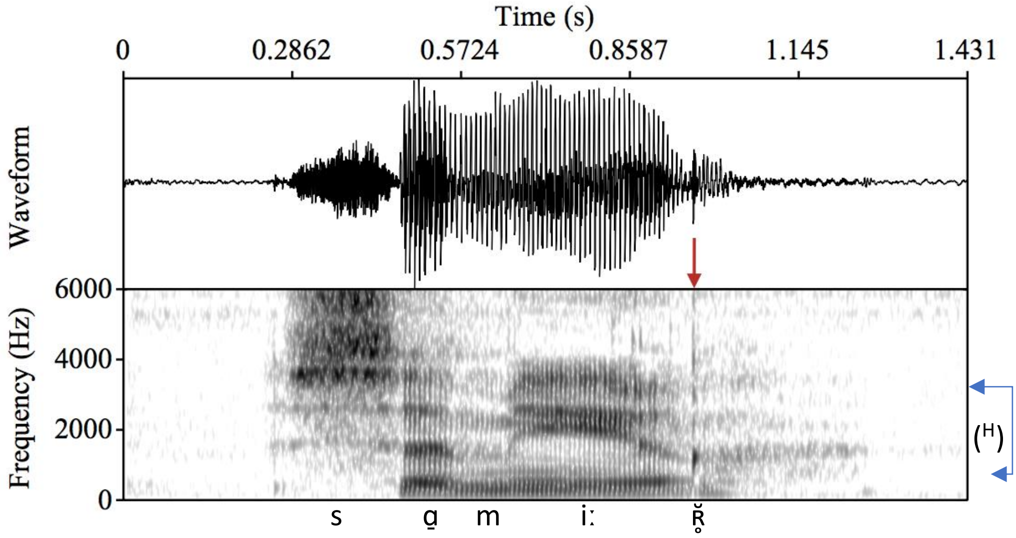


Figure 7.11.[127] Spectrogram & waveform of the word [sɑ̠miːʀ̥̆] (proper name) by (M7) with a DORSAL-TYPE tap

After this presentation on rhotic taps, the next part will synthesize the phonetics and phonology of fricative rhotics as they occur in JBBA.

7.2.1.3 Fricatives

If the requirements for a trill are not properly met, then trilling would turn into frication; this takes place due to more loose *opening* in the stricture where the tongue is placed resulting into a *continuant pattern*, fricative or approximant. In casual speech, then, trills are more prone to be simplified by reducing the complexity in their *aerodynamic-lingual control* leading to two different potential outputs. One of which results from failing to meet the complex aerodynamic requirements to lead to *opening* either frication or at end of the consonantal spectrum to approximation; and another would lead to *reduction* and simplifying the 'lingual gesture' towards a 'single tap' at the end of the continuum (cf. §7.2.2, for more details). Fricative[128] rhotics are produced with a turbulent airflow going through a narrow stricture in the vocal tract. Rhotics produced with fricative manner in JBBA can be alveolar or uvular. The frication in this stricture, either dorsal [ʀᴴ ~ ʁᴴ] (cf. Figure 7.12); or coronal [rᴴ ~ ɾᴴ ~ ɹᴴ] (cf. Figure 7.13), is shaped by where the active articulator is placed to narrow the flow of the air stream which causes this frication to take place resulting into a turbulent airflow.

[127] The red arrow points to the closure phase in the tap. The superscript (ᴴ) and the blue arrows point to the random energy after the tap release.

[128] A superscript uppercase [ᴴ] will be used throughout this study to indicate prominent frication for rhotics. In the dorsal continuant variants of rhotics, the cover symbol for the voiced uvular fricative [ʁ] signal frication in manner unless a subscript downtack is used [ʁ̞] to indicate approximation.

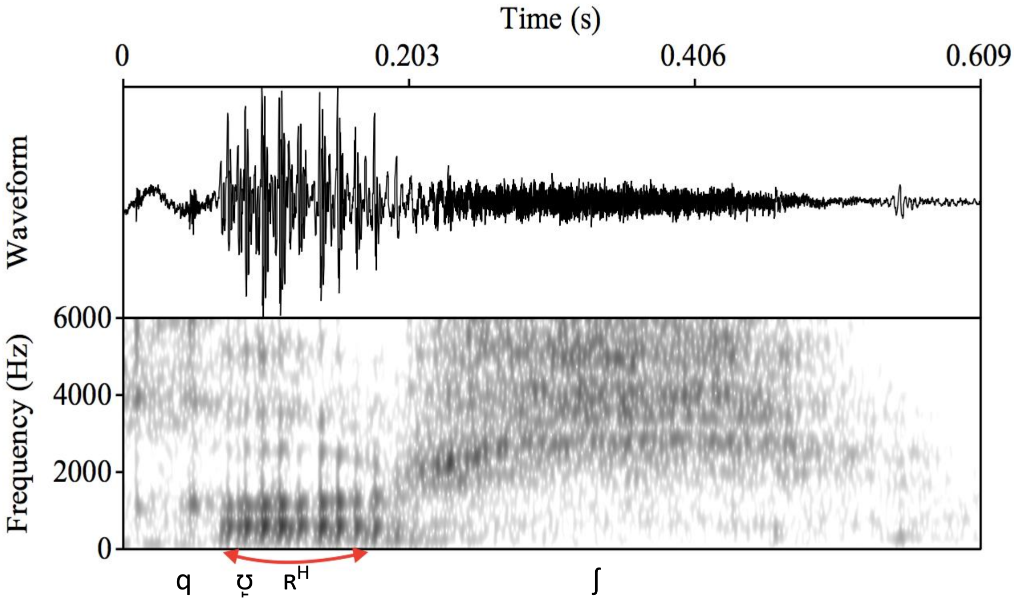


Figure 7.12[129]. Spectrogram & waveform of the word [qʊ̰ʁ^{H}ʃ] (unit of currency) by (F4) with DORSAL-TYPE trill (0.117519ms)

Fricative rhotics in JBBA are acoustically characterized by the presence of random energy distributed across a range of frequencies in the spectrograph corresponding to where the active articulator is placed against the roof of the mouth. This also mirrors similar findings on fricatives articulated in the literature by Ladefoged & Johnson (2011: 201 & 204). The random energy that shows in the spectrogram is a direct translation of the friction in the narrow *opening* in the stricture (cf. §7.2.2, for more details & figure 7.13).

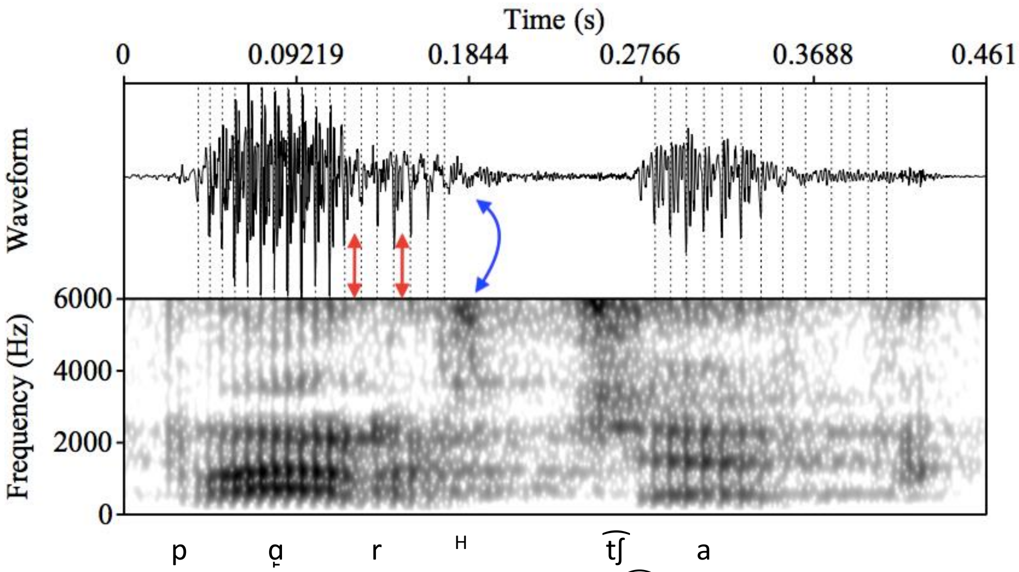


Figure 7.13[130]. Spectrogram & waveform of the word [pɑ̰r^{H}.t͡ʃa] 'brush' by (M5) with CORONAL-TYPE trill-fricative (0.117016ms)

[129] The red arrow shows the duration of the trilling phase intervening with the proceeding vowel where there also clearly a random energy along until the next consonant. Token from Timan's data.
[130] Blue arrow is used here to show 'random energy' in the spectrogram, and the less 'phonation' in the waveform; both were found to be correlated in detecting frication or devoicing for the latter. The red arrows show the closure phases in the spectrogram and the waveform. From my own corpus.

A very interesting observation we came across was that there is sometimes a loss of ‘pulses’ across voiceless fricatives, affricates, and aspirated (stop) consonants beside the presence of random energy for fricatives (cf. Figure 7.13, above). ‘Pulses’ rates are shown in the waveform as a vertical dotted line which corresponds to ‘voicing’ (cf. Figure 7.10 & 7.13). Thus, this study, then, suggests that ‘loss of pulses’ can be used as an instrumental tool in a spectrogram to aid in detecting frication in rhotics. That is, beside the random energy, there is a relative ‘loss of pulses’ in the wave signal as demonstrated in (Figure 7.10 & 7.13, above). Now, the crucial question that comes to mind is whether these occurrences are ‘genuine’ tokens of frication or this random energy is merely caused by ‘air pressure’ due to relative degrees of devoicing. We will discuss this below in more details.

‘Absolute’ fricative rhotics in JBBA occur more often in a word final or syllable final position, as in (23):

(23) Lexical or prosodic word final rhotic fricatives[131]

[əl-ˀʌhwɑːɹ̈^{H}]	‘in Iraq Marshes’
[giːɾ̞^{H}] or [giːr̥]	‘stick shift or gearbox’
[pɑ̝r^{H}.t͡ʃa]	‘brush’

Fricative rhotics can also occur as a second member of an initial and final consonant clusters as in (24):

(24) Fricative rhotics in initial and final consonant clusters[132]

a. CORONAL-TYPE fricative

[dɑkɑːtɾ̻^{H}ɐ]	‘doctors’ M.PL.
[ˌkɑ̠·ɾ̞.bʊ.haidɹ^{H}ɑ̠ːt]	‘carbohydrate’
[bæ̝.tɹ̻^{H}i̻]	‘battery’

b. DORSAL-TYPE fricative

[ʕɑ̝ʃʁ^{H} a̝wla̝ːd]	‘ten children’
[qʊ̝ʀ^{H}ʃ]	(unit of curreny)

[131] Timan’s & Own data.
[132] Timan’s & Own data.

The distribution of coronal fricative rhotics is way less common compared to dorsal fricative rhotics. Frication in dorsal rhotics [ʁ] is more common and is a benchmark in the lexicon of JBBA, but still less common than approximant dorsal rhotics [ʁ̞].

There sometimes also occur some ‘absolute’ dorsal fricative tokens in onsets similar to [mɛʁᴴɨ̞·] ‘mirror or car side-mirror’, [mɑħʁᴴo̞q̚] ‘burned’, or [ʔəz.ʁᴴɑ̞q] ‘blue’ that show some random energy on higher frequencies[133]. Bhat (1974) in his typological survey of ‘liquids’ reported such tendencies about rhotic ‘spirantisation’ of a historical rhotic in word final position that alternate with trills in many languages (cf. §2.2.3, for details). Thus, this does not seem unreasonable that there is, in fact, a connection between trill devoicing and frication - as both have higher random energy in word-syllable final positions. However, devoicing was found to have or show much less ‘intensity’ as a phonation property in the waveform; and/or ‘air pressure’ as an aerodynamic property in the waveform and the spectrograph (cf. Figure 7.7, for devoiced trill; Figure 7.12 & 7.13, for fricative trill).

Geminate dorsal fricative-approximant rhotics [ʁʁ ~ ʁ̞ʁ̞ ~ ʁʁ̞ ~ ʁ̞ʁ] occur in: word-initial, as in etymological-*r* assimilation to the definite article particle [l-]; word-medial and word-final positions with different syllable shapes and positions, as in (25):

(25) Geminate dorsal fricative-approximant rhotics[134]

[əʁʁ̞əd͡ʒɑːl]	‘the man’	[əʁʁ̞iħi]	‘the smell’
[mʊʁʁ̞ɑ̞ː]	‘bitter’	[əʁʁ̞eħɑ·n]	‘the basil’
[sˤʌʁʁɑ̞ː] ~ [ˀəsˤsˤʊʁʁɑ̞ː]	‘(exterior) stomach’	[ˀəl-d͡ʒɑʁʁɑ̞ː]	‘clay jar/ bottle’
[kəʁ̞ʁ̞ɑ̞ːdɑ̞]	(an area in Baghdad)	[ˀəl-fɑʁʁoːd͡ʒ]	‘chicklet’
[fɑʁ̞ʁ̞]	‘he poured/served food’		
[ħɑ̞ʁ̞ʁ̞]	‘hot’ n.	[əsˤfɑʁ̞ʁ̞]	‘he went pale’
[d͡ʒɑʁ̞ʁ̞]	‘pull’	[qɑ̞ʁ̞ʁ̞]	‘pumpkin’

It was found that the quality of the dorsal rhotic here can occur as a fricative or approximant; or a combination of fused manner of both; in the intra-speaker and inter-speaker levels. We could not establish whether this can be conditioned by phonological

133 Own data.
134 Timan’s & own data.

environment where both tokens could occur, which suggests that this is merely subject to articulatory selection and/or possibility. Below in Figure 7.14 is a demonstration of the word [bˤɑ̠ʁʁ̞ɑ̠ː] 'outside'.

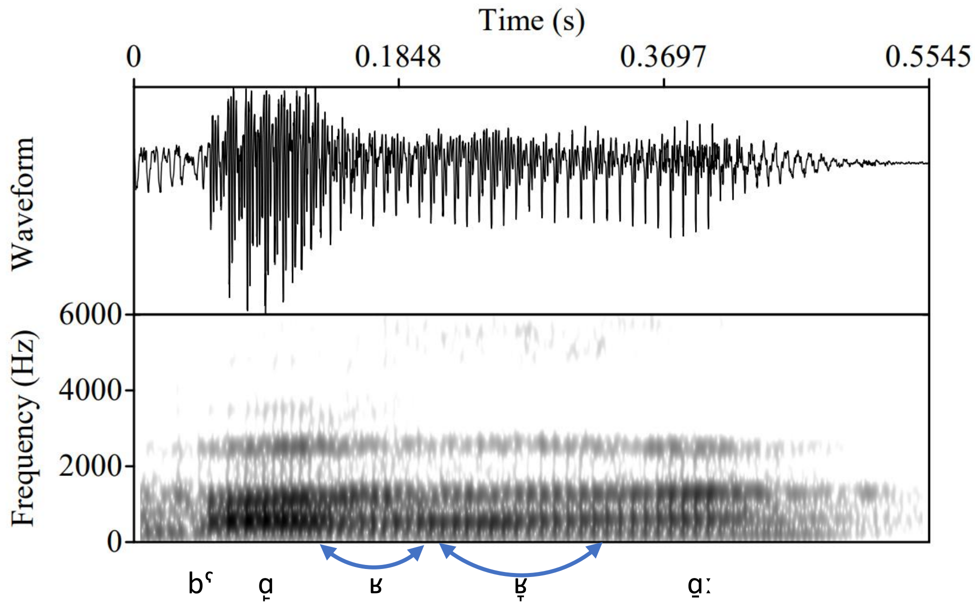


Figure 7.14[135]. Spectrogram & waveform of the word [bˤɑ̠ʁʁ̞ɑ̠ː] 'outside' by (M5) with DORSAL-TYPE fricative-approximant (0.203453ms)

Now after this presentation on rhotic fricatives, the next part will be on rhotic approximants which is also, similar to rhotic fricatives, is part of the *continuation pattern*.

7.2.1.4 Approximants

Another rhotic variant that falls into the *continuation pattern* continuum are the approximant[136] rhotics. Crosslinguistically, approximant rhotics are phonetically diverse because of their almost vowel-like nature which gives approximants a wider spectrum for phonetic variability (cf. §2.2.4, for details). Approximants require less *aerodynamic-lingual control* compared to fricatives and trills, respectively (§7.2.2, for details).

Articulatorily, approximants are characterized by incomplete constriction in the oral cavity which in turn may cause very little to no turbulent airflow. This takes place in the coronal (post) alveolar or dorsal (uvular) point of articulations - whereby the tongue tip or blade is narrowing near the (post) alveolar to produce [ɹ], the tongue tip or body curved

---

[135] The blue arrows used to show the adjacent consonantal phases. Token from my own data.
[136] This study uses the following phonetic notation for rhotic approximants: [ɹ] for an alveolar approximant, and [ɻ] for a retroflex approximant, and [ʁ̞] for uvular approximants.

backwords causing retroflexion [ɻ], or the tongue back is approximating the uvula to produce [ʁ̞].

Acoustically, what unifies approximant rhotics is their vowel-like formant structure, (cf. Figure 7.15, below) which is attributed to relative *opening* and *wide stricture* approximants enjoy, that show prominent formant shapes (cf. §2.2.4; and §7.2.2, for details). However, what makes approximants different from vowels is that they show a bit less 'intensity' in the waveform compared to vowels (see Rennicke 2015: 34, as well). On the same line, approximant rhotics can be distinguished from fricative rhotics in that approximants show less to no turbulent airstream in the spectrogram than fricatives. This study also reiterates that in JBBA a low F3 is in an indication of an approximant articulation, including retroflexes (cf. §7.2.1.5, for more details). They all show similar effects on F3, as it has been reported in many studies in the literature (cf. Lindau 1985; Ladefoged & Maddieson 1996; Rennicke 2015; and Sebregts 2015).

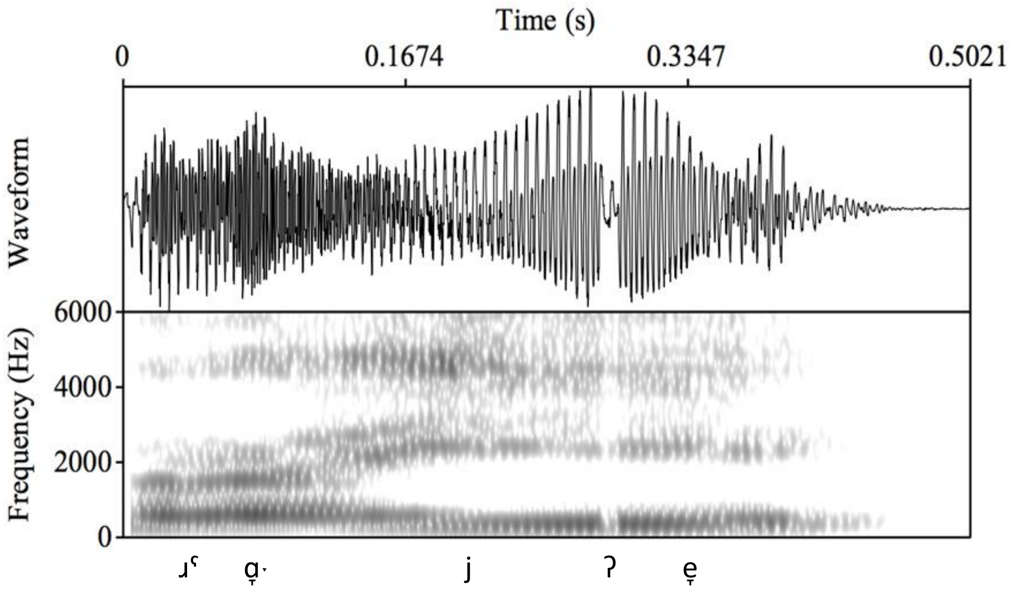


Figure 7.15. Spectrogram & waveform of the word [ɹˤɑ̞jʔe̞] 'my opinion' by (M6) with CORONAL-TYPE approximant (0.092383ms)

The distribution of approximant rhotics, both coronal and dorsal, is widely established in the lexicon of JBBA in this study. An approximant rhotic is also the most frequent realization in the coronal and dorsal categories; especially 'coronal' approximants in coda. Approximants are more common than fricatives on the *continuation pattern* (cf. §7.2.2, for details). This is why they exhibit more elaborate variants. The most frequent variant of approximants is the uvular approximant [ʁ̞] (cf. Figure 7.16, below); which is 'hypothetically' the dominant variant of the DORSAL-TYPE rhotics; and it occurs in all syllable positions by default, as in (26):

(26) DORSAL-TYPE rhotic approximant[137]

[ʁ̞əzz]	'rice'	[ʁ̞ʌbbʌk]	'your God' 2SGM.
[ᵊmqʌʁ̞mʊz]	'crimson'	[mɑ̞ʁ̞ɑ̞ː]	'woman'
[ʁe̞ʁ̞ we̞ħəd]	'someone else'	[χœ̞ʁ̞̊bˤɐ̞ːn]	'malfunctioned'

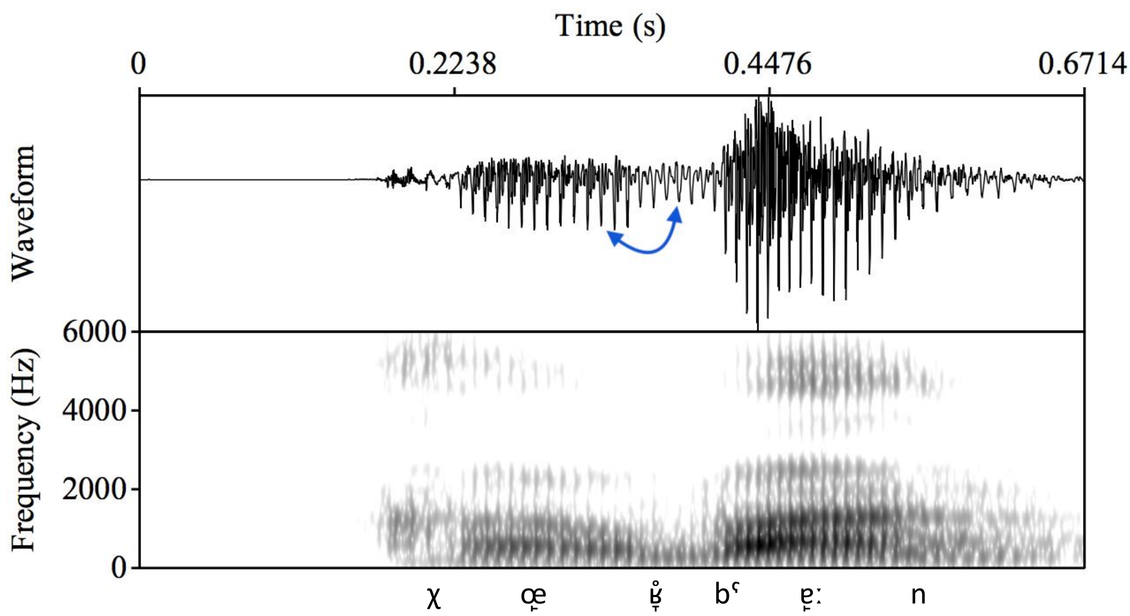


Figure 7.16. Spectrogram & waveform of the word [χœ̞ʁ̞̊bˤɐ̞ːn] 'malfunctioned' by (M5) with DORSAL-TYPE approximant (0.075510ms)[138]

The CORONAL-TYPE approximants: the alveolar [ɹ] can occur word-initial, as in [ɹəħnɑ] 'we went', or onset[139] as in [gaw.ɹɑ̞·g] 'toasted bread', [ʔɨɹˤɑ̞·d] 'details, lit. import', [bɑ̞qe̞ɹˤɑ̞̊ː ʰ] 'cow', [masˤɹiː] 'Masri' (proper name), or word-medial as geminate in [mɑ̞ɹˤɹˤɑ̞ːt̚] 'sometimes'.[140] However, alveolar approximants were found to favour a word-final or coda positions, as in (27):

[137] Timan's & own data.

[138] The arrow to show a relative degree of less phonation in the waveform for the dorsal approximant. The token from my own corpus.

[139] Or intervocalic, as in [ʔɨɹˤɑ̞·d] 'details, lit. import', or [bɑ̞qe̞ɹˤɑ̞̊ːʰ] 'cow'.

[140] Timan's & own data.

(27) CORONAL-TYPE rhotic approximant[141]

[ʁ̞ẹːɹ][142] 'different' [tɑijəɹ] 'tire/tyre'

[ʔənnɑ̞·ɹ] 'fire'

DORSAL-TYPE approximant-fricatives can also occur as geminates; and in fusion with either combination [ʁʁ ~ ʁ̞ʁ̞ ~ ʁʁ̞ ~ ʁ̞ʁ], in word-initial, as in etymological-*r* assimilation to the definite article particle [l-]; word-medial; and word-final positions with different syllable shapes and positions, as in (28):

(28) Geminate dorsal fricative-approximant rhotics[143]

[əʁʁ̞sˤɑ̠ːsˤɨ]	'the grey colour'	[ħɑ̠ʁ̞ʁ̞]	'hot' n.	[bˤɑ̠ʁʁ̞ɑ̠ː]	'outside'
[əʁʁ̞ɑ̞qqi̠]	'water-melon'	[d͡ʒɑʁ̞ʁ]	'pull'	[ˀəl-fɑʁʁoːd͡ʒ]	'chicklet'

This was a brief synthesis on rhotic approximants in JBBA. The next section will present the phonetics and phonology of rhotic retroflexes, which also, similar to fricatives and approximants, is part of the *continuation pattern*.

7.2.1.5 Retroflexes

Another rhotic variant which is part of the *continuation pattern* continuum are the retroflex rhotics. Retroflex rhotics in JBBA were found to have a coarticulatory gesture, or a fusion of a rhotic continuant approximant constriction, and an ə-like element which causes sometimes an un-lowered F2. This makes retroflexes stand out from all of the other variants of rhotics; as they all, including vocalic rhotics, have a lowered F2. Retroflex rhotics still, however, show a lowered F3 which unifies retroflexes and approximants; and is similar to all the other approximant variants.

Retroflex rhotics are quite rare in JBBA. Articulatory, a retroflex rhotic is produced by approximating the tongue tip/body to the 'palatal' region without proper constriction to cause occlusion, or to cause a turbulent airflow by *narrowing;* and then the tongue is curved/curled partially backward in a secondary gesture (cf. §2.2.5, for more details).

[141] Timan's & own data.

[142] More often realized as [ʁ̞ẹːʁ̞] we just came across this token in one speaker (M6).

[143] Timan's & Own data.

Acoustically, retroflexes show a vowel-like formant structure and a lowered F3; which both can be attributed to relative *opening* and *wide stricture* (cf. §7.2.2, for details). Retroflexes were also found to show less 'intensity' in the waveform than vocalic rhotics and approximants (cf. Figure 7.17).

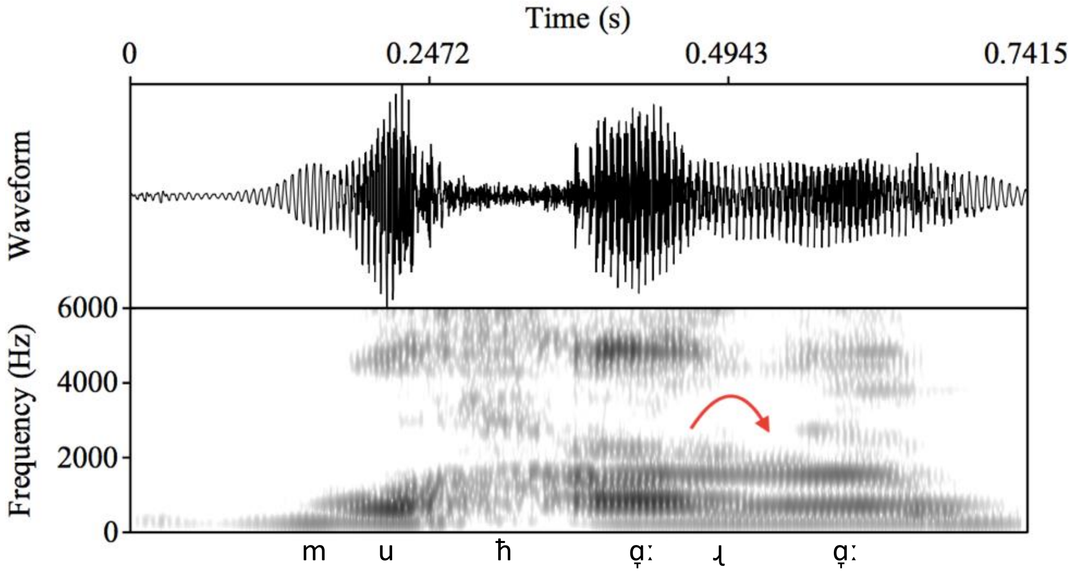


Figure 7.17. Spectrogram & waveform of the word [ħɑ̩ːɻɑ̩ː] 'neighbourhood' by (M6) with CORONAL-TYPE retroflex (0.070909ms)[144]

Retroflexes in JBBA are also subject to inter-speaker variation. These tokens were found amongst speakers of JBBA with early sequential bilingualism in English; thus we cannot role out the possibility of interference between the second language and first language rhotic phonology in the speaker's grammar. This can be exemplified also by recently borrowed lexical items from English, as in [əl-əstḛːɻə̰n] 'steering wheel'. Distribution again is very rare and can be outlined as follows. The retroflex approximant [ɻ] seems to prefer syllable coda, as in: [əl-əs.tḛːɻ.ən] or [ᵊstḛːɻ.ə̰n] 'steering wheel', or in broken consonant sequences with an epenthetic-ə as [ᵊɻsˤɑ̩ːsˤi·] 'grey', and the least preferred environment in onset as in [ħɑ̩ːɻɑ̩ː] 'neighbourhood'.[145]

Thus, this was a brief presentation on rhotic retroflexes in JBBA. The next section will take us through the phonetics and phonology of vocalized rhotics, which occupies the end of the *continuation pattern* continuum of rhotics.

[144] The arrow in the spectrograph to show the lowering of the 3rd formant in the retroflex [ɻ]. Token from my own data.
[145] All the examples in this paragraph from my own data.

7.2.1.6 Vocalized Rhotics

The labialized dorsal approximant glide [w] can be assumed to be historical 'linker' between the dorsal rhotic approximant consonant [ʁ̞] in an intermediate stage in the sound chain chronology that leads to rhotic vowels. This still, however, is a 'hypothesis', as the pieces of evidence used to support this argument are rare; and is based on historical sound correspondences, reconstruction, and observations on analogous crosslinguistic tendencies. For instance, Blanc (1964: 22) states that in an example like the JBA /bəʁqaːn/ 'pitchers', and the CBA or JBA /fəʁħaːn/ 'glad' there is no audible 'velar' constriction in the dorsal-r, and in turn can be perceived as close to a [w]. Similarly, recent studies such as that of Youssef (2019) had reported that in words like [fuʁħaːn] 'happy', [quʁuːn] 'horns', or [ʔakbaʁ kaðða:b] 'biggest liar' the dorsal rhotic [ʁ] can be perceived with little to no audible 'velar' constriction; which he attributes to influence from adjacent /uː/, /ħ/, and /k/ sounds.

Putting these pieces of evidence together with the empirical tokens we have, we can suggest that the approximant glide [w] seems to be an intermediate stage in the process of lenition and vocalization or *opening* sonorization between the dorsal rhotic approximant consonant and rhotic vowels; and this can be supported by historical reports on word fossils. For instance, Blanc (1964) proposes that the instances of dorsal-r realizations as the vowel [oː] are a result of the nucleus development that occurred in the coronal-r. He suggests this chronology of the root **arb* > *aġb* > *awb* > *ōb* from the OA root for the lexical word 'four' and 'Wednesday'; and their derivatives.

It is worth noting that vocalization as a phonological process is a 'natural speech' phenomenon; which is different but still connected and historically contributed to the rise of vocalization as a historical sound change in instances, such as: [qo̞ːsˤɑ̞·] 'flat bread' or [əl-boːħi ~ boːħi] 'yesterday'. Vocalization as a historical sound change is not subject anymore to alternation with another token with a dorsal rhotic approximant consonant [ʁ̞] even in citation speech, as in */qoʁsˤɑ/ 'flat bread' or */l-boʁħi ~ boʁħi/ 'yesterday'. Vocalization as a phonological process in instances, such as: /fəʁħɑːn/ 'happy', /jəʁoːħ/ 'go to' 3SG.M, /qɑd-ɑʁwi/ 'I was illustrating' are subject to gradient differences in the degree or quality of vocalization, or the lack of vocalization, and are also subject to inter-speaker and intra-speaker variation. Youssef (2019) echoes similar findings on his study of CBA and Maṣlāwī where he shows that vocalization is connected to 'speech rate', and that in careful speech it does not occur.[146]

At the end of the *continuation pattern* continuum of rhotics, the approximant glide [w] and then the vocalized variants of rhotics fall at the articulatory simplex of the aerodynamic control characterized by *narrowing* in the case of [w]; or *unrestrictive airflow* and more *opening* in the case of [ɑ̙ː], [ə̙], and [o̙ː], respectively (cf. §7.2.2, for more details). There is crosslinguistic evidence that shows laterals and rhotics vocalization to occur in postvocalic and syllable coda positions (cf. §4.6 for more details). Vocalic outputs that fill, and phonetically correspond to, a rhotic sound position, however, are crosslinguistically quite rare and occur in less than one percent in the languages of the world (Maddieson 1984) (cf. §2.2.6.1, for more information). In JBBA, vocalic variants are [o̙ː], [ɑ̙ː], and [ə̙]; and a labialized dorsal approximant glide [w]; which all show relative degree of different lengths as a result of compensatory lengthening to counteract the consonantal dorsal-r fusion, mainly in syllable coda position (cf. ch. 8, on the phonology of rhotic vocalization).

Vocalization seems to be gradient, and so it 'hypothetically' takes place in different intervening stages: into [w]-gliding, /uʁ ~ ʊʁ ~ oʁ ~ ɑʁ ~ əʁ /ʁə ~ ʁo/ → [ɑ̙w ~ ə̙w ~ w]; or in later stages whereby the adjacent vocalic segment to the fused rhotic is compensatory lengthened [o̙ː/ɑ̙ː]; or in further later stage where the fused rhotic can be retrieved from the retraction of the neighbouring centralized vowel [ə̙], thus, we propose this chronology /uʁ ~ ʊʁ ~ oʁ ~ ɑʁ ~ əʁ /ʁə ~ ʁo/ → [ɑ̙w ~ ə̙w ~ w] → [o̙ː/ɑ̙ː] → [ə̙]. The frequency of the vocalic variants of rhotics is very rare in the data corpus of JBBA.

Articulatorily, the labialized dorsal approximant glide [w] is characterized by the tongue dorsum being positioned close to or approximating the soft palate 'the velum' or further back by *narrowing*; or briefly restricting the airstream; but there is no complete lingual construction. The mid back rounded vowel [oː] is characterized by the tongue dorsum being positioned with midpoint height towards the roof of the mouth at the back of the oral cavity, with sometimes further retraction [o̙ː]; and with cooccurring modest rounding of the lips. The vocalized open back unrounded [ɑː] is characterized by the tongue being positioned back with further retraction [ɑ̙ː]; and the tongue is relaxed far 'open′ from the roof of the mouth. The mid central vowel [ə] is characterized by the tongue being

[146] All the tokens in this paragraph are from Timan's & own data.

relaxed and positioned in central position in the oral cavity, but further retracted [ə̠] towards the back. Thus, categorically, all vocalic rhotic variants fall under the DORSAL-TYPE rhotic variants due to their consistent retraction, i.e. cooccurring lowering and backing gesture. Vocalic rhotics require the least aerodynamic-lingual control compared to the other variants of rhotics and characterized by *opening* and *wide stricture* (cf. §7.2.2, for further details).

Acoustically, [w] show a vowel-like formant structure with less 'intensity' in the waveform than rhotic vowels; but more than rhotic approximant and retroflex consonants (cf. Figure 7.18 below). The vocalic rhotic variants [o̠ː], [ɑ̠ː], and [ə̠] show a prominent formant structure (cf. Figure 7.19 below) which can be ascribed to the *opening* and *wide(r) stricture* in the oral cavity (cf. §7.2.2, for details). In the waveform, they show more 'intensity' than any other variant of rhotics (cf. Figure 7.19 below). Their formant structure shows a converging, sometimes almost conflating, F1 and F2, with F2 being extremely lowered towards F1 in value (cf. Figure 7.19 below).

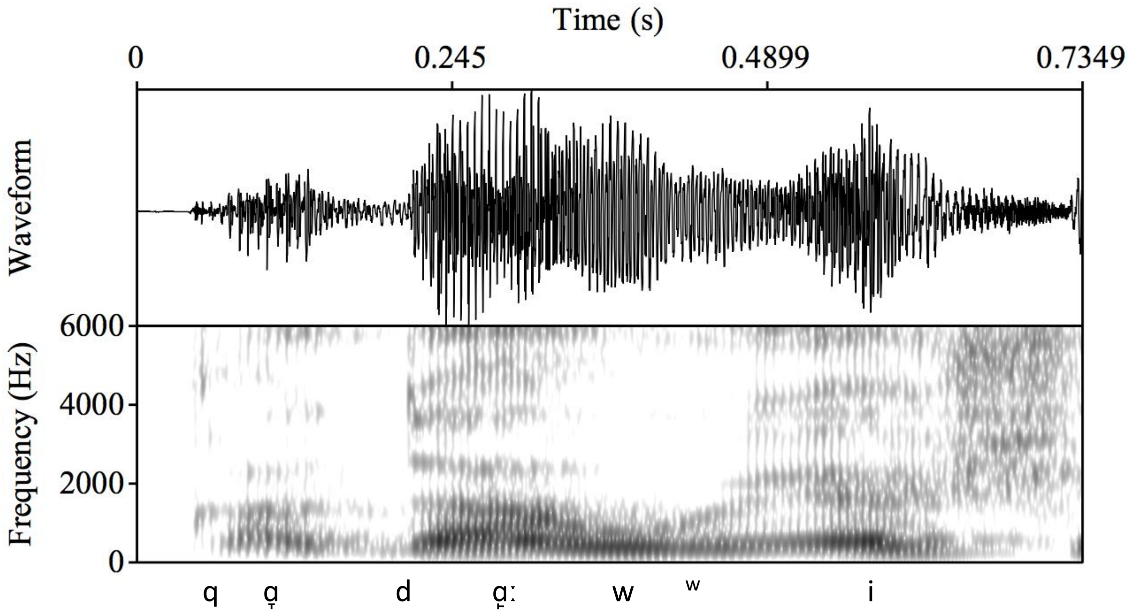


Figure 7.18[147]. Spectrogram & waveform of the word [qq̣d-ɑ̠ːwʷi] 'I was illustrating' by (M3) with a DORSAL-TYPE glide approximant

[147] Timan's data.

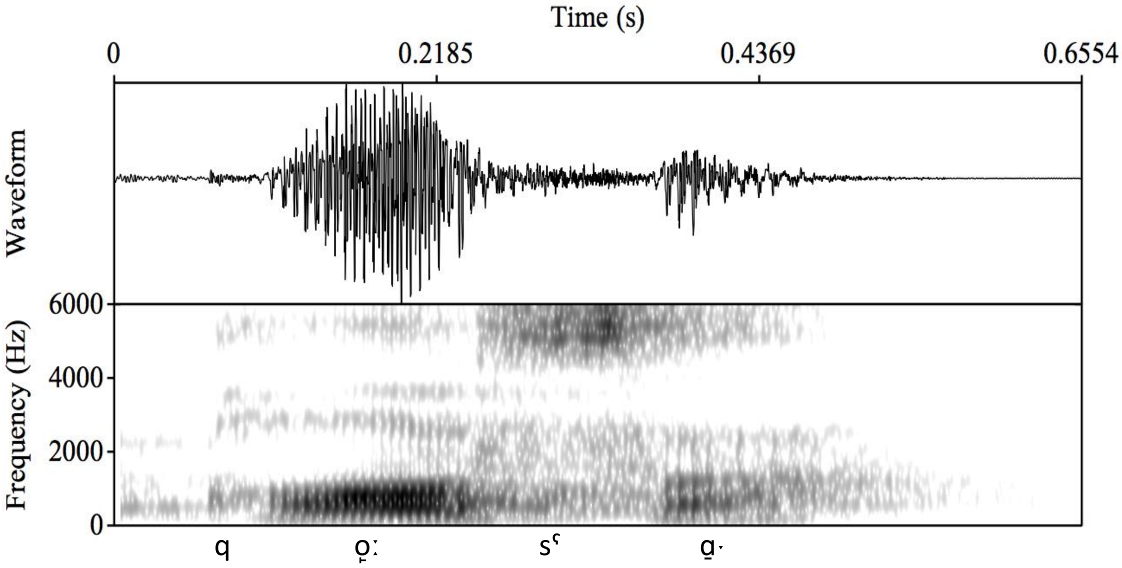


Figure 7.19[148]. Spectrogram & waveform of the word [qo̞ːsˤɑ̞·] 'flat bread' by (M5) with a DORSAL-TYPE rhotic vowel

The distribution of the vocalic variants [o̞ː], [ɑ̞ː], and [ə̞]; and the labialized dorsal approximant glide [w] in JBBA is more common in syllable coda position, as in (29):

(29) Vocalized DORSAL-TYPE rhotics in coda[149]

[fə̞ʷʁ̞.ħɑ̞ːn] ~ [fə̞w.ħɑ̞ːn]	'happy or glad'	[qo̞ːsˤɑ̞·]	'flat bread'
[mˤœ̞ʕo̞ːfiːn]	'(they) are well-known'	[ᵊjoħoːn]	'they go' 3.PL
[əl-boːħi ~ boːħi]	'yesterday'		

Rhotic vowels can also occur in word-initial or onset position, but still in most tokens is out of an underlying true coda position /aʁ ~ ʁə ~ ʁo/ → [o̞ː/ɑ̞ː/ə̞] , as in (30):

(30) Vocalized DORSAL-TYPE rhotics in underlying true coda position[150]

[mˤɑ̞·ʕʁə̞f]	'I don't know'	[ᵊjəo̞ːħ]	'go to' 3.SG.M,
[nœʕə̞f]	'we know'		
[qɑ̞d-ɑ̞ːwʷi]	'I was illustrating'		

[148] My own data.
[149] Timan's & Own data.
[150] Timan's & Own data.

Below in Figure 7.20 is an example of the word [nœʕə̠f] ‘we know’ with a centralized retracted schwa caused by the rhotic.

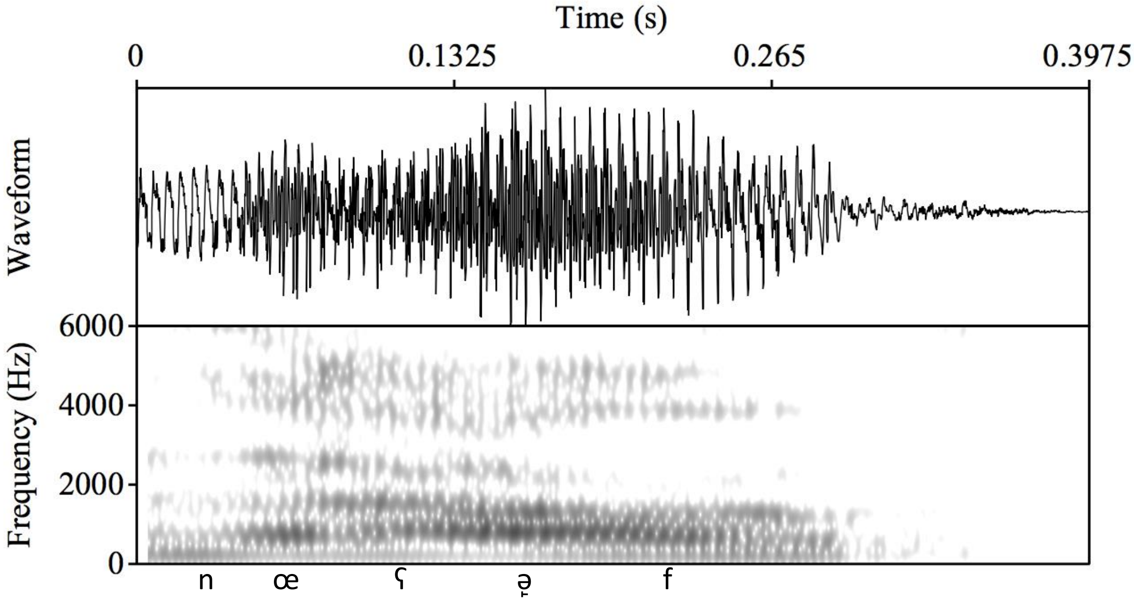


Figure 7.20[151]. Spectrogram & waveform of the word [nœʕə̠f] ‘we know’ by (M6) with a DORSAL-TYPE rhotic vowel

This section presented the phonetics and phonology of vocalized rhotics in JBBA. The next part of this chapter will present whether rhotics can form a cluster with other consonants; and if that is the case, how rhotics, then, behave in consonant sequences in JBBA.

7.2.1.7 Rhotic Clusters

Rhotics in JBBA form clusters in initial (CC-) and final syllable positions (-CC) (Tables 7.3 & 7.4, below). In initial consonant sequences, rhotics almost always come as a second member to the right towards the nucleus. If the rhotic is word initial and first member in a cluster, which is limited to two tokens [ᵊɹ̠.sˤ-] and [ᵊʁ.m-], the sequences are broken with an epenthetic schwa. The most common consonants that cluster with a rhotic in syllable initial position are stops including: [b, t, d, tˤ, q, m]. The least common are the affricates [d͡ʒ] and [t͡ʃ]. There also one token with a voiceless pharyngealized alveolar fricative [sˤ] next to a rhotic in word initial position. Below in Tables 7.3 are some examples for syllable-initial or word-initial rhotic consonant clusters.

[151] My own data.

Table 7.3 Initial consonant clusters with rhotics[152]

Word	Cluster Shape	Gloss
[kæbretɐɹ̥]	br-	‘car carburettor’
[jə-tmə̠ʁ̞ʌ̠ʕʌ̠l bə-tʁɑ̠ːb-u̠ː]	tʁ-	‘he rolled over dirt’
[tʁɑːb]	tʁ-	‘dirt’
[dʁ̞ɑ̠·biːŋ̩]	dʁ-	‘paths/ways Lit:. alleys’
[tˤrʌmbɑ̠ː]	tˤr-	‘water pump’
[bætɹ̥i]	tɹ̥-	‘battery’
[bˤɑ̠̃n.t̠ˤrõ̠ːn]	t̠ˤr-	‘pants’
[qʁ̞o̠ːn]	qʁ̞-	‘horns’
[qʁ̞ə̠nfəl]	qʁ̞-	‘clove’
[ᵊɹ̥sˤɑ̠ːsˤi·]	ɹ̥sˤ-	‘grey’
[ᵊʁ̞sˤɑːsˤi]	ʁ̞sˤ-	‘grey’
[χɑʁ̞ɑː bʁ̞̥o̠ːħu labuːk]	bʁ̞-	‘fuck off’
[d͡ʒʁɑ·dəq]	d͡ʒʁ-	‘a type of papadum’
[ᵊd͡ʒʁede]	d͡ʒʁ-	‘rat’
[ᵊʁ̞mɑ̠ːd ᵊb-ʁ̞ɑ̠ːsɑk̠]	ʁm-	‘ash on your head’
[ᵊmʁɑ̠·w.wəd]	mʁ-	‘earrings’
[pʌn.t͡ʃᵊɹeːn]	-t͡ʃᵊɹ	‘two punctures’

Rhotics can also form a cluster with another consonant in syllable or word final position. Rhotics almost always occur next to the nucleus, except in two cases whereby the rhotic takes place word-final and next to a word-initial vowel, as in [ʕɑ̠ʃʁᴴ ɑ̥wlɑ̥ːd] ‘ten children’; [ʕɑ̠ʃʁ̞ əsniːn] or ‘ten years’ (cf. Table 7.4, below). Final consonant sequences with rhotics are systamtically allowed to occur in JBBA without any processes of epenthesis to maintain a VCV syllable shape. Thus, rhotics in consonant sequences almost always occur next to a nucleus in complex onsets and complex ‘codas’. Below in Table 7.4 is a demonstration of final rhotic clusters with some first-hand examples.

[152] Timan’s & Own data

Table 7.4 Final consonant clusters with rhotics[153]

Word	Cluster Shape	Gloss
[ʁɐɹb]	-ɹb	‘west’
[əl-wɑ̠ʁ̥̠θ]	-ʁ̥̠θ	‘inheritance’
[qʊ̠ʁ̥ʃ]	-ʁ̥ʃ	(unit of curreny)
[ləl-ʕɒ̠ʁ̠sˤ]	-ʁ̠sˤ	‘to the wedding’
[ʕɑ̠ʃʁᴴ ɐ̠wlɐ̠ːd]	-ʃʁ	‘10 children’
[ʕɑ̠ʃʁ̠ əsniːn]	-ʃʁ	‘10 years’
[qʌ̠zzʌ̠r qˤʌ̠rt̠ˤʰ]	-rtˤ	‘wishing someone to choke twice’
[bˤɑsˤˈb̥ɔɹˤt̪ˤ] & [bˤɑsˤˈb̥ɔɹt]	-ɹˤt̪ˤ/ɹt	‘passport’
[ʔəl-kɑ̠r̥̠χ]	-r̥̠χ	‘area in Baghdad’

This part had presented rhotic consonant sequences in syllable initial or final positions in JBBA. Now, the next section will offer a synthesis on English loanword phonology of rhotics as they occur in two varieties of Arabic: JBBA and Maṣlāwī.

7.2.1.8 English Loanword Phonology of Rhotics in JBBA & Maṣlāwī

Words like *majestēr* ‘master’s’, *duktorā* ‘doctorate’, *bītza* ‘pizza’ show how loanwords were adapted into Arabic from English. This occurs due to the fact that the phonological system of the recipient language is different on the segmental and suprasegmental levels from that of the donor language. The process is subject to phonological constraints imposed from the recipient language that condition the way in which these words are adapted. More importantly, this in turn gives us more details about the sound system of the borrowing language. In this part, I will focus on English loanwords with rhotics due to their recent history which should manifest more clearly the patterns and behaviour of rhotics adopted.

This part will examine the phonological status of rhotics in recently borrowed (British) English loanwords during or after the British mandate in Iraq and into JBBA. This study assumes that the donor variety of British English is RP/Southern Standard or similar

[153] Timan’s & Own data.

affiliates. Rhotics of English back then would most likely have been either an alveolar or post-alveolar approximants /ɹ/ in onset, or a central vowel schwa /ə/ in coda. This study also does not assume that the lexical items discussed here were directly adopted from the English speakers, there could also be a scenario where an intermediate variety of Arabic in Iraq, such as Christian Baghdadi, or especially Muslim Baghdadi - as the latter was a mainstream *lingua franca*, and in this case was functioning as a donor language variety to JBBA (cf. chapter 6, on the ecology of JBBA). The Maṣlāwī data used here is part of a fieldwork conducted in 2014-2015 (Aldahook 2015). Some of the word equivalents in Maṣlāwī were not given because they were not elicited at the time when the fieldwork was conducted.

One of the most interesting facts about recent borrowings from English, and even in some cases from other language varieties as shown in this study, is that they always exhibit a coronal-type rhotic unless the loanword form was already available in the lexicon, and was subject to semantic widening as in the case of [mɛʁᴴɨ·] 'mirror' to also include 'car side-mirror'. There are also some cases where the English language did not 'loan' the consonantal-r in the first place. This is manifested as in the case of /saɪlənsə(r)/ > [sˤɑːlɑnsˤɑː] 'car exhaust silencer' in JBBA, which was subject to coda-diphthongization where a schwa(r) vowel occupies the syllable coda, a characteristic of Southern Standard English. A similar instance occurs also in Maṣlāwī: [ta:jə] 'tire/tyre', although it seems the rhotic was reintroduced in JBBA, and the corresponding example is [taijəɽ̩] & [tɑijəɹ]. There is a token of lateralization of /-ɹd/ sequences as in [daʃbuːl] 'dashboard' which could highlight a perceptual similarity with a rhotic token in the same example elsewhere [daʃbo̞ːɹd̪]. The same token of [daʃbuːl] was evident in other speakers of JBBA as well, which also could suggest a free variation in progress towards the lateralized form. There is also a token that shows an opposite case as in the word /pæntəluːnz/ 'pantaloons' < FR through Italian, that became rhotacized into [bˤɑ̞̃nt̺ˤɾõ̞ːn] in JBBA, and similarly into [b̥ãntˤɑ̞ru·n] 'pants' in Maṣlāwī[154] (cf. Table 7.5, below for more details).

Evident rhotics in English loanwords in JBBA includes: trills [r], approximants [ɹ] or retroflexes [ɻ], and taps [ɾ] with their elaborate variants as in Table 7.5 below. Rhotics seem to also form a second member in clusters towards the nucleus exclusively with labio-

[154] All tokens in this paragraph are from Timan's & own data.

alveolar stops, as in: onset [pɹ-], [br-], [tɹ-], [tˤr-], [dɹ-]; and coda [-ɹd], [-ɹˤtˤ]. What is also quite interesting in these examples of /-Cr/ or /rC-/ sequences is that approximants are the most common variants of rhotics; and trills (coronals and dorsals alike) are the least to occur in consonant clusters. This, perhaps, rearticulate the fact that (coronal) trills and their coarticulation "with tautosyllabic obstruents would affect the narrowly constrained lingual and aerodynamic requirements for tongue-tip trilling" (Solé 2002: 685). This mirrors a similar case in Standard German whereby onset rhotic clusters are always allowed next to a stop, as in: *preis* 'price', *braun* 'brown', *traum* 'dream', *drei* 'three', *kreis* 'circular' and *grau* 'gray' (Wiese 2011: 13). However, in the lexicon of JBBA, rhotic-clusters occur with more sound categories than merely rhotic-stop sequences (cf. Table 7.5 below). It is worth noting, that in JBBA, there is a tendency towards breaking consonant sequences in onsets with an epenthetic vowel in syllables of the quality [ᵊp.ɹ-] and [ᵊb.ɹ-]. Below in Table 7.5 is a list of examples of rhotic borrowings from English and their correspondences in Maṣlāwī and JBBA.

Table 7.5 Treatment of English loanwords with etymological rhotics[155]

English Loanwords with Rhotics			
JBBA	Maṣlāwī[156]	English	Gloss
[əlʔəspəɹiːn]	[ʔəsb̥ɛɹiːn]	/æspɹɪn/ or /æspəɹɪn/	'aspirin'
[pɹo̞·tiːn] & [ᵊpɹo̞·tiːn]	[ʔəprotiːn]	/pɹəʊtiːn/	'protein'
[həlɪkɔ̞btəɹ̥̝]	[həlɪkop̚tər]	/helɪkɒptə(r)/	'helicopter'
[bəkɪn pawdəɹ̝]	[b̥əkɪn pawdəɹ̝]	/beɪkɪŋ paʊdə(r)/	'baking powder'
[bætɹ̝i]	[pʰæ·tɹi]	/bætɹi/ or /bætəɹi/	'battery'
[pʌnt͡ʃaɽ̝]	[b̥ʌnt͡ʃaɽ̝]	/pʌŋktʃə(r)/	'puncture'
[taijəɽ̝] & [ˈtɑijəɹ]	[taːjə]	/taɪə(r)/	'tire/tyre'
[pɑ̞ɹᴴt͡ʃa]	[fɪɾʃa]	/bɹʌʃ/	'(tooth)brush' corresponds to Turkish *firça*

155 Timan's & Own Data.
156 All Maṣlāwī tokens from my own data.

			‘brush’ & Najdi *farša*
[bˤɑ̠̃nt̞ˤɾõ̠ːn]	[b̥ãntˤɑ̠ru·n]	/pæntəluːnz/	<FR & ENG> ‘pantaloons’ ‘pants’
[dʊkto̠ːr̞]	[dʊkto̠·r̞]	/dɒktə(r)/	‘doctor’
[giːɾ̞^{H}] or [giːɹ^{H}] or [gi̞ːr̞]	[geːr̞]	/gɪə(r)/	‘gear’
[əlæste̠ːɻə̠n]	[ʔistiːr̞ɪn]	/stɪəɹɪŋ/	‘steering (wheel)’
[ᵊspe̠ːr̞↓]	[speːr̞]	/speə pɑːt/ or /speə(r)/	‘spare part’
[kɑ̠·r̞bʊhai dɹ^{H}ɑ̠ːt]	----	/kɑːbəʊhaɪdɹeɪt/	‘carbohydrate’
[kæbreteɻ̞]	----	/kɑːbəɹetə(r)/	‘carburettor’
[ɹə̠·djɑːto̠ɻ̞̊]	----	/ɹeɪdieɪtə(r)/	car radiator’
[sˤɑːlɑnsˤɑː]	----	/saɪlənsə(r)/	‘car exhaust silencer’
[lo̠·ɾi]	----	/lɒɹi/	‘lorry’
[neːɹə·n]	----	/nɛəɹn/	‘Nairn’ ‘a motor transport company’
[daʃbuːl] or [daʃbo̠ːɹd̞]	----	/dæʃbɔːd/	‘dashboard’
[hɛ̃nd ᵊbɹeːk]	----	/hændbɹeɪk/	‘handbrake’
[mɛʁ^{H}ɨ·] or [mʌʁʁɨ·]	----	/mɪɹə(r)/	‘car side-mirror /mirror’
[bˤɑsˤb̥ɔɹˤt̞ˤ] & [bˤɑsˤb̥ɔɹt]	----	/pɑːspɔːt/	‘passport’
[ʌktubəɻ̊]	----	/ɒktəʊbə(r)/	‘October’
[səkɹɑːb̥]	----	/skɹæp/	'scrap'
[motˤʊɹsikəl]	----	/məʊtəsaɪkl/	‘motorcycle’
[kɛləstəɹɤn]	----	/kəlestəɹɒl/	‘cholesterol’

[ʔər-rujə·l]	----	/ɹɔɪəl/	'the royal'

This section presented the phonology of rhotics in English loanwords in JBBA and Maṣlāwī. The next part of this chapter will propose a phonetic model to unify rhotics in JBBA. This model is grounded in the articulatory and acoustic properties of rhotics.

7.2.2 Modelling Phonetic Variation in Rhotics

This study proposes a phonetic model for rhotics in Arabic, and in JBBA. This model has also crosslinguistic implications to rhotics (cf. Chabot 2019; Youssef 2019; Natvig 2020). This section puts forward a TRAJECTORY OF RHOTIC AERODYNAMIC-LINGUAL COMPLEXITY CONTROL in (31) (cf. Figure 7.21a and Figure 7.21b). This trajectory mirrors together the articulatory properties (cf. Figure 7.21a); and acoustic properties (cf. Figure 7.21b) of rhotics; and projects rhotic variation, and distributional frequency of rhotic variants in the lexicon of Arabic varieties, and in JBBA (cf. Figure 7.21c; and see Youssef 2019, for rhotic variation in Arabic). This trajectory also captures all of the phonetic possibilities of rhotics reported in the literature as proposed by Chabot (2019); and Natvig (2020). Rhotics are always trills, taps, flaps, fricatives, approximants, retroflexes, or vocalized. The variation in rhotics can be highlighted by a statistical implicational universal that a language with two or more rhotics is 'unlikely' to restrict their contrast to 'place' of articulation which constitute a 55\60 91.7% (Maddieson 1984: 88).

A schematic representation for the stages of *aerodynamic* and *lingual* constrictions of rhotics highlights the potential directionality towards 'simplification' in rhotics either by (i) *opening* and/or (ii) *reduction*. Both processes were found to be informed by historical and active processes of lenition due to neutralization, coarticulation or assimilation in Arabic in general, and in JBBA in particular (cf. §7.1.1; and ch. 5 & 8, for more details). This also is echoed by similar findings on the development, and patterning of rhotics, as in Dutch (Sebregts 2015); and BP (Rennicke 2015). Hall (1997: 110) states that rhotics can be distinguished in terms of *manner* or *laryngeal features* (cf. §7.2.1, for details), rather than *place features*. Thus, below in (31) this study proposes a trajectory for both the articulatory and acoustic properties that unify rhotics.

(31) ARCHETYPE AND TRAJECTORY OF RHOTIC AERODYNAMIC-LINGUAL COMPLEXITY CONTROL

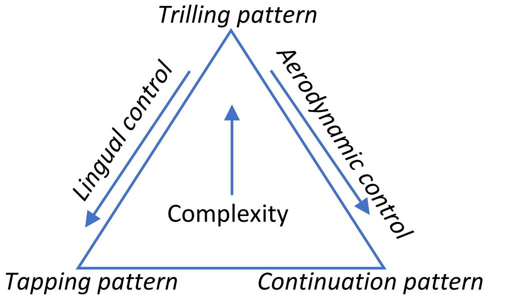


Figure 7.21a. Articulatory Properties of Rhotics

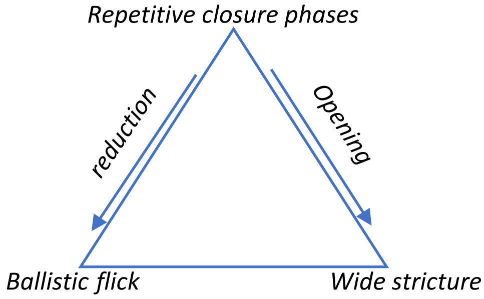


Figure 7.21b. Acoustic Properties of Rhotics

Trills are articulatorily characterized by an aerodynamic VIBRATION (cf. Figure 7.23 & 7.25b, below) or *trilling pattern*; and acoustically by a *repetitive closure phases*. They are the most complex and vulnerable variants of rhotics. Trills are at the top of this hierarchy to represent their complexity, and as a result, their lowest frequency in the lexicon (cf. Figure 7.21c, below). This complexity arises from the number of requirements needed for trills to be successfully produced (cf. §7.2.1.1, for details). Trills also exhibit relative degrees of different lengths 'quantitative' difference; which is part of the *reduction* continuum (cf. §7.2.1.1, for more details and examples). This 'quantitative' difference can be also projected by a *lingual control continuum* which integrates in a wider spectrum, relative differences in lingual trilling or vibration in the *reduction* continuum towards a single closure, or a tap (cf. Figure 7.22, below). Dorsal trills in JBBA were found to show an identical formant structure to coronal trills, but are longer in duration with way more 'rapid' and 'condensed' occlusions or closures; which can be explained by the 'narrower aperture' at the back of the mouth where the uvula is located; and the size of the uvula which also does the vibration (cf. §7.2.1.1; and Figure 7.4).

Thus, in Figure 7.22 below, the first three components from the left of this spectrum constitute a 'complete closure' that both trills and taps solely share; and both are connected by the 'quantitative' factor; or the *reduction* continuum (cf. §7.2.1.2, for details on taps and trills). The last three components of this spectrum encompass an 'incomplete closure', and involve rich 'qualitive' differences in the *aerodynamic control,* and are governed by the *opening* continuum (cf. Figure 7.23, below); which includes fricatives, approximants, retroflexes, and vocalized rhotics as part of the *continuation pattern*, respectively.

Figure 7.22. *Lingual control continuum*

REDUCTION CONTINUUM										OPENING CONTINUUM
Maintained prolonged lingual 'posture'	~	Shorter lingual 'posture'	~	Single lingual 'gesture'	~	Incomplete lingual constriction	~	Wider lingual constriction	~	Minimal or no lingual involvement

Trills are prone to simplification by *reducing* complexities on the aerodynamic and lingual configurations (cf. Figures 7.22 & 7.23), and this in turn lead to two different outputs: (i) the *continuation pattern* as in fricatives, approximants, retroflexes, and vocalized rhotics; which all governed by the *aerodynamic control continuum* (cf. Figure 7.23, below); and (ii) leads into involving a simpler *lingual control* with a *reduced tapping pattern* towards a 'single closure' at the end of the *reduction continuum* (cf. Figure 7.22, above). Trills were found to show different degrees of lengths 'quantity' in JBBA (cf. §7.2.1.1, for more information). The *aerodynamic control continuum* integrates the phonation quality of rhotics involving the airstream flow or airflow mechanics vis-à-vis where and how the tongue is placed in the oral cavity (cf. §7.1.1, for details). Because of the vibration trills show, which is a continuous rapid opening for the airstream and closing by the active articulator, trills require an aerodynamic condition for successful production – the quick opening and closing of the airstream by the tongue manifested in a *repetitive closure phases* (cf. Figure 7.21b & 7.23).

Taps are acoustically characterized by the appearance of a single *ballistic flick* (cf. Figure 7.21b) cutting through the formants; which looks like a 'stop closure' or an empty/faint sound bar, or blank segment in the spectrogram (cf. §7.2.1.2, for details). Articulatorily, they occur as a successful 'single lingual gesture' in the oral cavity. Similar to uvular trills, uvular taps are subject to inter-speaker variation. Taps do not participate in the *aerodynamic* requirement in articulation, because they lack an *opening* phase and are characterized by a CLOSURE (cf. Figure 7.25b, below).

If the sensitive requirements for a trill are not properly met, such as not making a 'proper closure', then trilling would turn into a *continuant pattern* by *opening*. This, in turn, allows airstream to go through a 'stricture' depending on how close and where the tongue is placed against the 'passive articulator' causing either frication, or narrowing i.e. approximation. Frication takes place due to loose *opening* in the stricture where the tongue is placed resulting into a 'turbulent airflow' (cf. Figure 7.23, below; and §7.2.1.3, for details). However, frication in rhotics is not that common in occurrence in the *continuation pattern* spectrum; as more often they turn into approximants (cf. §7.2.1.3 & 7.2.1.4, for details).

Figure 7.23. *Aerodynamic control continuum*

Periodic vibration (occlusions) ~ Turbulent airflow (friction) ~ Airstream restriction (narrowing) ~ Unrestricted airflow (opening)

Approximants require less *aerodynamic-lingual control* compared to fricatives and trills, respectively. Articulatorily, they are characterized by 'incomplete constriction' in the oral cavity (cf. Figure 7.22). This in turn may cause very little to no turbulent airflow due to *narrowing* in the stricture (cf. Figure 7.23). Acoustically, what unifies approximant rhotics, coronal and dorsal, is their vowel-like formant structure which is attributed to relative *opening* and *wide stricture* (cf. Figure 7.22; and §7.2.1.4, for details). However, what makes approximants different from vowels is that they exhibit less 'intensity' in the waveform compared to vowels (Rennicke 2015: 34).

Retroflex rhotics in JBBA were found to have a fusion of a rhotic continuant approximant constriction; which are part of the *opening continuum*, and an ə-like element which causes an un-lowered F2 (cf. §7.2.1.5, for details). Thus, retroflex rhotics are part of the *continuation pattern* with a coarticulatory gesture, an ə-like; and they fall at the end of the *lenition spectrum* of the approximant coronal rhotic *opening* continuum (cf. Figure 7.1b). Similar to plain approximants, retroflexes were also found to show less 'intensity' in the waveform than vocalic rhotics (cf. Figure 7.17, above). In support of the ə-like element in rhotic retroflexes, Scobbie (2006), for instance, demonstrates that the schwa-like coda is acoustically similar to the vowel-retroflex sequences. Another piece of evidence that support the existence of a centralized vowel comes from BP; whereby rhotic retroflexes alternate with a centring diphthong (Rennicke 2015).

At the end of the *continuation pattern* continuum of rhotics, the approximant glide [w] and then the vocalized variants of rhotics fall at the articulatory simplex of the *aerodynamic control* characterized by *narrowing* in the case of [w]; or *unrestrictive airflow* and more *opening* in the case of [ɑ̰ː], [ə̰], and [oː], respectively (cf. Figure 7.22 & 7.23, above). Vocalic rhotics require the least *aerodynamic-lingual control* compared to the other variants of rhotics and characterized by *opening* and *wide stricture* (cf. Figure 7.21b, above). The vocalic rhotic variants [oː], [ɑː], and [ə] show a prominent formant structure, which can be ascribed to the *opening* and *wide(r) stricture* in the oral cavity with *minimal lingual involvement* (cf. Figure 7.22 & 7.23).

The *opening* and *reduction* continuums are both a result of processes of lenition. These processes of lenition are synchronically conditioned by prosodic aspects: (i) rhotic position in the suprasegmental word; (ii) whether the rhotic is subject to a phonological process; (iii) and whether the rhotic occurs in a native or loanword. There also some extra-linguistic factors that participate in the lenition process, such as: 'speech rate', 'inter-speaker' and 'intra-speaker' variations (cf. ch. 2; 5 and 7, for details). These factors; and historical sound changes and active phonological processes involving rhotics in JBBA all contributed towards processes of *lenition*.

Thus, we now have to demonstrate how rhotic variants in JBBA fit in this model. CORONAL and DORSAL-TYPE trills and taps are both part of the *reduction* continuum which is characterized by a 'quantitative' difference in 'closure phases' and 'complete closure'. CORONAL and DORSAL-TYPE fricatives, approximants, and vocalized rhotics; and CORONAL-TYPE retroflexes are all characterized by 'incomplete closure', and involve 'qualitive' differences in the *aerodynamic control,* and are governed by the *opening* continuum.

Longest trills were found to occur in word-medial position (cf. §7.2.1.1, for details). Then, there are 'relative degrees' of different lengths in the trilling in different positions in the prosodic word (cf. §7.2.1.1, for details). Trills are at the top of this hierarchy in Figure 7.21c to represent their least frequency in the lexicon of JBBA, due to their multifaceted requirements. Then, on the *reduction* continuum, these 'quantitative differences' in the *trilling pattern* decline towards a 'single closure', a tap. Thus, trills and taps are unified by the *reduction* continuum or 'closure' parameter. Shorter trills and taps were found to show a wider distribution in JBBA (cf. Figure 7.21c, below).

Frication and approximation in rhotics are characterized by 'incomplete closure' and *opening* in the stricture. This *opening* continuum unify frication, approximation, retroflexion and vocalization under the *continuation pattern*. DORSAL-TYPE approximants and CORONAL-TYPE taps were found to represent the majority of the variants in both types in rhotics in JBBA (cf. 7.21c, for details). The DORSAL-TYPE approximant [ʁ̞] is the most common of all rhotic variants in JBBA.

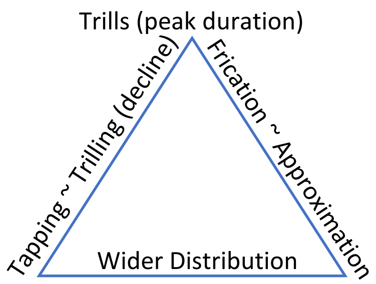


Figure 7.21c. Distribution of Rhotics in JBBA

Thus, this study is proposing a novel pairing and matching between the articulatory and acoustic properties unique to rhotics. This trajectory, in Figures 7.21a and 7.21b, mirrors together the articulatory and acoustic properties of CORONAL-TYPE and DORSAL-TYPE rhotics. Rhotics were found to exhibit a tendency towards 'simplification' in two subprocesses of *lenition*. Both processes were found to be informed by historical and active processes of *lenition*: (i) *reduction* (cf. Figures 7.1a; 7.2a; and 7.21b); and (ii) *opening* (cf. Figures 7.1b; 7.2b; and 7.21b). These processes were found to be rooted in neutralization, coarticulation, assimilation, and other phonological processes in Arabic in general, and in JBBA in particular (cf. §7.1.1; ch 5; 7; and 8, for details).

JBBA is a DORSAL-TYPE rhotic language (cf. Figure 7.24b, below). This entails that the default and widely distributed rhotic variants in JBBA emerge from a dorsal, 'uvular', point of articulation. The uvular trill [ʀ] and tap [ʀ̆] are subject to inter-speaker preference or variation. In the corpus and the data of this study, speakers of JBBA use only one type of trills: either dorsal (uvular) or coronal (alveolar) but never both. This mirrors a similar tendency in BP that speakers opt for one variant of trills: either a uvular or an alveolar but never use both on the intra-speaker level (Rennicke 2015: 30).

This entails that there were two types of speakers, who are, by sociolinguistic terms, the 'initiators' of the innovation, adapt two different types of trills: a CORONAL-TYPE or a DORSAL-TYPE. This tendency will work as a basis for our crucial 'hypothesis' that the CORONAL-TYPE ~ DORSAL-TYPE systems of rhotics (cf. Figures 7.24a & 7.24b, below) are rooted in the speaker 'perception' and their origin is in the 'innate acquisition' of the language for the speaker. This realization also echoes Sebregts' (2015: 136-137) findings in Dutch-r; that the relationship between the 'alveolar' and 'uvular' trills in Dutch is 'perceptual', and that the origin of both is in the acquisition process. In other words, the origin of the two rhotic systems and their development in some varieties of Arabic: such as the Tigris subgroup of *qəltu*-Arabic, and in some North African varieties of Arabic, must have evolved out of individual speakers anchored with either an innate CORONAL-TYPE trill *or* DORSAL-TYPE trill system, but not both. Then, both rhotic systems merged through processes of lexical diffusion; and historical processes of lenition (cf. Figure 7.25a, below). I will explain this in more details below.

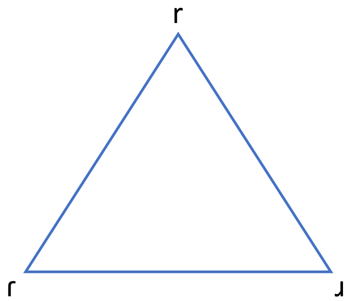


Figure 7.24a. CORONAL-TYPE Rhotic System

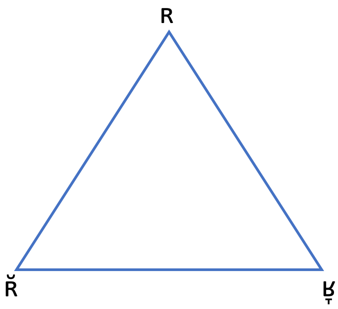


Figure 7.24b. DORSAL-TYPE Rhotic System

Those speakers, with categorical CORONAL-TYPE RHOTIC system (Figure 7.24a), or categorical DORSAL-TYPE RHOTIC system (Figure 7.24b), were the main ‘adopters’ of either of the rhotic systems in apparent-time who contributed to the diffusion of these two mirroring rhotic system elements in the lexicon. Another type of speakers who coexisted were the ‘adaptors’ who came as the ‘early imitators’ and they were exposed to both rhotic systems in Figure 7.24a & Figure 7.24b. The ‘adaptors’ are the ones who exhibit(ed) most of the ‘free variation’ in the use of rhotic variants from both, the CORONAL-TYPE RHOTIC system, and the DORSAL-TYPE RHOTIC system at the early stages; and this process still continues until today. The tendency today, however, is that speakers contribute with more CORONAL-TYPE RHOTICS in the lexicon of JBBA due to education and large-scale language borrowings from sister language varieties of Arabic, or other languages (cf. ch. 5, for details). Most speakers of JBBA are, in fact, ‘aware’ that the dorsal pronunciation of the rhotic is ‘native’ feature of JBBA.

This ‘hypothesis’ in turn also has further implications to the historical development of rhotics. It accounts for the diachronic ‘abrupt’ development of the dorsal articulation of etymological-*r* in Arabic by the ‘adopters’; and how this pronunciation had merged with the dorsal articulation of etymological-*ġ* initiated by the ‘adaptors’, as in the Tigris cluster. Then a process of a ‘gradual’ diffusion of lexical items with both rhotic systems in the lexicon of the respective varieties took place. This, in turn, led to a fusion between two mirroring rhotic systems, i.e. the CORONAL-TYPE and DORSAL-TYPE, due to ‘perceptual’ similarity of the two systems (cf. Figure 7.25a & 7.25b, below).

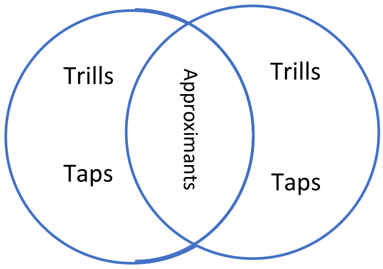


Figure 7.25a. CORONAL OR DORSAL-TYPE Rhotics

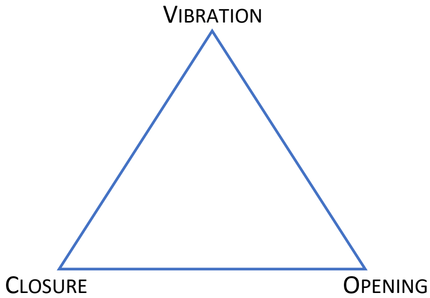


Figure 7.25b. Archetype of Rhotics

This 'hypothesis' on the aspect of 'actuation' and 'transition' of a CORONAL-TYPE RHOTIC system, and a DORSAL-TYPE RHOTIC system and how they merged in some varieties of Arabic is not actually a new linguistic phenomenon. For instance, one of the best studied analogous linguistic situations can be derived from Sankoff and Blondeau's (2007) longitudinal research which conducted an insightful study on the 'actuation' and 'transition' aspects of the voiced uvular continuant [ʁ] in Montreal French; and on the aspect of change in progress with respect to apical and uvular r-sounds in apparent-time and real-time evidence from Francophone Montreal. Sankoff (2015: 32) postulates that during the second half of the 20th century, there must have been some speakers who use only apical [r]; others who used only [ʁ]; and others who show 'free variation' in using both. She demonstrated that amongst the 32 speakers she studied in 1971, 13 of them show consistency in their use of apical [r]; 8 who used a consistent uvular [ʁ]; and 11 who exhibit 'free variation' in their use of [r] and [ʁ]. Thus, she concludes that "[a]ny change that goes to completion in three generations or less will perforce result in "old system" and "new system" speakers being alive and in contact at one time period. In this case, a young teenager in 1984 would most probably be a categorical user of [ʁ], with parents variable between [r] and [ʁ], and grandparents fully anchored in the older phonology with categorical [r]" (Sankoff 2015: 32-33).

Thus, this model looks at CORONAL- DORSAL rhotics from a holistic view; as overlapping phonetic-phonological systems; which are collectively rooted in an identical set of manners of articulation. Both CORONAL-DORSAL trills and taps have a 'complete closure' and involve 'quantitative' differences in the *lingual control*, and are governed by the *reduction continuum*. CORONAL-DORSAL fricatives, approximants, and vocalized rhotics all have an 'incomplete closure', and involve 'qualitive' differences in the *aerodynamic control,* and are governed by the *opening* continuum. In other words, the CORONAL- DORSAL rhotics can be taken as an analogy to the two seeds you can find inside an apple; they both are part of the apple, and both make the apple as a whole – being RHOTIC (cf. Figure 7.25b). They both mirror the same manners of articulation on the phonetic level (cf. Figure 7.21a; and 7.21b; and §7.2.1.1-7.2.1.6). On the subsegmental level, all rhotic variants of both types are connected, as a whole, by an |A| identity element in the base of their phonological expression (cf. ch 8, later on).

7.3 Summary

This chapter had focused on the articulatory and acoustic aspects of rhotics in JBBA. This chapter had also proposed two major macro groups for rhotics in Arabic. This grouping was based on phonetic patterns and phonological behaviour. This typological classification builds on the quadruple micro-typological categories proposed by Youssef (2019). This chapter had offered a synopsis for rhotic variation in Arabic; and phonetic and phonological justification for the CORONAL- DORSAL typology and classification proposed in this study; and their distribution in the Middle East and North Africa. This chapter also came up with a number of proposals. One is a *lenition spectrum* for rhotics in JBBA which projects a tendency towards 'simplification' in rhotics either by *opening* and/or *reduction*. Another is a phonetic model that unifies both CORONAL and DORSAL-TYPE rhotic variants into one trajectory which mirrors both articulatory and acoustic properties which all governed by two subprocesses of lenition: (i) *reduction*; and (ii) *opening*. This model looks at CORONAL- DORSAL rhotics from a holistic view; and as overlapping phonetic-phonological systems identical collectively in manners of articulation.

Chapter 8

FORMAL REPRESENTATION OF JEWISH BAGHDADĪ-BAṢRĀWĪ ARABIC RHOTICS: GOVERNMENT PHONOLOGY

8.0 INTRODUCTION

This chapter focuses on the representation of rhotics in JBBA using Government Phonology (GP) and Element Theory (ET). This thesis employs GP and ET as a theoretical research framework to capture the unity of rhotics as they occur in JBBA. Rhotics in JBBA in general were found to be characterized by an |A| element in the base of the phonological expression. The |A| element signifies articulatory openness, and acoustic central spectral energy characterized by high F1 value manifested as vowel adjacent 'lowering'. The manifestation of the |A| element in rhotics is also supported by empirical evidence with tendencies in rhotics' phonological processes towards extending 'pharyngealization' and/or 'retraction' to adjacent sounds, especially vowels; disfavouring palatalization or fronting environment; and vocalizing to a non-front glide or non-front vocalic output. Rhotics in JBBA are composed 'minimally' of an |A| element in nuclear position; and |U.A.L| elements in non-nuclear position.

This chapter is structured as follows: Section §8.1 presents an overview for the architecture of GP. Section §8.1.1 provides a brief synopsis for constituency in the prosodic word and the view of syllable structure in GP. Section §8.1.2 runs as an overview for the organization of two lateral forces in GP: 'government' and 'licensing'. Section §8.1.3 is a review on the theory of elements and how it is integrated as theory of representation within the framework of GP. The next subsection §8.1.3.1 is an overview for the internal structure and the subsegmental representation of speech sounds in ET. Section §8.2 is a brief synthesis on rhotics and how they are represented in ET crosslinguistically. Then, section §8.2.1 is an introduction to the representation of rhotics in JBBA. Section §8.2.1.1 provides an empirical evidence for the existence of the 'm|A|ss' pattern in rhotics. Section §8.2.1.2 presents a subsegmental geometry for the internal structure in rhotics. Section §8.2.1.3

provides a well-rounded presentation for the distribution and behaviour of rhotics in JBBA. Then the last section presents a sum up for this chapter's findings and realizations.

8.1 Government Phonology

One of the three main components of non-linear models in phonology is Autosegmental Phonology (AP). AP deals with prosodic and melodic information at different levels of representation and link them all together non-monotonically. This was the phonological research ground for Standard Government Phonology (GP) in the early 1980s (Kaye & Lowenstamm 1981, 1984). First serious steps for modelling the internal structure of speech sound units, known as segments, was proposed by Kaye et.al. (1985). Then, later attempts of GP in outlining the syllable structure were proposed in separate study (Kaye et al. 1990). Until today, there are four main presentations and review of the theory: Charette (1991); Harris (1994); and Gussmann (2002), Scheer & Kula (2017).

Kaye (2005) explains that GP deals with the sound system form an 'epistemological principle': which simply means that phonological knowledge is established by inspecting a segment's phonological behaviour, both within the system and in phonological processing; and that the phonetic object does not participate in the process of understanding of phonological objects and their behaviour. Scheer & Kula (2017: 227) show an example from Polish that highlights the crucial difference in consulting phonological behaviour and not surface phonetic speech units: [ɛ] is a front vowel on the surface level, but this cannot be taken as enough evidence to derive phonological frontness, i.e. [-back] in binary and |I| in unary, but the fact that this very vowel, [ɛ], triggers palatalization of a preceding velar consonant shows us that this vowel is in fact front. Thus, GP brings about a unique approach to melodic representation, i.e. the melodic primes manifested by the phonology were assumed to be more detailed from articulatory mechanics than the SPE-style feature representations otherwise assumed.

GP, as an architecture model of language grammar in the phonetic-phonology interface, works out in a 'spell-out' operation which assigns a phonetic value to phonological primes through a lexical specification; which is known as 'phonetic interpretation' (Harris & Lindsey 1995; Scheer & Kula 2017). This is hard-wired and is language specific; a child acquires along with the sound system inventory (Scheer & Kula 2017: 228). GP, then, works along the metaphor '*what you get is not what you see*' which means that surface forms are not necessarily representative of the phonological property of a 'phoneme', but only their phonological behaviour (Scheer & Kula 2017).

GP has benefited a lot from formal syntax, and had imported many principles informed by syntactic theory, such as: the Empty Category Principle (ECP), Proper Government (PGov), c-command, the Projection Principle (PP), and many others (cf. Scheer & Kula 2017: 229). Alternation in language grammar is viewed in GP to be supplied by one of the following linguistic levels (Scheer & Kula 2017 230):

(32) Locus of alternation in language

a. Different lexical entries

b. Morpho-phonology

c. Allomorphy

d. Analogy

e. Phonology

Scheer & Kula (2017) use some examples of 'velar softening' from English to demonstrate these types of alternation. For instance, the pair *electri*[k]-*electri*[s]*ity* would be considered the same lexical entry under (32a). In (32b), the process is morphologically conditioned: it does not occur morpheme-internally, and is triggered by a subset of i-initial suffixes *(-y*, *-ity* and *-ism*); thus, the process is managed by morpho-phonological computation. In (32c) allomorphy, there are two allomorphic entries *electri*[k]-*electri*[s]-; which are isolated by morphological computation. In (32d), analogy falls out of the grammar because it involves comparisons with, technically, unrelated lexical items: the speaker knows that *electri*[s]*ity* has an [s] because there are a number of words in the lexicon that carry a *-sity* ending and so reanalyzes the lexeme *electri*[k]- into *electri*[s]-. In (32e), computation of phonology provides grammatical directions wired in the long-term memory, either as a rule or constraint, to change [k] in *electri*[k] into [s] before an [i] initial suffix.

Thus, the question now is: what counts, then, as part of phonology in GP. GP is quite 'radical' in its position to phonology, i.e. *small is beautiful,* which is parallel to 'natural phonological approaches'. If an alternation is characterized by any of the conditions below in (33), then it falls outside the area of phonology (Scheer & Kula 2017: 231).

(33) An alternation is not phonological, if:

a. It is not 100% regular; or

b. It is conditioned by morphological context and cannot be captured by domain structure; or

c. There is no observed causal relationship between a change and a triggering context.

In (33a), there is solely one set of phonological instruction for a phonological process which applies whenever the condition is met. In (33b), GP has a 'depleted' version of 'cyclic structure', but all domains/cycles are subject to the same phonology; which means if we take the 'velar softening' process into account, a word with a [k] will change into [s] before an [i] in the computation. This entails that all the words with [ki] sequences will change into [s] leaving words like *monar*[k] to be parsed as **monar*[s]-*ism*. In (33c), the 'velar softening' examples show us that the front vowel [i] triggers palatalization, but not [u] or [a]. However, crosslinguistic evidence shows that [k] becomes [ts] or other palatal-place outputs due to the same trigger. In fact, historically, this [k] we are dealing with in English was also diachronically: [k] > [ts], but this [ts] was subject to further lenition of the affricate which in a later stage became [s]. This is where a regular process becomes opaque through 'aging' (Scheer & Kula 2017: 231). Then, the question that naturally comes to mind is whether GP will be able to accommodate this kind of alternation, especially if opaque due to connected diachronic change, either in English or crosslinguistically. The answer in GP is 'no' – as this will break down because the different alternation [k] > [ts] in retrospect is no longer expressible in the phonology (Scheer & Kula 2017: 232).

In melodic representation, this process can be articulated as: a velar stop which gets a front prime turns it into an [s]; however, this is not always the case as we discussed above. Thus, 'velar softening' in the view of GP will be considered out of the realm of phonology. Melodic representation in GP was developed to phonologically explain a number of phonological processes and alternations which seem to be regular (Scheer & Kula 2017: 232). GP does not employ serialism, i.e. 'derivation', as in generative grammar – whereby computation in the mind includes a 'set of instructions' in chronological and logical order which are executed in a step-by-step fashion leading to a final output (Scheer & Kula 2017: 232).

There is, however, a constrained-based component of computation in GP, one of which is the ‘licensing constraints’ (Gussmann 2007). At the same time, and differing from Optimality Theory (OT), constraints in GP do not have ranking, ordering or violability. That is, the set of constraints is simultaneously executed in the string of phonetic interpretation and computation (Scheer & Kula 2017: 233). Thus, in GP, this computation can capture a ‘feeding relationship’ which handles constrains by modifying the input string by another constraint, but there are no similar computations as: bleeding, counter-feeding or counter-bleeding; which is a ‘true’ serial computation, but not serialism *per se* as the latter involves rule ordering; or ‘ranking’ and ‘dominance’ relationships in the constraints (Scheer & Kula 2017: 234). All instructions are equally executed and there is no selective application of a subset of instructions in computation. In sum, GP was developed as a ‘rigid’ theory of phonological representation “augmented” with well-formedness constrains; and its contribution to computation in phonology is ‘secondary’ and very minimal (Scheer & Kula 2017: 234).

Thus, in GP, our assumption of the cognitive model for phonological knowledge should be constrained to avoid ‘overgeneration’, and prevent ‘falsifiable’ predictions. Both of which are navigated by the ‘Minimality Hypothesis’, and the ‘Non-Arbitrariness Principle’ in GP. That is, GP focuses on the local source of phonological events; which helps in classifying phonological phenomena into two major types: (i) *assimilation*; and (ii) *lenition*. In *assimilation*, GP assigns a ‘melodic prime’ node which is the ‘locus’ of the phonological event attached to a relevant ‘tier’ in the hierarchy to ‘project’ the ‘LINKING’ of the ‘elemental’ characteristics to the (adjacent) ‘target’. In *lenition,* ‘weakening’, the local source is the ‘weak’ prosodic position of the segment, as in word-final or rhyme, which in turn results in ‘weakening’ or ‘no licensing’; and this is technically in GP ‘DELINKING’ i.e. loss of (some) characteristics; or ‘DECOMPOSITION’.

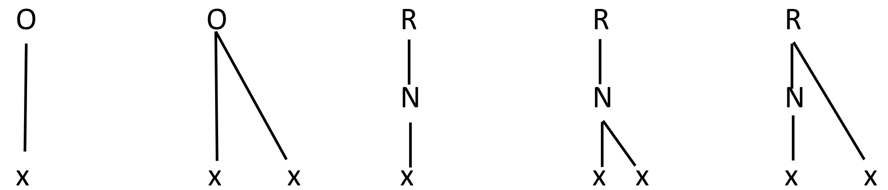
A critical component of GP is Element Theory (ET) which is based on elements of melodic representations that have their roots in Dependency Phonology (Anderson & Jones 1974), which are mapped into the acoustic signal. This melodic representation contains elements arranged on their own tier below the skeletal tier. An Element Calculus is used to convert the melodic representations into metrics of unary features that could be interpreted phonetically (Kaye et.al. 1985; Harris & Lindsey 1995). At the same time, “the properties inherent in speech sounds are generally thought to function as universal ‘primes’ which form part of the phonological component of the language faculty” (Kula, Botma & Nasukawa 2013: 34).

Now this section was an introduction to the architecture of GP, the next part should presents an overview for the syllable units structure in GP.

8.1.1 Syllable Structure

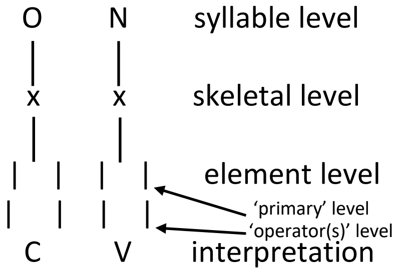
Traditionally, the architecture of the syllable is ‘arboreal’ which divides syllabic units into interconnected constituents [Onset [Nucleus Coda]$_{\text{Rhyme}}$]$_{\sigma}$ (Scheer & Cyran 2017: 262). The view of prosodic (syllabic) constituency in Standard GP, in (34) below, recognized three phonological units: Onset, Rhyme, and Nucleus. This view of the Onset-Rhyme pairs constituency in Standard GP was harvested as a result of a Strict Locality Principle which dictates that syllable structure is computation of the relative sonority of the adjacent segments; and the Binary Theorem (Scheer & Cyran 2017: 264). Thus, the ternary constituents are ruled out.

(34) Phonological Constituents in Standard GP



GP views structure of phonological units to be confined within a ‘lateral’ relation; which came at the expense of the ‘arboreal’ view of the syllable. Later on, representation in GP gradually became characterized by: (i) denial of the interconnected constituents in the traditional ‘arboreal’ syllable structure; (ii) recognition of empty categories; (iii) and that the structure of constituency is held instead by ‘lateral’ relations: (a) ‘government’; and (b) ‘licensing’ (Kaye et al. 1990). Syllable structure and syllabic causality, the latter refers to segment’s reaction to syllabic pressure, were lateralized in two steps in GP with an intermediate stage (Scheer & Cyran 2017: 262). As a result, and as a consequence of this position on lateralization of structure and causality, the ‘empty nuclei’ gained an official status in GP. Lowenstamm (1996) was then the first to reduce constituency to strict sequence of non-branching onsets and non-branching nuclei whereby lateral relations alone define syllabic positions. Lowenstamm (1996) also argues that strict CV, as in (35) below, is a universal syllable structure. In (35), we show the CV skeleton of phonology we are following throughout this chapter.

(35) Strict CV in GP



The perspective of lateral relation, and empty categories, as a result, also diminished branching constituents. Thus, consonant clusters (CC), geminates (CC), diphthongs (VV) and long vowels (VV) have the following representation in (36) below (Scheer & Cyran 2017: 272).

(36) a. cluster b. geminates c. diphthongs d. long vowels

8.1.2 Licensing & Government

As we briefly discussed earlier in section §8.1 & 8.1.1, 'government' and 'licensing' are a component of computation in GP. These two lateral forces organize phonological representation in all positions. 'Government' relation diminishes melodic material under the affected position; whereas 'licensing' supports melodic structure (Scheer & Cyran 2017: 273). The licensing constraints can capture 'restrictions' within a language system by showing elemental combination capabilities based on active phonological processes (Scheer & Kula 2017: 243). The main purpose of licensing constraints is to 'define' the lexical set allowed in a language from larger set of possible and well-formed expression in elemental representation. In other words, licensing constraints function to show neatly how and why 'headedness' 'and 'licensing' are assigned. There are often different sets of licensing constraints for nuclear and non-nuclear expressions (Scheer & Kula 2017: 243).

According to Bellem (2007), 'licensing' and 'government' can account for language-specific phonotactic constraints. All phonological processes are rooted in two operations:

‘linking’ or ‘delinking’ of elements; and these two operations are regulated by ‘licensing’. For instance, ‘licensing’ in GP allows empty position in the string; which may or may not have an interpretation. This is informed by the ECP; which solely GP gave it a formal status in the architecture (Scheer & Cyran 2017: 266). This operation is formally known as ‘vowel-zero alternation’ which is regular and predictable.

After this brief introduction on ‘licensing’ and ‘government’ in GP, the next subsection will review the Theory of Elements as a theory of melodic representation.

8.1.3 Element Theory

Our understanding of speech sounds since Jakobson et al. (1952) is that sounds can be broken down into features that capture the segment’s distinctive characteristics, and group segments into natural classes. Scheer & Kula (2017: 235) highlights two issues in the classical feature theory (FT): (a) the problem of overgeneration of features and the lack of predictability of natural classes; (b) whether features should be binary or monovalent. Kula, Botma & Nasukawa (2013) brings about a worthy example that shows binary valued features can be unnecessarily ‘redundant’. In English, for instance, nasals share their point of articulation with following stops, thus, the relevant elements or features would be either |N| or |L|[157] in ET, or [+nasal] in FT. However, there is no phonological peculiarity to label a sound or a natural class with [-nasal] since all oral sounds would fall under this characteristic. Thus, unlike the feature theory which is based on articulation and speech production, GP treats segments as composed of elements of monovalent cognitive units, which are rooted in the perception-oriented grammar from acoustic signals (Kula, Botma & Nasukawa 2013; Scheer & Kula 2017). Perception-oriented approaches to language grammar can be supported with empirical evidence from early language acquisition: speech perception is prior and independent from speech production; and that phonological interactions between sounds are rooted not in the articulatory domain but in the acoustic space (Kula, Botma & Nasukawa 2013).

ET differ from FT in a number of ways. Elements are strictly ‘privative’. This entails that they are either present or absent in a segment or ‘phonological expression’. Elements

[157] Nasality has been represented differently: |N| to represent nasality by Harris (1990); Harris & Lindsey (1995) Kaye (1989); Backley and Nasukawa (2009), or |L| to represent nasality and voicing by Kula & Marten (1998); Kula (2002); Ploch (1999); Botma and Smith (2007); Kula, Botma & Nasukawa (2013).

are phonetically interpretable (Harris & Lindsey 1995). Moreover, elements can occupy nuclear, non-nuclear and empty slots. Elements also have asymmetrical relation in complex phonological expressions, and this is organized by ranking 'headedness' and 'dependency' relation (Kula, Botma & Nasukawa 2013).

The system of privative elements is not exclusive to GP. The origins of ET is rooted in Dependency Phonology (Anderson & Jones 1974). Element theory was developed as a theory of sub-segmental structure. Elements were first introduced on the representations of the triad vowels by the work of Kaye et al. (1985) and Harris & Lindsey (1995). They are the internal representation of the listener's auditory input, and this input is pattern templates as 'resonance' properties (Harris & Lindsey 1995). The basic primes of vowels and *place elements* are the triangle hot features (Kaye et.al. 1985): |A| (with central spectral energy, and high F1 [F1– F2 convergence]) [- high], |I| (with high F2 [F2 – F3 convergence]) [-back], and |U| (low spectral peak [F1 – F2 convergence]) [+round] (Kula, Botma & Nasukawa 2013; Scheer & Kula 2017). All of the other vowels are composed of combinations of these three primes (Krämer 2012: 154-155; Scheer & Kula 2017: 236). These three elements can be independently interpreted as /a/, /i/ and /u/, respectively. In a five-vowels language system, elements can be specified in a 'dependency' and 'headedness' manner with a combination as: |A.I| for /e/; and |A.U| for /o/; and in a seven-vowel system that distinguishes between high mid and low mid vowels /ɛ/ & /ɔ/: /ɛ/ would be headed |I.$\underline{\text{A}}$| element, and /ɔ/ as headed |U.$\underline{\text{A}}$| element (Botma & Nasukawa 2013).

There are also 3 distinctive *laryngeal* or *manner elements* |ʔ.L.H| that complements the place elements we discussed earlier (Harris & Lindsey 1995; Kula, Botma & Nasukawa 2013). |ʔ| independently is a glottal stop, characterized acoustically by abrupt and sustained fall in amplitude which can be non-continuant segments like stops, |L| to represent voicing and nasality characterized by periodicity, and |H| to represent voicelessness and frication characterized by aperiodicity (Kula, Botma & Nasukawa 2013; Scheer & Kula 2017). Although ET exists in several forms, the recent version uses solely six elements (see Scheer & Kula 2017, for review). These six elements are |A.I.U.ʔ.L.H|, which also denote acoustic patterns: 'dIp', 'rUmp', and 'mAss', for *resonance* elements; and 'edge', 'noise' and 'murmur', for *laryngeal* elements in (37) below (Backley & Nasukawa 2020). These elements can also represent phonological categories as in (38) below (Backley 2021).

These categories have function and a mental representation of words and morphemes as lexical contrasts in 'nuclear' and 'non-nuclear' positions.

(37) Elements and their acoustic patterns (Backley & Nasukawa 2020)

a. Vowels *resonance* elements

|I|	'dIp'	low F1 with high spectral peak – convergence of F2 and F3
|U|	'rUmp'	low spectral peak – lowering of all formants
|A|	'mAss'	central spectral energy mass – convergence of F1 and F2

b. Consonant *laryngeal* elements

|ʔ|	'edge'	abrupt and sustained drop in amplitude
|H|	'noise'	aperiodicity, noise
|L|	'murmur'	periodicity, nasal murmur

The acoustic patterns of 'dIp', 'rUmp', and 'mAss' that correspond respectively to the |I|, |U| and |A| elements exhibit a unique spectral shape, as in Figure 8.1, 8.2, and 8.3, below. These are patterns of energy that occur within the frequency range 0-3kHz (Backley 2011). The 'dIp' pattern in Figure 8.1 below shows an intervening 'dip' and two energy peaks in its spectral pattern. One around 500Hz and another around 2.5kHz. The 'rUmp' pattern shows a concentration of energy at lower frequencies. In Figure 8.2 below, energy peaks within 0-1kHz and then rapidly drops (Backley 2011). The 'mAss' pattern shows a mass energy at the lower central part of the spectrum. In Figure 8.3 below, the energy peaks around 1kHz with a drop in energy on either side (Backley 2011).

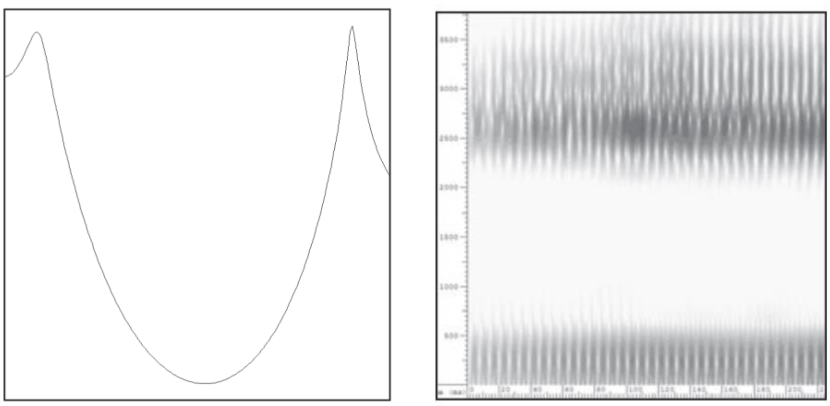


Figure 8.1: |I| or 'dIp' pattern in spectral slice (left) and a spectrogram of [i] (right) (Backley 2011: 22)

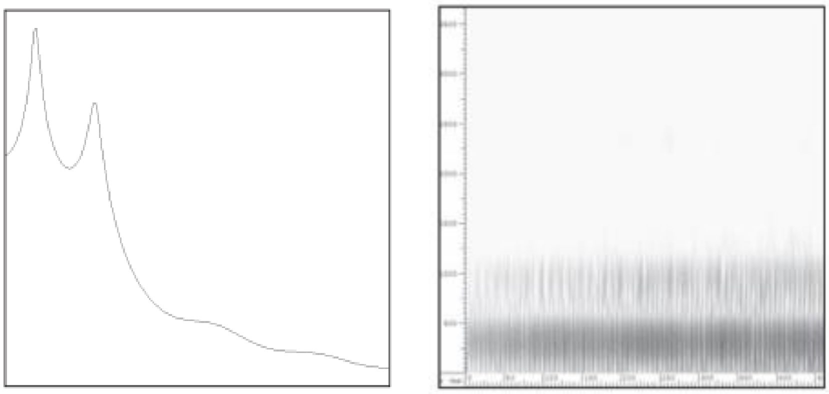


Figure 8.2: |U| or ‘rUmp’ pattern in spectral slice (left) and a spectrogram of [u] (right) (Backley 2011: 23)

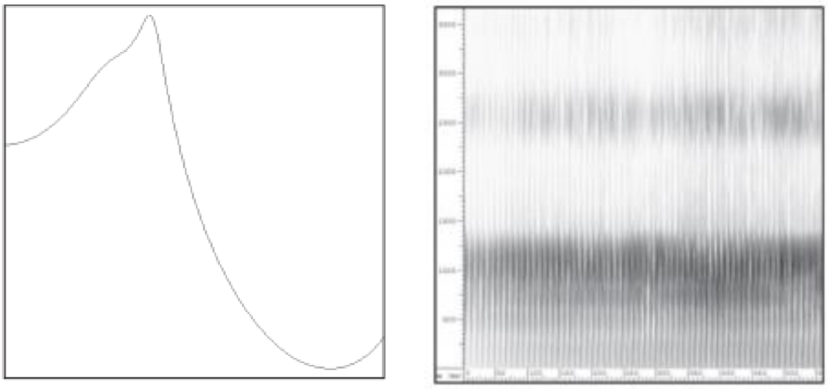


Figure 8.3: |A| or ‘mAss’ pattern in spectral slice (left) and a spectrogram of [a] (right) (Backley 2011: 24)

(38)

a. Resonance elements (Backley 2021)

nuclear	*non-nuclear*
|I| front vowels	Coronal: dental, palatal POA
|U| round vowels	Dorsal: labial, velar POA
|A| non-high vowels	Guttural: uvular, pharyngeal POA

b. Laryngeal elements

non-nuclear	*nuclear*
|ʔ| oral/glottal occlusion	creaky voice in laryngealized vowels
|H| aspiration, voicelessness	high tone
|L| nasality; obstruent voicing	nasality; low tone

Kaye et al. (1985) indicate that elements are arranged on autosegmental tiers which are connected with skeletal points to capture a representation of a segment (see Kula, Botma & Nasukawa 2013, as well). In the school of GP, there are now two positions in using the set of elements: (a) a position that subscribes to inventory element economy and reduction: |A.I.U.ʔ.L.H|; and (b) a traditional position that opts for elaboration and expansion in the element inventory: |A.I.U.ʔ.L/N.H.h.R|. |h| represented frication, and |N| represented nasality, both merged in the revised set of elements into |H| and |L|, respectively (Backley 2011).

In ET, a phonological expression can be 'simplex' when it is composed of a 'single' element, as in |I| for /i/, or 'complex' when the expression contains more than 'one' element, as in |A.I| for /e/. In complex phonological expressions, the relation of elements, which could translate into a comprehensible 'phonological interpretation', is captured by 'headedness' and 'dependency' relation; namely a 'head' and an 'operator(s)', respectively. The 'head' of a phonological expression carries the 'main' acoustic properties of a segment, and the 'operator(s)' show(s) the 'fusion' or 'colouring' of the expression. The first member in the complex phonological expression is, by default, a 'head' unless the non-first member in the expression is underlined to indicate 'headedness' '|__|' in which the expression would be interpreted as 'headless'. There is always only one 'head' in the phonological expression, but the number of 'operators' is unlimited as long as the elements in the expression are used only once.

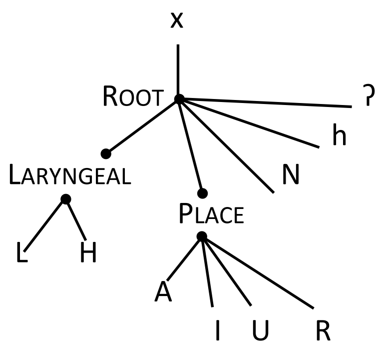
8.1.3.1 Subsegmental Structure of speech sounds

Melodic representation of speech sounds in ET not only capture phonological behaviour but also the internal structure of minimal speech units, which is segment-internal. This representation-based phonology is inspired by the 'One-Mouth' Principle; which dictates that the melodic primes of consonants and vowels overlap (Harris 1994: 118). It deals with the concept that the melody of sounds are composed of 'primes' which are 'unary', 'monovalent', and 'privative'; and are phonetically readable. This representation-based phonology model assumes segment-internal dependency relations, 'headedness' and 'dependency', or 'melodic geometry'.

Since Kaye's et al. (1985), ET has undergone many revisions. For recent reviews on ET see Backley (2011; 2012); and Scheer & Kula (2017). Many studies employ ET with flat-structure, however, some recent proposals use element geometry integrated into a threedimensional structure (Harris 1994; Kula 2002; Nasukawa & Backley 2005; Bellem 2007). Below in (39) we present three main representational models of subsegmental structure.

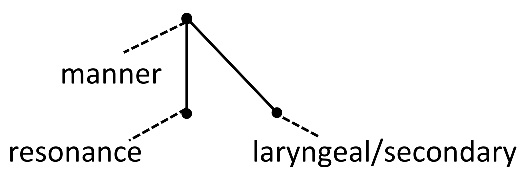
(39)

a. Multi-layered subsegmental geometry (Harris 1994: 129)



Bellem (2007) uses Harris's (1994) as a base model for her schematic representational model of subsegmental structure. It maximally consists of three nodes onto which the elements are attached in (39b).

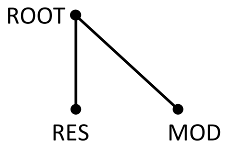
b. subsegmental structure and function of each node linked to an expression



(39b) above shows the 'function' of elements as linked to their corresponding nodes. Bellem (2007) states that the main body 'core' for the expression is comprised of two nodes: (i) the 'resonance' elements; (ii) the manner or laryngeal elements, the latter while linked to the node is labelled 'manner' which translates into a 'manner' role.

Bellem (2007) exemplifies that this schematic representation can answer questions such as how to distinguish aspiration in a segment like [p^h] from frication in a segment like [f]. In [p^h], both |ʔ| and |H| are present in the expression, but solely |H| is available as a 'laryngeal' element, while for [f] the |H| element has a 'fundamental' role as a 'manner'. For this reason, Bellem (2007) suggests that 'nodes' prefer to have solely one element attached to them and not to branch out into more than one element. Thus, to show a process of lenition for [p^h] → [f] would come across as a manifestation of 'linking' of the |H| element to the 'manner' node instead of the 'laryngeal' node, and 'delinking' the |ʔ| element from the expression. In (39c) below is a subsegmental structure showing the nodes in which the elements link. The ROOT node branches downwards into: (i) the RESONANCE node in which resonance elements attach; and (ii) 'offshoot' a MODIFIER node to which 'laryngeal' elements attach. The ROOT node is the 'core' of the expression, and the elements attached to the ROOT and the RESONANCE nodes give a segment its 'quality' characteristics. The schema is shown below in (39c).

c. Subsegmental structure and the nodes to which element link



Bellem's (2007) model, in (39e) below, is inspired by Nasukawa & Backley's (2005) proposal, in (39d), which is derived from CV phonology, and that the inventory of elements is grouped into two sets. Each of which translates into its own type of the acoustic information to the speech signal. That is, the RESONANCE set carries the |A.I.U| elements, the EDGE set carries |h.ʔ.L.H|. These binary groups further subdivide; thus the EDGE set consists of EDGE |h.ʔ| elements, and SOURCE |L.H| elements; and the RESONANCE set comprises the RESONANCE elements |I.U|, and FUNDAMENTAL element |A|. In non-nuclear position, the EDGE dominates RESONANCE; AND in nuclear position the RESONANCE dominates the EDGE as outlined in (39d) below.

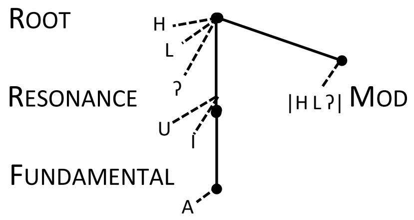
d. The revised element geometry of Nasukawa & Backley (2005)

i. nuclear position (vowels)		ii. non-nuclear position (consonants)	
FUNDAMENTAL	{A} = X	EDGE	{h, ʔ} = X
RESONANCE	{I, U}	SOURCE	{L, H}
SOURCE	{L, H}	RESONANCE	{I, U}
EDGE	{h, ʔ}	FUNDAMENTAL	{A}

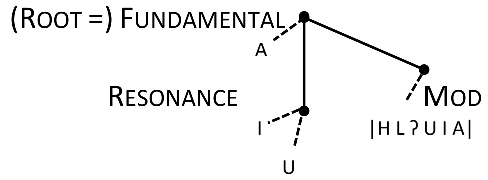
In (39e) below is Bellem's (2007) proposal of subsegmental structure. Her proposal also operates on CV phonology. The MOD node carries the elements that are interpreted as 'secondarily' modifying elements, and are 'optional' in nature and not present in all segments. Bare nodes in the 'core' of the expression translate into a schwa-type vowels, i.e. bare FUNDAMENTAL is interpreted as a non-high central vowel such as [ʌ] or [ə]; and a bare RESONANCE is interpreted as a high central vowel [ɨ]. Elements that attach to the MOD node have either of two functions: (i) the laryngeal elements |H.L.ʔ| yield a tonal contrast including laryngealization which sometimes interacts with tone; (ii) |U.I.A| are interpreted as a diphthongal off-glides and are branching.

e. Subsegmental structure (Bellem 2007)

i. non-nuclear position



ii. nuclear position



8.2 REPRESENTATION OF RHOTICS

There are two questions vis-à-vis 'rhotics' that this framework is trying to answer: (i) what is the internal content of 'rhotics'?; (ii) what is their structure? In this section, we will explore various attempts in ET that show the representation of rhotics in different languages of the world.

Harris (1990 & 1994), for instance, define rhotics, laterals and coronal nasals as having an |R| element. The |R| element independently can be interpreted as a coronal tap (Harris 1994: 123). The coronal nasals have the most complex expression, and rhotics as the least complex expression amongst coronal sonorants (cf. (40), below).

(40) Coronal sonorants (Harris 1994)

/n/	/l/	/r/
x	x	x
R	R	R
ʔ	ʔ	
N		

Thus, the defining element of coronal sonorants is |R| which ultimately was associated, in earlier version of ET, with 'coronality' and the 'coronal gesture' (see Scheer & Kula 2017, for review). One of the reasons that |R| is no longer a primitive element in ET has to do with its association with the complex sound category of coronals. Backley (1993), for instance, was one of those who noticed some issues with this element in examples like *swine* and *swim*, where /s/ is composed of |R| and |h|, and /w/ as composed of |U|. Due to the 'Complexity

Condition' – where onsets and codas in CCs- must be equal in complexity, this construction would violate this principle because [s] is more complex than [w]. Thus, the only way to fix this issue is to lessen the weight of [s] by reducing its elements composition. This in turn lead (Backley 1993) to reconsider the subsegmental structure of coronals, and to reconsider the status of |R| as a prime element. He chose the |h| element to represent /s/, which to him, represent coronal fricatives.

Thus, if |R| is not a prime element anymore, what are 'rhotics' made of? Backley (1993) argues that /r/ is composed of an empty vowel which corresponds to a schwa [ə] in nuclear position which when licensed becomes expressed. Broadbent (1991) defined this empty vowel as 'neutral' |@| element. For instance, Broadbent (1991) suggests that in non-nuclear position /r/ is the result of 'glide formation' akin to [j] and [w] that correspond to [i] and [u] in nuclear position, respectively. Backley (2011: 169) in discussion of cases of intrusive-r and linking-r in English argues that linking-r is the result of 'linking' the |A| element from the preceding vowel (cf. (41), below).

(41) Glide formation and linking-r in English (Backley 2011: 172)

	Linking |I|	*Linking* |U|	*Linking* |A|
preceding vowel	{iː ɪ eɪ aɪ ɔɪ}	{uː ʊ əʊ aʊ}	{ɛː ɑː ɔː ə ɪə eə ʊə}
resulting glide	[j]	[w]	[ɹ]
example	*fly* [j]*away*	*go* [w]*away*	*far* [ɹ]*away*

Thus, formally, this entails that whenever there is an empty onset followed by a 'non-high' vowel, /r/ surfaces. All low vowels are composed of an |A|; and empty onset always has an |@| element in which in the case of 'glide formation' a fusion of both elements occur, i.e. |A.@| = [ə] is/r/ in onset position (Broadbent 1991: 300). Similarly, intrusive-r is a manifestation of an |A| 'linking' to a following empty onset as a 'glide formation' (cf. (42), below).

(42) Glide formation and intrusive-r in English: *Lisa* [ɹ] *is* (Backley 2011: 173)

```
          N         O          N
          |         |          |
          x         x          x
          |         |          |
         |A|-------|►|        |I|
   liːs   ə         ɹ          ɪ  z
```

Since then, these collective arguments have supported that the prime element rhotics are made of in English is |A|.

On the same line with these arguments on British English /r/, Brockhaus (1995) argues for |A.@| to represent /r/ in German. The neutral element |@|[158] is used to signify 'empty' nuclear position and velarity for consonants. |@| can be attached to an onset to capture [ɐ̯], vocalic-r. This representation shows an alternation between two underlying variants of rhotics: one is consonantal-r, and another is vocalic-r. Vocalic-r occupies a coda position as [ɐ̯] unless it is followed by a vowel then it would be /r/. In other words, it is 'lenited' in weak environment. The consonantal-r, thus, is composed of |@| as a 'head' and |A| as an 'operator' in onset position, whereas in coda where [ɐ̯] is present, both elements are available but only |@| is licenced. There is also a case of /ər/ sequences which is realized as [ɐ] – a slightly longer variant than [ɐ̯], which suggests that [ɐ] perhaps occupies two positions instead of one as in the case of [ɐ̯]. Brockhaus (1995) argues that in the case of [ɐ] spreading occurs from the root node sharing the element features of the onset. The main characteristic that distinguishes /r/ from /l/ or /n/ in German is that it is composed of elements found in nuclear position and for this reason it consistently spreads into an empty nuclear position to its left (cf. Figure 8.4, below).

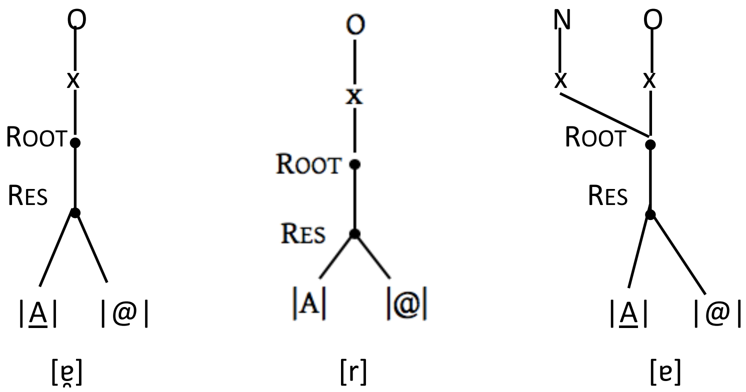


Figure 8.4: Representation of /r/ in German (Brockhaus 1995: 230-232)

In fact, the same realizations on Standard German have been also echoed by Hall (1993: 87-88); and Scheer (1996: 163) that /r/ vocalizes regularly in preconsonantal and final positions to an [ʌ̯] or [ä]. Thus, these cases from English and German have led ET to the hypothesis that rhotics are composed of an |A| prime or the 'mAss' element. In fact, this claim is also

[158] The neutral element |@| is not available anymore in the revised version of elements (Scheer & Kula 2017).

supported by how neighbouring vowels behave next to rhotics causing 'lowering' (Backley 2011: 89). As a result, |R| and |@| were not promoted in recent versions of ET anymore.

The support for the existence of the |A| element also comes from evidence of 'vowel lowering' which is, similar to rhotics, also triggered by pharyngeal consonants as attested across many Semitic languages. This is a manifestation of |A| element spreading, as in Cairene Arabic: *ħubb* [ħobb] 'love'; or *ṭiliʿ* [tˤɨlɛʕ] 'he went up' (Bellem 2007: 117). These very instances show lowering of [u] to [o], and lowering and backing of [i] in both syllables to [ɨ] and [ɛ]. Bellem (2007: 120) derives the voiceless pharyngeal [ħ] as having a primary pharyngeal with |A.H| elements to capture lowering configuration and frication manner for [ħ]. Bellem (2007) also captures the voiced pharyngeal [ʕ] approximant or fricative as composed of an |A| element. Bellem (2007) argues that both [ʕ] and [ħ] are characterized by higher F1 value, lowering, and lower F2 value, backing, which are the main features of the |A| element.

Similarly, the uvulars [q], [ʁ], [χ] exhibit significant backing of F2 which also corresponds to an |A| element. Phonological evidence of a manifested |A| element in uvulars can be supported by verb pattern alternation of vocalic verb roots in perfective triconsonantal verb stems (CiCvC) surfacing as [ɑ] next to dorsal consonants or uvular continuants, and pharyngeals in Najdi Arabic, thus *nišad* 'he asked', *kitab* 'he wrote'; and *ḥalaf* 'he swore', *xalaṭ* 'he mixed', *ġamaz* 'he winked' (Ingham 1994: 18-19). The uvular continuants [ʁ] and [χ] can be represented as having a headed |H| element and can be captured through |H.A.L|, and |H.A|, respectively.

Thus, Bellem (2007: 128) argues that Arabic pharyngealized consonants, 'emphatics', have an increased volume resonance in the oral cavity through a secondary pharyngeal constriction and could be increased by jaw-lowering and lip protrusion. Acoustically, they show a lowered F2 and both are features of |A| and |U| elements. In MBA and DA, Bellem (2007) also argues that rhotics are sonorants and are underlyingly 'back'. There exists a pharyngealized rhotic, but it is in a complimentary distribution with an underlying plain rhotic. The pharyngealized rhotic depharyngealizes in fronting environment. The pharyngealized rhotic in MBA and DA does not spread pharyngealization to surrounding segments (Bellem 2007: 232). Bellem (2007) argues for a 'headless' rhotic which is composed of an |A.I| elements. As we already have discussed and shown the representation before in section §3.4, we will show it here again for convenience (cf. Figure 8.5, below).

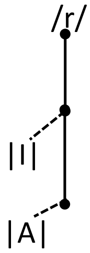


Figure 8.5. Representation of rhotics in DA and MBA (Bellem 2007)

In MA, Bellem (2007) argues that there are two contrastive rhotics: plain /r/ and a pharyngealized /rˤ/. In MA, however, the pharyngealized rhotic spreads pharyngealization to adjacent segments except in one example *ṭrab* 'dirt' which seems it warranted to be treated as a different type of rhotic in which Bellem (2007) uses *R*. Thus, Bellem (2007) argues for three types of rhotics to be represented in MA: /r/ as having an |I| element, /rˤ/ as having an |A.I| elements, and *R* as an unspecified resonance element. This was already discussed in section §3.4, but we will show the representation again here for convenience (cf. Figures 8.6 below).

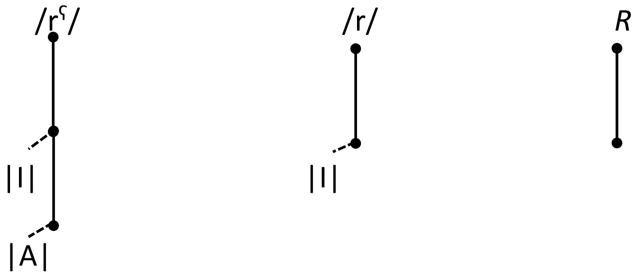


Figure 8.6. Representation of rhotics in MA (Bellem 2007)

As we previously discussed in section §3.4, this model, however, received some criticism from Sebregts (2015) by which he claims that modelling rhotic variation in ET by changing or adding elements is not feasible but solely through decomposition, i.e. loss of elements. He states that this can be modelled by the London English onset [tʰ] which alternates with [ʔ] in coda; in which the fully specified onset [tʰ] decomposes to merely an |ʔ| in coda. He also argues that there is another issue in capturing lenition processes of rhotics: because of the loss of elements in the representation of rhotics, the segments as a result will become less complex over time, and that even if that complexity of rhotics is served, only subsets of the rhotic variants can be represented as allophones.

However, in GP, the architecture of the framework centres around the behaviour of the segment; and how it participates in phonological processes. Thus, GP, is concerned with the subsegmental component of a speech sound. Phonetic variation are captured by the lateral relation of 'licensing' through distributional restrictions; and abstracting the local source of phonological events the segment being analysed are subject to; which are in turn on the supra-melodic level. That is, all segments with no exception are subject to fusion or assimilation and/or lenition; and those factors are governed by the prosodic realm. For instance, rhotics in Dutch, the language Sebregts (2015) is analysing, behave differently in pre-nucleus (onset) and post-nucleus (rhyme) positions. Vocalic rhotics occur in rhyme position, and non-lenited or 'stronger' rhotic variants occur in onset position. That is where the variation of surface forms and the phonology of rhotics occur.

The next part now will take us to the representation of rhotics as they occur in JBBA and what elements of melody rhotics are made of.

8.2.1 Representing Rhotics in JBBA

In this chapter, we are going to use two cover symbols to represent rhotics in JBBA: /ɹ/ and /ʁ̞/. These two are two phonemic or lexical sets that function and occupy a 'rhotic' slot in non-nuclear position. we are using /ɹ/ to represent all coronal rhotic variants, and /ʁ̞/ to represent all dorsal rhotic variants, which both coexist in the lexicon of JBBA (cf. 6.2.1, for details). The reason why we chose /ɹ/ as an underlying coronal rhotic that contrast with the dorsal /ʁ̞/ in a lexical set is due to the fact that trills [r] surface in restricted environment; more often as a geminate, RR, licensed in word medial or word final position by an empty nucleus. The coronal tap [ɾ] is an equally plausible choice to use beside the approximant [ɹ] to represent coronal R; however, solely a subset of intervocalic environment was found to be an absolute restriction for taps. Other occurrences show some degree of 'trilling' or more than a single 'tap'. Moreover, approximant rhotics, in general, were found to be the most articulatorily plausible rhotic choice across all speakers of JBBA. Thus, /ɹ/ was a reasonable choice. On the other hand, the dorsal approximant rhotic /ʁ̞/ was chosen to represent the dorsal category of rhotics because the dorsal variants are commonly approximants and do not show frication except in limited cases. On the subsegmental level, all rhotic variants are composed of an |A| prime.

The next part will provide an empirical evidence which demonstrates the resonance component of rhotics, across coronal and dorsal alike, that shows a manifested ‘M|A|SS’ pattern.

8.2.1.1 EVIDENCE OF ‘M|A|SS[159]’ IN RHOTICS

The |A| subsegmental resonance component in rhotics is manifested by the behaviour of the adjacent lexical vowels /i/ /ə/ /a/ /u/ that become retracted [˗] or lowered [˕] as [i̠, i̞], [ə̠, ə̞, ʌ̠, ʌ̞], [ɑ̠, ɑ̞], and [o̠, o̞, ʊ̠, ʊ̞], respectively. In (43) below are examples of the *mAss* resonance in some lexical words in JBBA.

(43) Resonance of *mAss* pattern in rhotics on adjacent vowels: (Timan’s & Own data)

rubiʿ	[ʁ̞ʊ̠]biʕ	‘quarter’	*ʿibrāni*	ʕəb[ʀ̆ɑ̠ː]ni[160]	‘Hebrew’
ʿešrīn	ʕiʃ[ʁ̞i̠ː]n	‘twenty’	*ʿabbāra*	ʕabbaː[ʀ̆ɑ̠][161]	‘ferry’
naʿref	naʕ[ə̠f]	‘we know’	*mizraf*	məz[ɾʌ̠]f	‘driller’
brūḥu	b[ʁ̞o̠ː]ħu	‘on his own’	*kahraba*	kah[ɾɑ̠]b	‘electricity’
l-ṛuṣāfa	[ərrˤʉ̠]sˤaːfa	(Baghdad area)	*gawrag*	gaw[ɹɑ̞·]g	‘toasted bread’

The resonance of *mAss* pattern can, in fact, vary from one variant of rhotics to another. For instance, the most ‘backed’, lower F2 value, variant of all rhotics is the vocalic [o̠ː] |A.U| in nuclear position, as in q[o̠ː]ṣa ‘flat bread’, (cf. Figure 8.7, below).

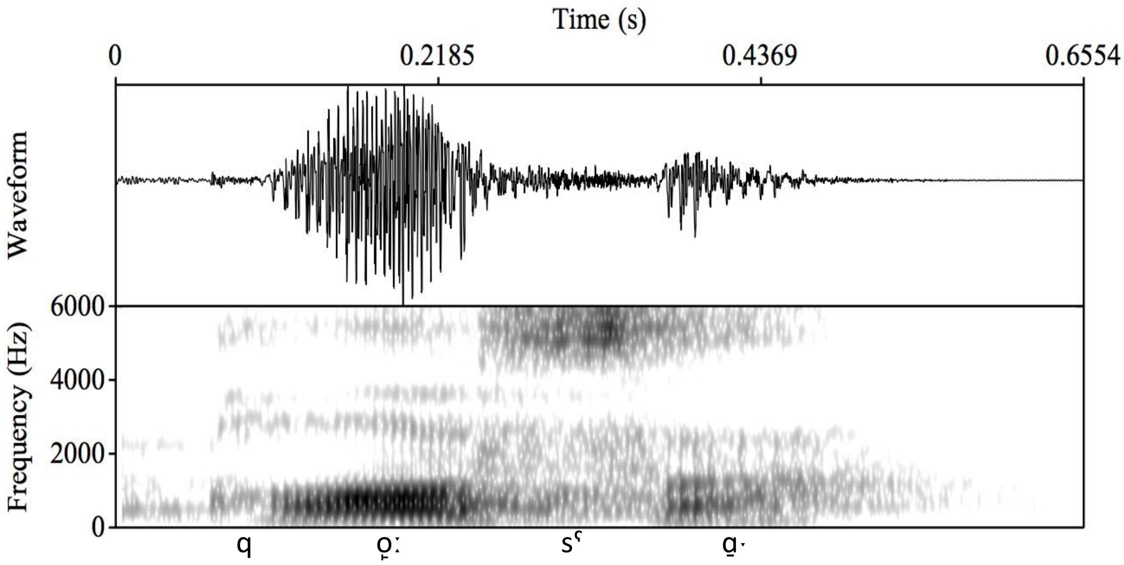


Figure 8.7[162]: Spectrogram & waveform of the word [qo̠ːsˤɑ̞·] ‘flat bread’ by (M5) with a DORSAL-TYPE rhotic vowel

[159] Refer to (§8.1.3, for more details)
[160] [ʕəbrˤɑ̞ːni] ~ [ʕəbʀ̆ɑ̠ːni] ‘Hebrew’ Adj. (Timan’s & Own data).
[161] [ʕabbaːʀ̆ɑ̠] ~ [ʕabbaːrɑ̠] ‘ferry’ (Timan’s data).
[162] My own data.

This shows almost merging F1 and F2 with *mAss* ‘intense’ energy. The least ‘backing’ effect on adjacent vowels shows from a rhotic retroflex [ɻ] which still, though, shows a high F1 value, which is associated with ‘lowering’, with either un-lowered F2 value as in ḥā[ɻɑ̰] ‘neighbourhood’; or very slight or delayed lowering of the F2 value associated with ‘backing’ as in estē[ɻə̰n] ‘steering wheel’[163]. Below in figure 8.8 is a spectrogram demonstration of the word ḥā[ɻɑ̰] ‘neighbourhood’ with a lowered F3 which unifies retroflex and approximant /ɹ/.

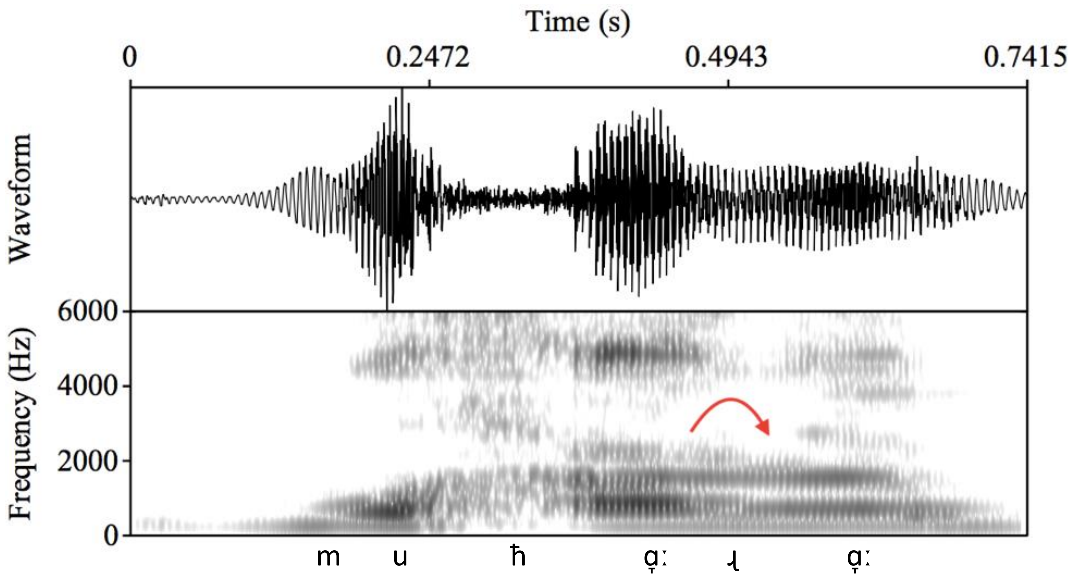


Figure 8.8[164]. Spectrogram & waveform of the word [ħɑ̰ːɻɑ̰ː] ‘neighbourhood’ by (M6) with CORONAL-TYPE retroflex (0.070909ms)

This study finds that rhotic retroflexes carry an ə-like element, which also shows its effect on either a delay or non-backing of the F2 value in adjacent vowels; which is composed of a headed |A̲.I|. The |A| element is headed in rhotics whenever there is an operational |I| due to rhotics showing resistance to ‘fronting’ gestures in retroflexes, while still colouring vowels to be lowered, as in the lexical vowels /ə/ and /a/ becoming [ə̰, ḛ, ɑ̰], respectively. Other variants of rhotics exhibit varying degrees in lowering and backing effects on adjacent vowels. Below in (44) is a melodic and supra-melodic evidence of ‘M|A|SS’ in rhotics.

(44) Evidence for the |A| element in the subsegmental structure of rhotics:

a. All variants of rhotics show lowering effect (higher F1 value) on adjacent vowels.
b. All variants of rhotics, except retroflexes, show prominent backing affect (lower F2 value) on adjacent vowels. Retroflexes still show a high F1 value with either un-

[163] My own data.
[164] My own data.

lowered F2, very slightly lowered, or delayed lowering of the F2 value; so they're composed of |A̲.I|. The |A| element is headed in rhotics whenever there is an operational |I| due to rhotics showing resistance to 'fronting' gestures in retroflexes, while still colouring vowels to be lowered [y̞].

c. Vocalization, opening lenition, occurs in 'weak' positions, i.e. post-nuclear position and results into [w ~ o̞ː ~ ɑ̞ːw] or [ə̞]. What this shows us is: the 'backing' and 'lowering' remnants of the rhotic after lenition, which translates into the |A| prime with |U| as an operator. Rhotics in JBBA never vocalize to a palatal glide [j], the glide front twin of [w]; or front vowels. So, vocalization is a manifestation of |A.U|; or 'minimally' |A|.
d. Pharyngealization or 'emphasis' is shown in rhotics as 'retraction' on adjacent vowels with cooccurring 'backing' and 'lowering'. So, headed |A̲| element. It is usually syllable local and it does not extend beyond the syllable. Thus, we do not discuss it any further.
e. Disfavouring palatalization, fronting or *ʔimāla*; (cf. §4.3; 5.2, for details). Rhotic retroflexes also have a 'fronting' coarticulatory gesture manifested in non-lowered F2 value whereby the cause of the delay or non-raising of F2 value is rooted in the resistance of the prime lowering gesture, i.e. higher F1 value, component in rhotics. Thus, this should not come as a surprise – since rhotics trigger vowel lowering and sometimes also backing; whereas palatalization requires the opposite with a fronting gesture and so, as a result, triggers vowel raising.
f. Historical and synchronic evidence of vocalization shows an intermediate stage of w-gliding in some word fossils (cf. §7.2.1.6, for more details).
g. Rhotics in consonant sequences almost always occur next to a nucleus in complex onsets and complex 'codas': ᵊrCrVrC (cf. §7.2.1.7, for more details).

What the behaviour of rhotics in JBBA tells us is that the |A| element is always available in all prosodic positions and is still manifested 'minimally' in the spectrum end of lenition processes as in vocalization. Thus, the |A| element should phonologically represent rhotics in JBBA.

In the next part, we will discuss in details the subsegmental components of rhotics and the elements they are made of as they occur in JBBA.

8.2.1.2 SUBSEGMENTAL GEOMETRY OF RHOTICS IN JBBA

Rhotics in JBBA are composed 'minimally' of an |A| element in nuclear position, as in na[ʕə̹f] 'we know'; and of |U.A.L| in non-nuclear position, as in [rɑ̹mz] 'symbol' or [wɑ̹ʁ̞]da 'flower'[165], (cf. §8.2.1.3, below for more details). Both CORONAL-DORSAL rhotics have the same phonological expression; DORSAL rhotics are headed by the |U̲| element; and CORONAL rhotics are headed by the |A̲| element in the expression (cf. §8.2.1.3, for details). The headedness of the |U̲| element in DORSAL rhotics is supported by a process of dissimilation with etymological-*ġ,* a process of total assimilation to /q/ and /χ/, and a process of lenition and vocalization to [o̹ː] and [ə̹] (cf. §8.2.1.3, for details). The headedness of the |A̲| element in CORONAL rhotics is intuitive, and is by product of the lack of counter-evidence that might suggest otherwise. In fact, one piece of evidence that can support this argument is manifested in rhotic retroflexes. Rhotic retroflexes, as we discussed earlier in the last section, have a 'fronting' coarticulatory gesture manifested as non-backed or delayed backing in F2 value. This delay in backing or non-fronting in F2 is rooted in the resistance of the prime 'lowering' gesture component in the rhotic, which is the higher F1 value associated with 'lowering' and in turn translates into an |A| prime.

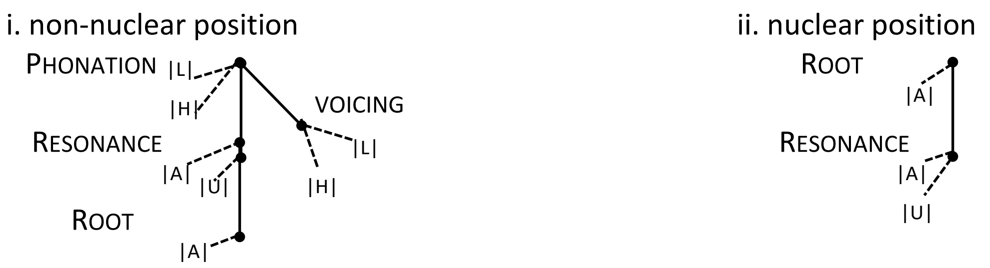
In the representation of the internal structure of rhotics in JBBA, we adopt the model proposed by Bellem's (2007) with some modifications as to accommodate the updates in the theory and representation of elements. Bellem's (2007) model has its own merits here as it was developed for the representation of Semitic languages; thus it is already acquainted with the phonological typology of Arabic and it should, for that reason, be a modular proper for representing rhotics in JBBA. The modifications I adapt to the model are as follows. As rhotics are non-obstruent segments, i.e. they require less element specification in their representation, the ROOT node is always composed of the prime |A| element in nuclear and non-nuclear position. In non-nuclear position, this can be supported by the 'lowering' gesture component in the CORONAL rhotic retroflexes; and by the |A| element remnant of the DORSAL rhotic vocalized [ə̹]. The other part that required some modification is how to integrate 'Frication' and 'devoicing' in rhotics as manifested in 'linking' and 'decomposition' processes, respectively, in this model (cf. §8.2.1.3, for details). In a way to do this is to incorporate 'PHONATION' as a primary node in the skeleton; and

[165] Own data.

‘VOICING’ as a secondary node. The primary node to carry frication ‘linking’ processes in rhotics; and the secondary node to show devoicing ‘decomposition’ processes in rhotics. As a point of support to make this distinction is that frication occurs in consonant sequences next to a voiceless fricative, stop or affricate consonants; whereas devoicing occurs in ‘weak’ syllable positions: in lexical word-final or prosodic word-final positions; which in turn is a manifestation of weakening or lenition. Thus, in frication there is no weakening, but a ‘linking’ of the |H| element to the expression |U.A.L|; whereas in devoicing there is ‘decomposition’ of the voicing |L| element in the expression turning into |U.A.~~L~~.H|.

Thus, in (45) below, I propose that the geometry for the internal structure of rhotics is composed of a ROOT and RESONANCE nodes in nuclear (45ii) and non-nuclear positions (45i). Both nodes also link the same elements in nuclear and non-nuclear positions. The |A| element has a dual role: (i) it grounds the ‘lowering’ component of the speech signal in rhotics where it is solo in the ROOT node; (ii) it has a resonance function in the phonological expression joining the |U| element. The resonance function of the |A| element translates in the speech signal into ‘lowering’; while the |U| element into ‘backing’. Both resonance elements also have different licensing function in rhotics as we discussed earlier. In non-nuclear position, there are two extra nodes attached to the skeleton. As we discussed earlier the ‘PHONATION’ primary node is integrated to accommodate frication in rhotics; and the ‘VOICING’ secondary node is incorporated to accommodate devoicing in rhotics (cf. §8.2.1.3, for more details).

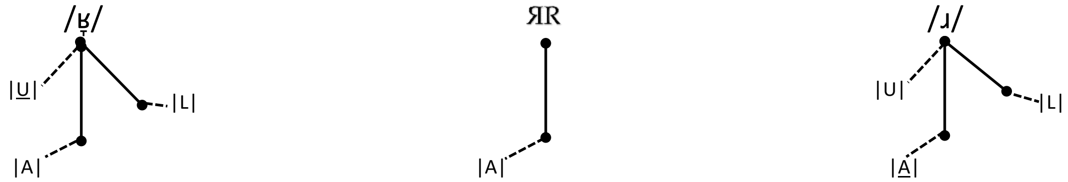
(45) SUBSEGMENTAL GEOMETRY OF RHOTICS



Thus, following the model in (45) above, (46) below is the internal structure of rhotics. Both CORONAL and DORSAL rhotics have the |A| element as the ROOT in the phonological expression. The |A̲| element is a head in CORONAL rhotics (46iii); and the |U̲| element is a head in DORSAL rhotics (46i). The |L| element is available in both CORONAL and DORSAL rhotics in a secondary node to signify voicing which could be subject to lenition in ‘weak’ syllable positions. The non-headed |U.A.L| expression allows CORONAL and DORSAL rhotics to cooccur (cf. §8.2.1.3, for some examples). In (46ii) below it shows the prime element rhotics are made of which is ‘lowering’ in the speech signal as manifested by rhotic retroflexes.

(46) THE INTERNAL GEOMETRY OF RHOTICS

i. DORSAL Rhotics ii. RHOTICS iii. CORONAL Rhotics



The next section is a detailed discussion on the distribution and behaviour of rhotics as they occur in JBBA.

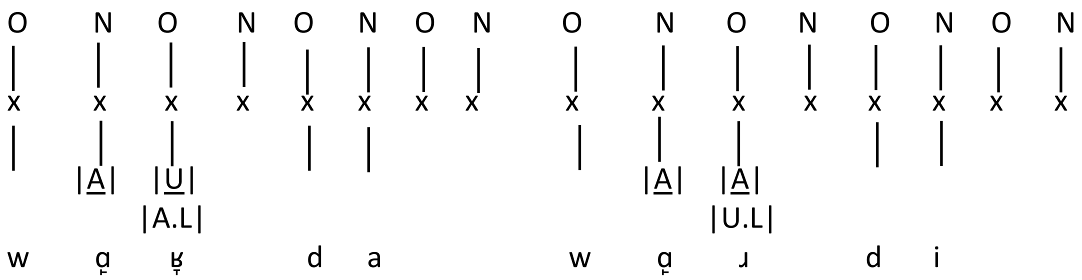
8.2.1.3 DISTRIBUTION & BEHAVIOUR OF RHOTICS IN JBBA

The first thing that needs to be introduced in this section on rhotics is the historical phonemic split between /ɹ/ and /ʁ̞/. This rhotic split enjoys a phonemic status in the Tigris subgroup of *qəltu*-Arabic; specifically, in JBBA, Maṣlāwī & CBA (cf. §7.1.1., for more details). This CORONAL-DORSAL rhotic split most likely have emerged out of (re)introducing /ɹ/ in the same word fossils but with a new meaning through the medium of Literary Arabic (Standard Arabic) which in turn then coexisted with the older lexical form reserving the older pronunciation [ʁ̞] (cf. (47), below).

(47) **r* split into /ʁ̞/ and /ɹ/ following or preceding an empty nucleus (only approximants and trills fill the rhotic slots): (Timan’s & Own data)

a. /ʁ̞/		b. /ɹ/	
/faʁ̞ʁ̞/	‘he poured’	/faɹɹ/	‘he threw’
/faʁ̞ʁ̞aq/	‘he separated’	/faɹɹaq/	‘he distinguished’
/baʁ̞ʁ̞aː/	‘outside’	/baɹɹaː/	‘outside (of Karrada)’
/ʁ̞ajjaʁ̞/	‘he changed clothes’	/ʁ̞ajjaɹ/	‘he changed’
/waʁ̞da/	‘flower’	/waɹdi/	‘pink’

a. /ʁ̞/ b. /ɹ/

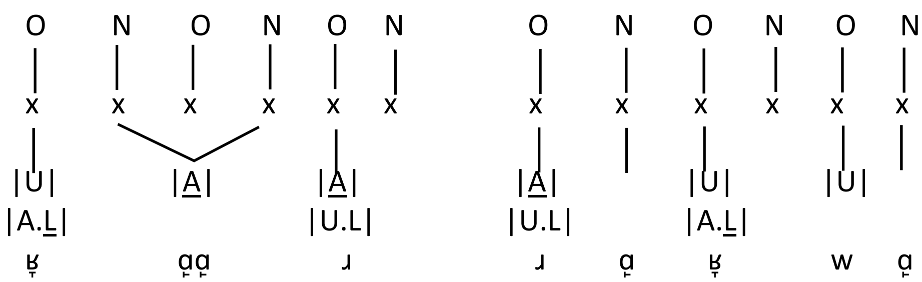


Thus, JBBA has two phonemic sets that can occupy a ‘rhotic’ slot in a non-nuclear position: /ɹ/ and /ʁ̞/. Phonetically, the dorsal rhotic /ʁ̞/ is identical to the phonetic output of etymological *ġ; however, they both are different in their distribution and behaviour (cf. §7.1; 7.1.1, also for more discussion). A clear manifestation of this phonetic similarity between etymological *ġ and the dorsal rhotic /ʁ̞/ of etymological *r can be highlighted by a dissimilation process which is motivated by OCP violation on conflating phonological expressions rooted in the |A.U| elements. Both etymological *ġ and etymological *r carry the |A.U| elements in their phonological expressions. Below in (48) is a demonstration of some examples whereby dissimilation occurs.

(48) Dissimilation of a dorsal rhotic /ʁ̞/ to coronal rhotic /ɹ/ in the vicinity of etymological-*ġ*:
(Timan’s & Own Data)

/ʁ̞aɹʁ̞aɹ/	‘gurgle’	/ʁ̞aːɹ/	‘cave’
/ʁ̞aɹb/	‘west’	/ɹaʁ̞bat χaːtuːn/	(area in Baghdad)
/ʁ̞əɹfa/	‘room’	/ʁ̞əɹaf/	‘rooms’
/ɹaʁ̞wa/	‘foam’	/ʁ̞ɹaːb/	‘crow’
/ʁ̞aɹiːb/	‘strange’	/ʁ̞ɹiːb/	‘stranger’

a. b.

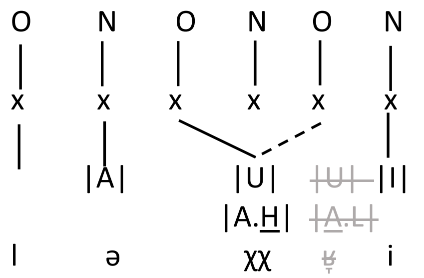


Thus, as it is demonstrated in (48a&b), to distinguish etymological **ġ* from etymological **r*, we need to assign headedness differently in the phonological expression. This can be done by assigning headedness to |L̲| because it highlights the obstruent aspect of etymological **ġ*; and that the composition of the phonological expression remains the same as I argue that etymological **ġ* carries the same expression as dorsal rhotics, and this can be supported by an assimilation process between dorsal rhotics and /q/ and /χ/ in (49) below. Thus, dorsal rhotics and etymological **ġ* are headed differently because the former behaves and occupies a rhotic position; whereas the latter does not as we will see later on with a process of assimilation to the definite article particle [l-].

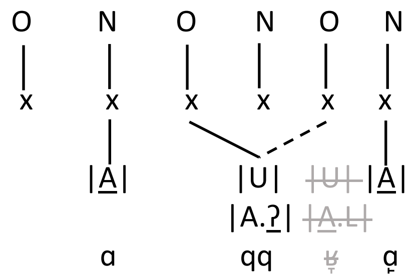
(49) Total regressive assimilation and 'linking' of a dorsal rhotic /ʁ̞/ |U̲.A.L| to /q/ |U.A.ʔ̲.~~L~~| or /χ/ |U.A.H̲.~~L~~|: (Timan's & Own data)

/l-χʁ̞i/	→ [ləχχi]	'the other' F.SG	/aχʁ̞as/	→ [ɑ̞χχɑ̞s]	'dumb'
/qʁ̞eːt-u/	→ [əqqeːtu]	'I read' PST.	/qad-aqʁ̞a/	→ [qɑ̞d aqqɑ̞]	'I'm reading'
/qʁ̞ib/	→ [əqqib]	'near'	/aqʁ̞ab/	→ [ɑqqɑ̞b]	'nearer'
/qʁ̞a/	→ [əqqɑ̞ː]	'read!' Imp.	/aqʁ̞a/	→ [ɑqqɑ̞]	'I read'

a. /χʁ̞/ → [χχ]



b. /qʁ̞/ → [qq]



This process shows us that the dorsal rhotic /ʁ̞/ shares with /χ/ and /q/ many similarities that stem from the |U| element; and that there is only a one way distinction between /ʁ̞/ for etymological **ġ*, /χ/ and /q/: the |L̲| element for /ʁ̞/, the |H̲| element for /χ/, and the |ʔ̲| element for /q/.

Another way to demonstrate lexical contrast between etymological **ġ* and etymological **r* in JBBA can be highlighted by the lexical set below in (50). This contrast is licensed by government of the final nucleus dominating the preceding empty nucleus which remains unexpressed in this set.

(50) Contrast between etymological **ġ* & **r* in onset followed by a nasal and an empty nucleus: (Own data)

a. /ʁ̞/		b. /ɹ/	
/ʁ̞amz/	‘wink.Pl’	/ɹamz/	‘symbol’
/ʁ̞anna/	‘he sang’	/ɹanna/	‘(my ear) is ringing’

a.

O	N	O	N	O	N
x	x	x	x	x	x
|U| |A.L̲|	|A̲|	|L|			
ʁ̞	ɑ̞	m		z	

b.

O	N	O	N	O	N
x	x	x	x	x	x
|A̲| |U.L|	|A̲|	|L|			
ɹ	ɑ̞	m		z	

Thus, now we know that to distinguish etymological **ġ* /ʁ̞/and a dorsal rhotic /ʁ̞/ headedness has to be assigned differently; /ʁ̞/ in etymological **ġ* is |L̲| headed, so |U.A.L̲| as we demonstrated earlier with the process of dissimilation in (48), and with the process of assimilation to /χ/ and /q/ in (49). Dorsal rhotics are headed by the backing element |U̲|, so |U̲.A.L| because only dorsal rhotics interact with the DORSAL PLACE consonants as etymological **ġ,* /χ/ and /q/. However, coronal rhotics are headed by the lowering element |A̲|, so |U.A̲.L|. The headedness of |U̲| in dorsal rhotics is not only assigned to distinguish it from etymological **ġ* or to distinguish it lexically from /χ/ and /q/, but it is, in fact, supported by a process of vocalization as in (51) below.

(51)Vocalization of a dorsal rhotic /ʁ̞/ |U̲.A.L| ‘decomposing’ to [o̞ː] |U.A.~~L~~|; or [ə̞] |~~U~~.A.~~L~~|: (Timan’s & own data)

a. Historical vocalization [o̞ː]

/quʁ̞sˤa/	>	[qo̞ːsˤɑ̞ˑ]	‘flat bread’
/l-buʁ̞ħi/	>	[əl-bo̞ːħi ~ bo̞ːħi]	‘yesterday’

b. Active vocalization

(i) [ə̞]		|A|	
/maʕʁ̞əf/	→	[mˤɑ̞ˑʕə̞f]	‘I don’t’ know’
/naʕʁ̞əf/	→	[nœʕə̞f]	‘we know’

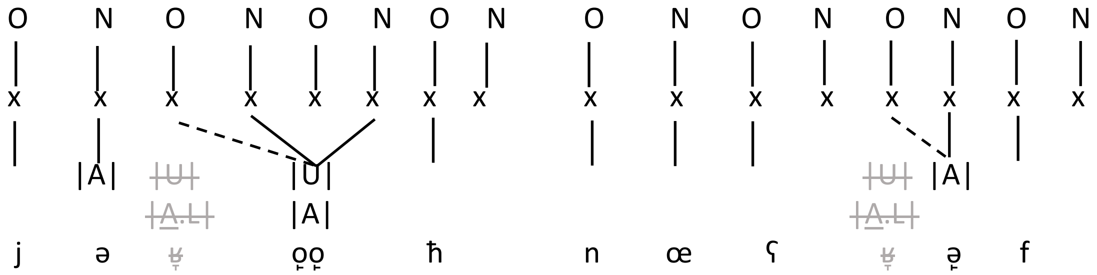
(ii) [o̞ː] |A.U|

/maʕʁ̞ufiːn/ → [mˤœ̠ʕo̞ːfĩːn] ‘(they) are well-known’

/jəʁ̞uħoːn/ → [ᵊjoːħoːn] ‘they go’ 3.PL

/jəʁ̞uħ/ → [ᵊjəo̞ːħ] ‘go to’ 3.SG.M

a. /uʁ̞/ ~ /ʁ̞u/ → [o̞ː] |U.A.~~L~~| b. /ʁ̞ə/ → [ə̞] |~~U~~.A.~~L~~|



As an extension of this argument that etymological **ġ* and etymological **r* behave differently, on one hand, and that the dorsal rhotic /ʁ̞/ is akin to the coronal rhotic /ɹ/, on the other, can be demonstrated by the ‘optional’ active total regressive assimilation process of the definite article particle [l-] to word-initial rhotics: /ʁ̞/ and /ɹ/ in (52a&b) below.

(52) Word initial etymological-*r* and etymological-*ġ* behaviour in regards to assimilation to the definite article particle [l-]: (Timan’s & Own data)

a. Dorsal rhotics of etymological-*r* |U̲.A.L|

[əʁ̞ʁ̞ə̞]d͡ʒaːl	‘the man’	[əʁ̞ʁ̞ᵊ]sˤaːsˤi	‘the grey colour’
[əʁ̞ʁ̞ɨ]ħi	‘the smell’	[əʁ̞ʁ̞ɑ̞q]qi	‘water-melon’

b. Etymological-*r* in loanwords[166] |U.A̲.L|

[ərrɨħ]	‘the wind’	[ərrˤʉ̞]sˤaːfa	(an area in Baghdad)
[ərru]jal	‘the royal’	[ərrɑ̞]ʃiːd	(street name)

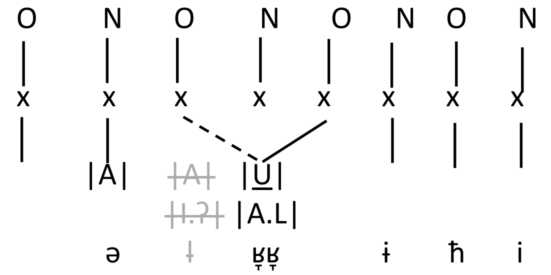
[166] For more details on ‘loanwords’ refer to (5.5.1 & data in (5)).

c. Etymological-*ġ* |U.A.L̲|

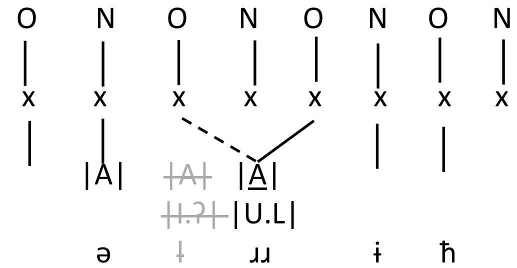
[əl-ʁ̞ɑ̠ː]ba ‘the forest’ [əl-ʁ̞ɑ̠ˑ]məq ‘the dark (colour)’

[əl-ʁ̞ɑ̠ː]səl ‘the washing’ [əl-ʁ̞eː]mae ‘the cloud’ SG.

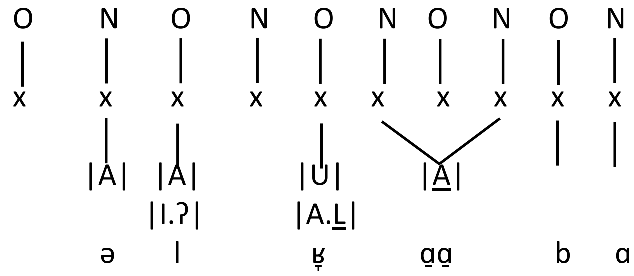
a. Etymological-*r*



b. Etymological-*r* in loanwords



c. Etymological-*ġ*



Thus, what this process shows us is that both CORONAL-TYPE and DORSAL-TYPE rhotics behave the same and occupy the same slot. The active total regressive assimilation process of the definite article particle [l-] is also ‘optional’; and only etymological-*r* undergoes this process and never etymological-*ġ*. Thus, words with etymological-*ġ* in (52c) do not pattern the same as ‘rhotics’ in terms of assimilation to the definite article although they are phonetically identical. This can be taken as evidence for the mental similarity of rhotics in this process regardless of place specification. Thus, the definite article /l/ triggers word-initial rhotic assimilation and results in gemination of the rhotic RR[167] regardless of the place specification of that rhotic whether it is CORONAL-TYPE or DORSAL-TYPE.

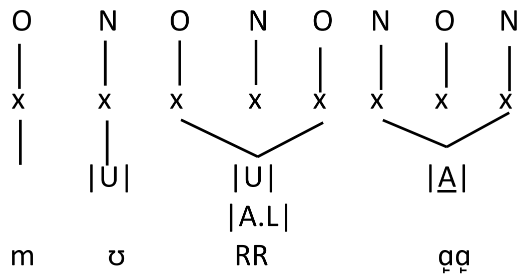
Geminate rhotic slots in JBBA are always occupied by either a CORONAL or DORSAL trill or approximant RR. Gemination in word-medial and word-final positions are licensed by morphological templates of the shape CVrrVV(C)(V) in word-medial as in /maɹɹaːt/

[167] We are using RR as a cover symbol for geminate rhotics. Geminate rhotics in JBBA are trills and approximants both coronal and dorsal.

‘sometimes’; or of the shape CVɹɹ in lexical word-final postvocalic position gemination as in /faɹɹ/ ‘(he) ran away’. Below in (53) and (54) is a demonstration with some examples for gemination RR in word-medial and word-final positions.

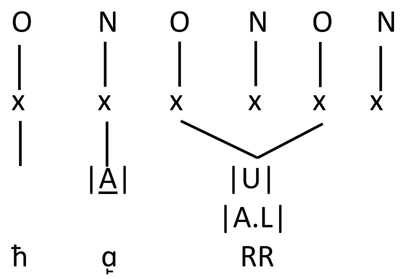
(53) Word medial rhotic gemination RR where only trill or approximant rhotics occur: (Timan’s & Own data)

/baɹɹaː/	‘outside (of Karrada)’	/baʁ̞ʁ̞aː/	‘outside’
/maɹɹaːt/	‘sometimes’	/l-faʁ̞ʁ̞oːd͡ʒ/	‘chicklet’
/baɹɹaːd/	‘air cooler’	/mʊʁ̞ʁ̞aː/	‘bitter’
/sˤʊʁ̞ʁ̞aː/	‘(exterior) stomach’	/l-d͡ʒaʁ̞ʁ̞aː/	‘clay jar/ bottle’



(54) Word-final gemination RR licensed by a final empty nucleus where only trill or approximant rhotics occur (Timan’s & Own data)

/ħaʁ̞ʁ̞/	‘hot’ n.	/sˤfaʁ̞ʁ̞/	‘he went pale’
/d͡ʒaʁ̞ʁ̞/	‘pull’	/qaʁ̞ʁ̞/	‘pumpkin’
/faʁ̞ʁ̞/	‘he poured/served food’	/faɹɹ/	‘he threw’



Frication in rhotics can be a manifestation of ‘linking’ |H| to the expression |U.A.L| or ‘decomposition’ of the expression |U.A.~~L~~.H|. Thus, there are two things that can be said about frication in rhotics. One is that frication in rhotics is a manifestation of |H| ‘linking’ when the rhotic occurs in consonant sequences next to a voiceless fricative, stop or affricate consonants, as in (55a) below. These consonants ‘link’ the |H| element to the adjacent rhotic. The other is that frication at the end of a lexical word is a manifestation of ‘decomposition’, as the ‘locus’ or ‘source’ of frication is the ‘weak’ syllable position akin to what happens when rhotics devoice in ‘weak’ syllable position; both of which are due to lenition, as in (55b) below.

(55) Frication in rhotics (Timan’s & Own Corpus)

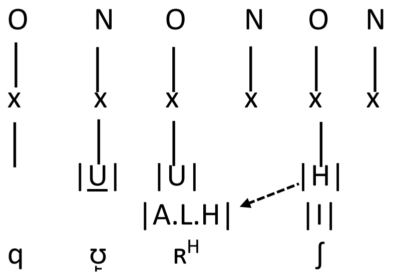
a. ‘Linking’ |H|

ʕa[ʃʁ^{H}] awlaːd	‘ten children’		
qʊ[ʀ^{H}ʃ]	(unit of currency)	ma[ʁ^{H}ɨ̥·]	‘mirror’
baː[tɹ^{H}i̥]	‘battery’	dakaː[tr^{H}ɐ]	‘doctors’

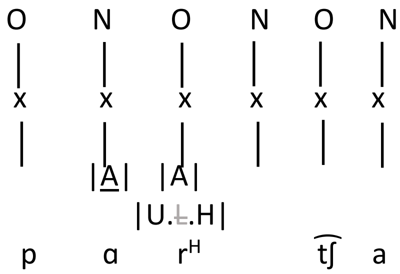
b. ‘Decomposition’ |H|

l-ah[wɑːɹ̤^{H}]	‘in Iraq Marshes’	[pɑr^{H}]t͡ʃa	‘brush’

a. ‘linking’ |H| to |U.A.L|



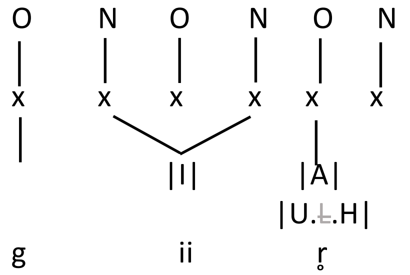
b. ‘decomposition’ |U.A.L| to |U.A.~~L~~.H|



Devoicing in rhotics is a manifestation of decomposition, that is decomposing |U.A.L| to |U.A.~~L~~.H| as in (56), below. Devoicing always occurs in ‘weak’ syllable positions: in lexical word-final and prosodic word final positions. There is a connection between trill devoicing and frication; both have some random energy in word-final or prosodic word final positions, but devoicing has much less ‘intensity’ (phonation property) and/or ‘air pressure’ (aerodynamic property) in the waveform when compared to frication. Below in (56) are some examples for rhotic devoicing.

(56) Rhotic Devoicing (Timan's & Own Corpus)

[giːr̥]	'stick shift'	ħa[riːr̥]	'silk'
[χœ̞ʁ̥̞]baːn	'malfunctioned'	oktu[bəɹ̥]	'October'
sa[miːʁ̥̆]	(proper name)	l-man[sˤu̞ːr̥]	(area in Baghdad)



8.3 Summary

This chapter had presented a formal account of GP and ET as a theoretical research framework to show the unity of rhotics as they occur in JBBA. Rhotics in JBBA, as should be the case in other Arabic varieties in general, were found to be characterized by an |A| element in the base of their phonological expression. The |A| element is characterized by high F1 value which translates into 'lowering'. These realizations were based on empirical evidence found in phonological processes, such as, pharyngealization and/or retraction in adjacent vowels; disfavouring or resisting fronting environment; and vocalization to a non-front glide [w] or non-front vowel [oː] or [ə̞].

Rhotics in JBBA are composed 'minimally' of an |A| element in nuclear position; and of |U.A.L| elements in non-nuclear position. Both CORONAL-DORSAL rhotics have the same phonological expression. DORSAL rhotics are |U̲| headed; and CORONAL rhotics are |A̲| headed in the expression. The headedness of the |U̲| element in DORSAL rhotics was supported by a process of dissimilation with etymological-*ġ,* a process of total assimilation to /q/ and /χ/, and a process of lenition and vocalization to [o̞ː] and [ə̞]. The headedness of the |A̲| element in CORONAL rhotics was supported by the acoustic signal of rhotic retroflexes. Rhotic retroflexes have a 'fronting' secondary gesture counteracted by a 'lowering' gesture component in the rhotic, which is the higher F1 value.

Chapter 9

Conclusions

9.0 Conclusion

This study had investigated rhotics in Arabic with a focus on JBBA. Thus, this thesis contributed to the description of rhotics in Arabic, and to the systematic analysis of rhotics in general. It also provided an articulatory and acoustic description, and systematic distribution of rhotic variants in JBBA. This includes syllable shapes and consonant sequences in which rhotics occur in natural speech. It also had outlined rhotics manner of articulation as they occur in JBBA, which had drawn some generalizations on Arabic rhotics in general.

This study also proposed a phonetic and phonological macro grouping which builds on the quadruple micro-typological categories proposed by Youssef (2019). This classification is informed, justified and supported by phonetic internal structure of rhotics; and by phonological processes and distributional restrictions exclusive in both types.

This thesis had also offered a phonetic model that unifies rhotic variants into one trajectory which mirrors both the articulatory and acoustic properties. This model also has crosslinguistic implications to rhotics. It treats rhotics as an integral part of a broader holistic overlapping systems that can be modelled by connecting and integrating two processes of lenition.

In addition, this study had also provided a formal representation for rhotics in JBBA using Government Phonology (GP) and Element Theory (ET). It had employed GP and ET as a theoretical research framework to capture the unity of rhotics as they occur in JBBA. Thus, this thesis has a typological and descriptive goal, on one hand; and also a formal representational goal, on the other.

9.1 Main Findings

This study has findings on phonetic, phonological, and typological levels. On the phonetic level, rhotics in JBBA were found to occur in different manners of articulation, which includes: trills, taps, fricatives, approximants, retroflexes, and vocalized (cf. §7.2.1., for more details). This study also puts forth a novel pairing and matching between the articulatory and acoustic properties unique to rhotics. This proposal has also crosslinguistic implications. Thus, this study proposes a TRAJECTORY OF RHOTIC AERODYNAMIC-LINGUAL COMPLEXITY CONTROL (cf. §7.2.2, for more details). This trajectory mirrors together the articulatory and acoustic properties of rhotics; and projects rhotic variation and distributional frequency. A schematic representation for the stages of aerodynamic and lingual constrictions of rhotics highlights the potential directionality towards simplification in rhotics either by OPENING and/or REDUCTION. Both processes were found to be informed by historical and active processes of lenition (cf. chs. 5; 7 and 8, for details)

This model looks at CORONAL- DORSAL rhotics from a holistic view; as overlapping phonetic-phonological systems; which are collectively rooted in an identical set of manners of articulation. Both CORONAL-DORSAL trills and taps have a 'complete closure' and involve 'quantitative' differences in the *lingual control*, and are governed by the *reduction* continuum. CORONAL-DORSAL fricatives, approximants, and vocalized rhotics all have an 'incomplete closure', and involve 'qualitive' differences in the *aerodynamic control,* and are governed by the *opening* continuum. Thus, the phonetic archetype of rhotics, in general, is phonetically governed within a triad spectrum: (i) CLOSURE; (ii) OPENING; (iii) VIBRATION (cf. §7.2.2, for details).

On the formal and phonological level, this thesis employs GP and ET as a theoretical research framework to capture the unity of rhotics as they occur in JBBA. Rhotics in JBBA, and Arabic in general, were found to be uniformly characterized by an |A| element in their phonological expression. The |A| element signifies articulatory openness, and acoustic central spectral energy. The manifestation of the |A| element in rhotics is supported by empirical evidence with tendencies in phonological processes towards extending pharyngealization 'emphasis' and/or retraction to adjacent vowels, disfavouring palatalization or fronting environment, and vocalization to a non-front glide or non-front vocalic output.

Rhotics in JBBA are composed 'minimally' of an |A| element in nuclear position; and of |U.A.L| elements in non-nuclear position. Both CORONAL-DORSAL rhotics have the same phonological expression. DORSAL rhotics are |U| headed; and CORONAL rhotics are |A| headed in the expression. The headedness of the |U| element in DORSAL rhotics was supported by a process of dissimilation with etymological-*ġ*, a process of total assimilation to /q/ and /χ/, and a process of lenition and vocalization to [o̢ː] and [ə̢]. The headedness of the |A| element in CORONAL rhotics was supported by the acoustic signal of rhotic retroflexes. Rhotic retroflexes have a 'fronting' secondary gesture counteracted by a 'lowering' gesture component in the rhotic, which is the higher F1 value (cf. §8.2.1._, for details).

On the typological level, this study also proposes that rhotics in Arabic can be typologically classified into two major macro groups: (a) CORONAL-TYPE; and (b) DORSAL-TYPE. This phonetic and phonological macro grouping builds on the quadruple micro-typological categories proposed by Youssef (2019). This classification is informed, justified and supported by phonological processes and by distributional restrictions exclusive in both types (cf. chs. 5&7, for details). The CORONAL-TYPE and DORSAL-TYPE are both unified in their formal representation by an identity element in the base of their phonological expression. On the subsegmental level, all rhotic variants of both types are connected, as a whole, by an |A| identity element in the base of their phonological expression (cf. ch 8, for details).

9.2 Shortcomings

This study on rhotics realized paucity in the linguistic literature either in the phonetic or phonological description of rhotics. Thus, I cannot stress enough how more detailed phonetic and phonological studies are needed. Phonetically, this study is the first in depth account of Arabic rhotics. Thus, more studies following similar path in phonetic description can confirm, reaffirm, or refute some of the realizations put forward by this study. The most common variants of a rhotic realization in Arabic appear to be a voiced coronal (alveolar) taps and approximants; however, we do not have enough systematic instrumental phonetic studies on rhotics in Arabic.

Many phonetic studies on Arabic that reported a dorsal rhotic claim on the basis of 'impressionistic' work that the point of articulation of dorsal rhotics is either 'velar' or 'uvular'. The only study, to the best of my knowledge, that confirms the point of articulation of dorsal rhotics in a uvular point of articulation from an instrumental or acoustic evidence is aldahook's (2015) on Maṣlāwī Arabic. For this reason, we cannot draw generalizations from such findings in this study on other dorsal rhotics which occur in other varieties of Arabic whether they could be velar or uvular; especially those occurring in different linguistic area like in Maghrebi Arabic. Thus, until we get more precise and narrower phonetic description of dorsal rhotics; the level of the label ‘DORSAL-TYPE RHOTIC’ was utilized as a plausible choice for these reasons.

Similarly, rhotics in the coronal region have a sporadic assignment in their point of articulation in the reported literature, in which also some are ‘impressionistic’. Coronal rhotics are generally constricted within the alveolar region which includes: dental, (dental)alveolar, alveolar, (post)alveolar. Thus, assigning these variants of rhotics a uniform label – ‘CORONAL-TYPE RHOTIC’ in these varieties of Arabic is, for this reason, a plausible choice.

9.3 Recommendations & Future Directions

On the phonetic side, rhotic approximants and retroflexes need further phonetic investigation both in the varieties of Arabic and in other languages. There so much that can be uncovered about rhotic approximants and retroflexes in instrumental studies; thus it is a promising area for research.

Phonologically, it was interesting to examine assimilatory processes of rhotics either in JBBA, or other varieties of Arabic, especially, where the active total regressive assimilation process of the definite article particle [l-] is ‘optional’. Thus, examining this process in a wider scope across many varieties of Arabic especially on how etymological-*r* and etymological-*ġ* behave in regards to this particular process would confirm our findings.

More studies on rhotic vocalization are also needed, either in Arabic or in other languages. The labialized dorsal approximant glide [w] can be assumed to be historical ‘linker’ between the dorsal rhotic approximant consonant [ʁ̞] in an intermediate stage in the sound chain chronology that leads to rhotic vowels. This still, however, is a ‘hypothesis’, as the pieces of evidence used to support this argument are rare; and is based on historical sound correspondences, reconstruction, and observations on analogous crosslinguistic tendencies. Thus, examining vocalization on sociohistorical and phonetic scales are needed.

It would be also equally interesting to investigate the actuation and transition enquiry in studying rhotics in Arabic from a sociohistorical perspective. This also includes re-examining our ‘hypothesis’ that the CORONAL-TYPE ~ DORSAL-TYPE systems of rhotics are rooted in the speaker’s ‘perception’, and that their origin is in the ‘innate acquisition’ of the language of the speaker. This can include investigating the two rhotic systems and their development in some varieties of Arabic: such as the Tigris subgroup of *qəltu*-Arabic, and in some North African varieties of Arabic.

This study had also contributed with a TRAJECTORY OF RHOTIC AERODYNAMIC-LINGUAL COMPLEXITY CONTROL which models both CORONAL-TYPE ~ DORSAL-TYPE rhotics into a uniform scheme that mirrors both the articulatory and acoustic properties of rhotics. Examining this model of rhotics on different languages would be useful for further research in the area.

References

Abdullah, T. (2001). *Merchants, Mamluks, and Murder: The Political Economy of Trade in Eighteenth-Century Basra*. SUNY Press

Abū-Haidar, F. (1991). *Christian Arabic of Baghdad*. Wiesbaden: Harrassowitz.

________. (2004). 'The Arabic of Rabīᶜa: a qəltu dialect of North-Western Iraq'. *Approaches to Arabic Dialects: a Collection of Articles Presented to Manfred Woidich on the Occasion of his Sixtieth Birthday*, Haak, M., Jong, R. & Versteegh, K. (eds.) 38: 1-12. Leiden and Boston: Brill.

Adler, M. (1904). The Itinerary of Benjamin of Tudela. *The Jewish Quarterly Review, 16(3):* 453-473

Aguadé, J. (2003). Estudio descriptivo y comparative de los fonemas del árabe dialectal marroquí. *Estudios de Dialectología Norteafricana y Andalusí 7*: 59–109.

________. (2018). The Maghrebi dialects of Arabic. *Arabic Historical Dialectology: Linguistic and Sociolinguistic Approaches*, Holes, C. (ed.) 29-63.

Ahmed, A. (2018). *Phonological variation and change in Mesopotamia: a study of accent levelling in the Arabic dialect of Mosul* (Doctoral dissertation, Newcastle University).

Al-Ani, S. (1970). *Arabic Phonology: an acoustical and physiological investigation*. The Hague: Mouton & Co. N. V.

Al-Bataineh, H. (2019). Emphasis harmony in Arabic: a critical assessment of feature-geometric and Optimality-Theoretic approaches. *Languages*, 4(4): 79.

Aldahook, U. (2015). Reflexes of Old Arabic *r in North Mesopotamia: Contribution on Maṣlāwī. Unpublished thesis, Master's, California State University: Fullerton.

Alderete, J. & Frisch, S. (2007). Dissimilation in grammar and the lexicon. In: The Cambridge Handbook of Phonology, Lacy, P. (ed.) (*Cambridge Handbooks in Language and Linguistics, 379-398*). Cambridge: Cambridge University Press.

Al-Farāhīdī, A. (1988). *Kitāb al-ʿAyn.* Al-Maẖzūmī, M. & Al-Sāmmarrā'ī (eds.), I., 8 vols. Beirut: Mu'assasat al-A'lamī li-al-Maṭbū'āt.

Al-Jāḥiḏ, ʿA. (1985). *Kitāb al-Bayān wa-t-Tabyīn*. Hārūn, ʿA. (ed.), (5th edn). al-Qāhira: Maktabat al-Khānjī.

Al-Khafāji, A. (1969). *Sirr Al-faṣāḥā*. Al-Ṣaʿīdi, ʿA. (ed.). Cairo: Maktabat Muḥammad ʿAli Ṣubeḥ.

Allen, W. (1973). *Accent and rhythm: prosodic features of Latin and Greek: a study in theory and reconstruction*. Cambridge: Cambridge University Press.

Al-Nassir, A. (1993). *Sibawayh the phonologist: A critical study of the phonetic and phonological theory of Sibawayh as presented in his treatise Al-Kitab*. London: Kegan Paul International.

Al-Qahtani, D. (2000). The nature of Arabic sonorant consonants. *Languages and Linguistics*, (6): 1-21.

Alrubaiy, N. (2017). *Tārīkh yahūd al-ˁirāq*. Vols 1-2. 1st edition. Lebanon/Canada

Al-Shahrani, S. (1988). *The phonology of the spoken Arabic of the Shahran tribe in southwestern Saudi Arabia*. Ph.D. Dissertation, University of Michigan.

Al-Ṭabarī, M. (1967). *Tārīkh al-Rusul wa l-Mulūk*. Vols I–IX. Al-Qāhira: Dār al-Maˁārif.

Al-Tamimi, J. (2017). "Revisiting acoustic correlates of pharyngealization in Jordanian and Moroccan Arabic: Implications for formal representations", *Laboratory Phonology 8*(1): 28. doi: https://doi.org/10.5334/labphon.19

Al-Wer, E. (2014). Language and Gender in the Middle East and North Africa. In: *The Handbook of Language, Gender, and Sexuality*. Ehrlich, S., Meyerhoff, M. & Holmes, J. (eds.) Wiley. 396- 411.

Anani, M. (1985). Differences in the distribution between Arabic /l/, /r/, and English /l/, /r/. *Papers and Studies in Contrastive Linguistics*, 20: 129-133.

Anderson, J. & Jones, C. (1974). "Three theses concerning phonological representations". *Journal of Linguistics*, 10(1): 1-26.

Arnold, W. (2004). 'Die Arabischen dialekte von Jaffa und Umgebung'. *Approaches to Arabic Dialects. A Collection of Articles Presented to Manfred Woidich on the Occasion of his Sixtieth Birthday*, Haak, M., Jong, R., & Versteegh, K. (eds.) (38): 33–46. Leiden and Boston: Brill.

Backley, P. (1993). Coronal: the undesirable element. *UCL Working Papers in Linguistics* 5: 301-323.

__________. (2011). *An introduction to Element Theory*. Edinburgh: Edinburgh University Press.

__________. (2012). Variation in element theory. *Linguistic Variation*, 12(1): 57-102.

Backley, P. & Nasukawa, K. (2009). Representing labials and velars: a single 'dark' element. *Phonological Studies* 12: 3–10.

________. (2020). Recursion in melodic-prosodic structure. *morpheme-internal recursion in phonology*, 140, 11.

Barkat-Defradas, M. (2011a.) “Vowel Backing”, In: *Encyclopedia of Arabic Language and Linguistics*, Managing Editors Online Edition: Edzard, L. & Jong, R. (eds.) Consulted online on 20 September 2021 http://dx.doi.org/10.1163/1570-6699_eall_EALL_COM_0371

________. (2011b). “Vowel Raising”, In*: Encyclopedia of Arabic Language and Linguistics*, Managing Editors Online Edition: Edzard, L., Jong, R. (eds.) Consulted online on 20 September 2021 <http://dx.doi.org/10.1163/1570-6699_eall_EALL_SIM_0140>

Bar-Moshe, A. (2019). *The Arabic Dialect of the Jews of Baghdad: Phonology, Morphology, and Texts*. ProQuest Ebook Central https://ebookcentral.proquest.com

Barry, W. (1997), ‘Another R-tickle’, *Journal of the International Phonetic Association* 27: 35–45.

Bateman, N. (2007). *A Crosslinguistic Investigation of Palatalization*. Doctoral Dissertation. University of California, San Diego.

_________. (2011). On the typology of palatalization. *Language and Linguistics Compass, 5(8)*: 588- 602.

Behnstedt, P. & Benabbou, M. (2002). ‘Zu den Arabischen Dialekten der Gegend von Tāza (Nordmarokko)’, In: *‘Sprich doch mit deinen Knechten aramäisch, wir verstehen es!’ 60 Beiträge zur Semitistik. Festschrift für Otto Jastrow zum 60. Geburtstag*. Arnold, W. & Bobzin, H. (eds.) Wiesbaden: Harrassowitz Verlag: 53–72.

Behnstedt, P. (2003). Zwei texte im altstadt-dialekt (t^3) von Taza (Marokko). *EDNA, Estudios de dialectología Norteafricana y Andalusí, 7*: 165-171.

Bellem, A. (2007). Towards a Comparative Typology of Emphatics: Across Semitic and into Arabic dialect phonology. Unpublished PhD thesis, School of Oriental and African Studies, University of London.

Bellem, A., & Smith, G. (2014). 'Middle Arabic'? Morpho-syntactic features of clashing grammars in a thirteenth-century Arabian text. In: *Proceedings of the Seminar for Arabian Studies* 9-17. Archaeopress.

Bennett, W. (2013). *Dissimilation, consonant harmony, and surface correspondence*. Rutgers The State University of New Jersey-New Brunswick.

Bhat, D. (1974) The phonology of liquid consonants. *Working Papers on Linguistic Universals* 16: 73-104.

_________. (1978). A general study of palatalization. In: *Universals of human language, Vol. 2*: *Phonology*. Greenberg, J. (ed.), 47-92. Stanford: Stanford University Press.

Blanc, H. (1964). *Communal dialects in Baghdad*. Cambridge, MA: Harvard University Press.

Blau, J. (1965). *The emergence and linguistic background of Judaeo-Arabic: a study of the origins of Middle Arabic*. [London]: Oxford University Press.

Blecua Falgueras, B. (2001). *Las vibrantes del Español: manifestaciones acústicas y procesos fonéticos*. PhD thesis, Universitat Autònoma de Barcelona.

Borg, A. (1997). Cypriot Arabic phonology. *Phonologies of Asia and Africa, 1*: 219-244.

Botma, B. & Smith, N. (2007). A dependency-based typology of nasalization and voicing phenomena, In: *Linguistics in the Netherlands*. Los, B. & Van Koppen, M. (eds.) Amsterdam and Philadelphia, PA: John Benjamins, 36–48.

Botma, E. (2011). Sonorants. In: *The Blackwell Companion to Phonology*, Oostendorp, M., Ewen, C., Hume, E. & Rice, K. (eds.), Malden, MA. / Oxford: Wiley-Blackwell. 171-194.

Botma, B. & Shiraishi, H. (2014). Nivkh palatalisation: articulatory causes and perceptual effects. *Phonology 31*: 181-207.

Brockhaus, W. (1995). *Final Devoicing in the Phonology of German*. Berlin, Boston: Max Niemeyer Verlag.

Broadbent, J. (1991). Linking and intrusive r in English. *UCL Working Papers in Linguistics* 3: 281-302.

Broselow, E. (1976). *The phonology of Egyptian Arabic*. Amherst, MA: University of Massachusetts dissertation.

Bulut, C. (2007). "Iraqi Turkman" In: *Languages of Iraq, Ancient and Modern*, British School of Archaeology in Iraq, Postgate, N. (ed.) 159-187.

Bye, P. (2011). "Dissimilation". In: *The Blackwell companion to phonology*, Van Oostendorp, M., Ewen, C., Hume, E. & Rice, K. (eds.) 1408–1433. Malden, Mass.: Wiley-Blackwell.

Cantineau, J. (1960). *Cours de phonétique Arabe. (Suivi de notions générales de phonétique et phonologie).* Paris, Librairie C. Klincksieck.

Card, E. (1983). A phonetic and phonological study of Arabic emphasis, unpublished thesis, Cornell University, Ithaca, USA.

Catford, J. (1977). *Fundamental problems in phonetics*, Edinburgh University Press.

_________. (2001). On Rs, rhotacism and paleophony. *Journal of the International Phonetic Association, 31*(2): 171-185.

Chabot, A. (2019). What's wrong with being a rhotic? *Glossa: A Journal of General Linguistics* 4(1): 38. 1–24.

Charette, M. (1991). *Conditions on phonological Government*. Cambridge: Cambridge University Press.

Chomsky, N. & Halle, M. (1968). *The sound pattern of English*. New York: Harper & Row.

Cohen, D. (1969). Sur le statut phonologique de l'emphase en Arabe*. Word 25*: 59–69. DOI: http://doi.org/10.1080/00437956.1969.11435557

Cohen, M. (1912). *Le parler Arabe des juifs d'Alger*. Paris: Champion.

Cohn, A. (1992). The consequences of dissimilation in Sundanese. *Phonology* 9: 199–220.

Colantoni, L. & Steele, J. (2006). Liquid asymmetries in French and Spanish. *Toronto Working Papers in Linguistics 24*: 1-14

D'Anna, L. (2021). The Judeo-Arabic dialect of Yefren (Libya): phonological and morphological notes. *Journal of Jewish Languages*, 1(aop): 1-31

Davis, S. (1995). Emphasis spread and grounded phonology. *Linguistic Inquiry 26*(3): 465–498. https://www.jstor.org/stable/4178907.

Delattre, P. & Freeman, D. (1968). 'A dialect study of American r's by X–ray motion picture', *Linguistics 44*: 29–68.

Den Heijer, J. (2012). Introduction: "Middle and Mixed Arabic, a new trend in Arabic studies". In: Middle Arabic and Mixed Arabic. Diachrony and synchrony, *Studies in Semitic Languages and Linguistics vol. 64*, Zack. L. & Schippers, A. (eds.) 1- 25. Leiden: Brill

Dietrich, A. (2012), "Māsardjawayh", In: *Encyclopaedia of Islam, Second Edition*, Bearman, P., Bianquis, T., Bosworth, C., Van Donzel, E., Heinrichs, W. (eds.) Consulted online on 30 November 2020 <http://dx.doi.org/10.1163/1573-3912_islam_SIM_4996> First published online: 2012 First print edition: ISBN: 9789004161214, 1960-2007

Dixon, R. (1980). *The Languages of Australia*. Cambridge: Cambridge University Press.

Duri, A. (2018). “Baghdād”, In: *Encyclopaedia of Islam, Second Edition*, Bearman, P., Bianquis, T., Bosworth, C., Van Donzel, E., Heinrichs, W. (eds.) Consulted online on 07 January 2021 http://dx.doi.org/10.1163/1573-3912_islam_COM_0084

Eph’al, I. (1974). “Arabs” In: Babylonia in the 8th Century B.C. *Journal of the American Oriental Society*, 94(1): 108-115

Engstrand, O., Frid, J., & Lindblom, B., (2007). A perceptual bridge between coronal and dorsal /r/. In: *Experimental Approaches to Phonology.* Solé, M-J., Beddor, P., Ohala, M. (eds.), Oxford University Press, Oxford, 175–191.

Faraj, S. & Benhaida, S. (2021) On Passover 2021, Iraqi’s Jewish community dwindles to fewer than five. *The Times of Israel*, 28 March 2021, 6:36 am. https://www.timesofisrael.com/on-passover-2021-iraqs-jewish-community-dwindles-to-fewer-than-five/

Farnetani, E. & Recasens, D. (2010). Coarticulation and connected speech processes. In: *The handbook of phonetic sciences* 2nd (edn.) Hardcastle, W., Laver, J. & Gibbon, F. (eds.), 316-352.

Fenton, P. (1990). ‘Judaeo-Arabic Literature’, In: *Religion, Learning and Science in the ʿAbbasid Period*. Young, Michael, J., Latham, J., and Serjeant, R. (eds.) Cambridge: Cambridge University Press, 461–76.

Ferguson, C. (1959). The Arabic Koine. *Language* 35/4: 616-630

Fleisch, H., “Imāla”, In: *Encyclopaedia of Islam, Second Edition*, Bearman, P., Bianquis, T., Bosworth, C., Van Donzel, E., Heinrichs. W., (eds.) Consulted online on 20 September 2021 http://dx.doi.org/10.1163/1573-3912_islam_COM_0368

Fleischer, H. (1888). *Kleinere Schriften* III. Osnabrück: Biblio Verlag.

Foreign Service Institute. (1961). *Tunisian Arabic*. Washington, D.C.: the Institute

Freeman, A. (2017). Phonetic variability in Moroccan Arabic rhotics. *The Journal of the Acoustical Society of America*, 141(5): 3578-3578.

__________. (2019). *Rhotic emphasis and uvularization in Moroccan Arabic* (Doctoral dissertation, University of Pennsylvania).

Frisch, S. (2017). Exemplar theories in phonology. In: *the Routledge handbook of phonological theory,* Hannahs, S. & Bosch, A. (eds.) 553-568. Routledge.

Fuchs, A. (2010). Mesopotamia and neighbouring regions in the late 7th and 6th cents. BC, In: *Brill's New Pauly Supplements I - Volume 3*: Historical Atlas of the Ancient World, English edition: Salazar, C. (ed.).

Fück, J. (1955). *ᶜArabīya. Untersuchungen zur arabischen Sprach- und Stilengeschichte*. Berlin: Akademie-Verlag.

Gąsiorowski, P. (2006). A shibboleth upon their tongues: Early English /r/ revisited. *Studia Anglica Posnaniensia 42:* 63-76.

Geng, C. (2007). *A cross-linguistic study on the phonetics of dorsal obstruents*. Berlin: PhD dissertation, Humboldt University

Gick, B. & Campbell, F. (2003). Intergestural timing in English /r/, In: '*Proceedings of the XVth International Congress of Phonetic Sciences*', Universitat Autònoma de Barcelona, Barcelona, 1911–1914.

Ghanima, Y. (1924) *Nuzhat al-mushtāq fī tarīkh yahūd al-'Irāq*. Baghdad, Al-Furat Publisher.

Glover, J. (2014). *Liquid vocalizations and underspecification in German dialects* (Doctoral dissertation, Indiana University).

Gorman, K. (2012). Exceptions to rhotacism. In: *Proceedings from the Annual Meeting of the Chicago Linguistic Society* (Vol. 48, No. 1, 279-293). Chicago Linguistic Society.

Gussmann, E. (2002). *Phonology: analysis and theory*. Cambridge: Cambridge University Press.

________. (2007). *The Phonology of Polish*. Oxford: Oxford University Press.

Hachimi, A. (2007). Becoming Casablancan. In: *Arabic in the city: Issues in dialect contact and language variation*, Miller, C., Al-Wer, E., Caubet, D., & Watson, J. (eds.) 5: 97-122. Routledge.

Hall, T. (1993). The phonology of German /R/. *Phonology 10*: 83–105.

________. (1997). *The phonology of coronals*. Amsterdam & Philadelphia: John Benjamins.

________. (2000). Typological generalizations concerning secondary palatalization. *Lingua*, 110(1): 1-25.

Hall, T. & Hamann, S. (2006). Towards a typology of stop assibilation. *Linguistics 44*: 1195-1236.

Hamann, S. (2003). *The phonetics and phonology of retroflexes*. Utrecht: LOT.

Harper, D. (1979-2021) *Online Etymology Dictionary*. Retrieved http://www.etymonline.com (July 22, 2021)

Hary, B. (2018). Judeo-Arabic in the Arabic-Speaking World. In: *Languages in Jewish Communities, Past and Present.* Hary, B. & Benor, S. (eds.), 35-69. Berlin, Boston: De Gruyter Mouton

Harris, J. (1969). *Spanish phonology*. Cambridge, MA: MIT Press.

_________. (1990) Segmental complexity and phonological government. *Phonology* 7: 255–300

_________. (1994). *English Sound Structure.* London, UK: Blackwell

Harris, J. & Lindsey, G. (1995) The elements of phonological representation, In: *Frontiers of Phonology: Atoms, Structures, Derivations*. Durand, J. & Katamba, F. (eds.) London and New York: Longman, 34–79.

_________. (2009). Why final obstruent devoicing is weakening. In: *Strength relations in phonology* 9-46. De Gruyter Mouton.

Harris, J. (2013). Wide-domain r-effects in English. *Journal of Linguistics*, *49(2)*: 329-365.

Heath, J. (1987). *Ablaut and ambiguity: Phonology of a Morcoccan Arabic dialect*. SUNY Press.

_________. (1997). Moroccan Arabic phonology. In: *Phonologies of Asia and Africa,* Kaye, A. (ed.) 1: 205–219. Winona Lake, Eisenbrauns.

_________. (2002). *Jewish and Muslim dialects of Moroccan Arabic*. Routledge Press.

Henshke, Y. (2018). The Hebrew and Aramaic component of Judeo-Arabic. In: *Languages in Jewish Communities, Past and Present,* Hary, B. & Benor, S. (eds.) 9-34. Berlin, Boston: De Gruyter Mouton

Kennedy, H. & Zaryāb, ʿA. (2020). “BAGHDAD i. Before the Mongol Invasion”, In: *Encyclopaedia Iranica Online*, © Trustees of Columbia University in the City of New York. Consulted online on 29 April 2021 <http://dx.doi.org/10.1163/2330-4804_EIRO_COM_6367> First published online: 2020 First print edition: 19881215

Holes, C. (2007). “Colloquial Iraqi Arabic” In: *Languages of Iraq, Ancient and Modern*, British School of Archaeology in Iraq, Postgate, N. (ed.) 123-134.

________. (2018) “Introduction” In: *Arabic Historical Dialectology: Linguistic and sociolinguistic approaches*. Holes, C. (ed.) Oxford: Oxford University Press. 1-28

Howson, P. (2018). *A phonetic examination of rhotics: gestural representation accounts for phonological behaviour* (Doctoral dissertation, University of Toronto (Canada).

Herrero, M. (1996). *El árabe marroquí: Aproximación sociolingüística*. Almería (Spain).

Herzallah, R. (1990). Aspects of Palestinian Arabic phonology: a non-linear approach, unpublished thesis, Cornell University.

Ibn al-ˁAdīm, K. (1951). *Zubdat al-ḥalab min tārīkh Ḥalab*, vol. I (1–457 AH/AD 622/1064). Sami Dahhan (ed.) Damascus: Institut Français de Damas.

Ibn-H̲allikān, A. (1868). *Ibn Khallikan's biographical dictionary.* Mac Guckin, W. (ed.) (Vol. 3). Duprat.

Ibn-Jinnī, A. (1954). *Sirr ṣināᶜat Al-iᶜrāb*. Al-saqqa, M. (ed.), Matbaᶜat al-Bābī al-Halabī, Cairo

Ibrahim, M. (1969). *Ibn Al-Sakeet Al-Lughawi*. Ph.D. Dissertation. Cairo.

Ingham, B. (1973). Urban and rural Arabic in Khūzistān. *Bulletin of the School of Oriental and African Studies*, 36(3): 533-553.

_________. (1997). *Arabian diversions: studies on the dialects of Arabia*. Lebanon: Ithaca Press.

_________.(1994). *Najdi Arabic: Central Arabian*. Amsterdam: John Benjamins.

Ismail, H. (2007). The urban and suburban modes: patterns of linguistic variation and change in Damascus. In: *Arabic in the city: Issues in dialect contact and language variation*, Miller, C., Al-Wer, E., Caubet, D., & Watson, J. (eds.). 5: 188-212. Routledge.

Issa, A. (2017). Acoustic cues to the singleton-geminate contrast: the case of Libyan Arabic sonorants*. Proc. Interspeech 2017*: 2988-2992.

Iverson, G. & Salmons, J. (2007). Domains and directionality in the evolution of German final fortition. *Phonology* 24: 121–145.

Jakobson, R., Fant, G. & Halle, M. (1952) *Preliminaries to speech analysis: the distinctive features and their correlates* (Second edition). Cambridge, MA: MIT Press.

Jakobson, R. & Halle, M. (1956) *Fundamentals of language*. The Hague: Mouton.

_________. (1968). "Phonology in relation to phonetics". In: *Manual of phonetics*, Malmberg, B. (ed.), 411-49. Amsterdam: North-Holland.

Jastrow, O. (1979). “Zur arabischen Mundart von Mossul.” *Zeitschrift für arabische Linguistik* 2: 36–75.

_________. (1983). “Tikrit Arabic verb morphology in a comparative perspective.” *Al-Abḥāth* 31: 99–110.

_________. (1991). ‘Unheimliche Begebnisse in Sendor’, In: *Semitic Studies in Honour of Wolf Leslau on the Occasion of His Eighty-Fifth Birthday November* 14th, 1991, Kaye, A. (ed.) Vol. 1. Wiesbaden: Harrassowitz: 773–84.

_________. (1993). ‘Geschichten Aus Sendôr’, *ZAL 25*: 161–77.

_________. (2006a). “Anatolian Arabic”. In: *Encyclopedia of Arabic Language and Linguistics*. Versteegh, K. (ed.). Vol. 1. Leiden: Brill, 87–96

________. (2006b). “Iraq”. In: *Encyclopedia of Arabic Language and Linguistics*. Versteegh, K. (ed.) Online edition. Vol. 2. Leiden: Brill, 414–424

Jesus, L. & Shadle, C. (2005). ‘Acoustic analysis of European Portuguese uvular [χ ʁ] and voiceless tapped alveolar [ɾ̥] fricatives’, *Journal of the International Phonetic Association 35*(1): 27–44.

Johnstone, T. (1967). *Eastern Arabian dialect studies* (Vol. 17). Oxford UP.

________. (1975). “The spoken Arabic of Tikrit.” *Annual of Leeds University, Oriental Society* VII: 89–109.

Kaye, J. & Lowenstamm, J. (1981). Syllable structure and markedness theory, In: *Theory of Markedness in Generative Grammar*, Belle, A., Brandi, L., & Rizzi, L. (eds.) Pisa: Scuola Normale Superiore, 287–315.

________. (1984). De la syllabicité, In: *Forme Sonore du Langage*, Dell, F., Hirst, D. & Vergnaud, J-R. (eds.), Paris: Hermann 123–159.

Kaye, J., Lowenstamm, J. & Vergnaud, J. (1985). The internal structure of phonological representations: A theory of charm and government. *Phonology Yearbook* 2: 305–328.

Kaye, J. (1989). *Phonology: a cognitive view*. Hillsdale: Erlbaum. WEB .328–305.

Kaye, J., Lowenstamm, J. & Vergnaud, J. (1990) Constituent structure and government in phonology. *Phonology 7*: 193–231

Kaye, J. (2005). GP, I'll have to put your flat feet on the ground. In: *Organizing grammar. Studies in honor of Henk van Riemsdijk*, Broekhuis, H. Corver, N. Huybregts, R., Kleinhenz, U. & Koster, J. (eds.), 383–288. Berlin: Mouton de Gruyter

Kennedy, H. (2007). *The great Arab conquests: how the spread of Islam changed the World we live in*. London: Weidenfeld and Nicolson

Kenstowicz, M. (1994). *Phonology in Generative Grammar.* Massachusetts: Blackwell Publishing.

Khan, G. (1995). 'The pronunciation of resh in the Tiberian tradition of Biblical Hebrew', *Hebrew Union College Annual*, LXVI 67-80.

________. (2018a). "Judaeo-Arabic." In: *Arabic Historical Dialectology: Linguistic and sociolinguistic approaches*. Holes, C. (ed.) Oxford: Oxford University Press. 148–170.

________. (2018b). Jewish Neo-Aramaic in Kurdistan and Iran. In: *Languages in Jewish Communities, Past and Present*, Hary, B. & Benor, S. (eds.) 9-34. Berlin, Boston: De Gruyter Mouton

Khattab, G. (2002). /r/ production in English and Arabic bilingual and monolingual speakers. *Leeds Working Papers in Linguistics and Phonetics*, 9: 91-129.

Khattab, G. & Al-Tamimi, F. (2006). *Variation in (r) production by Jordanian speakers*, manuscript.

Kochetov, A. (2005). Phonetic sources of phonological asymmetries: Russian laterals and rhotics. *Canadian Linguistics Association*, 1-12.

________. (2011). "Palatalization". In: *The Blackwell companion to phonology*, Van Oostendorp, M., Ewen, C., Hume, E. & Rice, K. (eds.) Vol. 3: 1666-1690. Malden, MA: Wiley

Krämer, M. (2012). On the form and contents of contrastive features. In: *Underlying Representations* (Key Topics in Phonology, 149-175). Cambridge: Cambridge University

Kula, N. & Marten, L. (1998) Aspects of nasality in Bemba. *SOAS Working Papers in Phonetics and Linguistics* 8: 191–208

Kula, N. (2002) *The phonology of verbal derivation in Bemba*. PhD. dissertation, University of Leiden. Utrecht: LOT Publications

Kula, N., Botma, B. & Nasukawa, K. (2013) “features” In: *The Bloomsbury Companion to Phonology,* Kula, N., Botma, B., & Nasukawa, K. (eds.) (33-63). Bloomsbury Publishing.

Labrune, L. (2021) “Word-initial rhotic avoidance: a typological survey”, *Glossa: a journal of general linguistics 6(1)*: 9. doi: https://doi.org/10.5334/gjgl.922

Ladefoged, P. (1975). *A course in phonetics*. New York: Harcourt Brace Jovanovich.

Ladefoged, P. & Johnson, K. (2011). *A course in phonetics*. Sixth ed. Cengage Learning, Boston.

Ladefoged, P. & Maddieson, I. (1996). *The sounds of the world's languages*. Oxford: Blackwell.

Laver, J. (1994). *Principles of phonetics*. Cambridge: Cambridge University Press.

Lavoie, L. (2001). *Consonant strength: phonological patterns and phonetic manifestations*. New York and London: Garland Publishing.

Lawson, E. & Scobbie, J. & Stuart-Smith, J. (2015). The role of anterior lingual gesture delay in coda /r/ lenition: an ultrasound tongue imaging study, In: *‘Proceedings of the 18th International Congress of Phonetic Sciences’*, The Scottish Consortium for ICPhS. Article 0332.

Lehn, W. (1963). Emphasis in Cairo Arabic. *Language 39*(1): 29–39. DOI: http://doi.org/10.2307/410760

Levin, A. (1975). The vernacular poetry of Ṣafiyy al-Dīn al-Ḥillī: A source for the reconstruction of Iraqi Arabic in the 14th Century. In: *Israel Oriental Studies* V. Tel Aviv University: Faculty of Humanities. 259-276. Reprinted in Levin, Linguistic, article XIII.

Lindau, M. (1980). The story of /r/. *The Journal of the Acoustical Society of America*, 67(S1): S27-S27.

_________. (1985). The story of /r/. In: *Phonetic linguistics: Essays in honor of Peter Ladefoged*, Fromkin, V. (ed.), 157-168. Orlando, FL: Academic Press.

Lodge, K. (2009). *A Critical Introduction to phonetics*. London: Continuum

Lowenstamm, J. (1996). CV as the only syllable type. In: *Current trends in phonology: models and methods*, vol. 2, Durand, J. & Laks, B. (eds.) 419–441. Salford, Manchester: ESRI.

Maddieson, I. (1980). “A survey of liquids”. *UCLA Working Papers in Phonetics 50*: 93-112.

_________. (1984). *Patterns of sounds*. Cambridge: Cambridge University Press.

Magidow, A. (2013). *Towards a sociohistorical reconstruction of pre-Islamic Arabic dialect diversity*. PhD Dissertation, The University of Texas at Austin.

Mansour, J. (1957). The Arabic dialect of the Jews of Baghdad and the pronunciation of Hebrew. *Journal of Jewish studies 8*: 187–198. DOI: http://doi.org/10.18647/320/JJS-1957

_________. (1991). *The Jewish Baghdadi dialect: studies and texts in the Judeo-Arabic dialect of Baghdad* (Vol. 7). The Babylonian Jewry Heritage Center, the Institute for Research on Iraqi Jewry.

Masica, C. (1991). *The Indo-Aryan languages*. Cambridge: Cambridge University Press.

Marçais, P. (1956). *Le parler arabe de Djidjelli* (Nord Constantionois, Algérie), Paris

_________. (1977). *Esquisse grammaticale de l'arabe maghrébin*, Paris: Maisonneuve.

McCarthy, J. (1986). "OCP effects: gemination and antigemination". *Linguistic Inquiry 172*: 207–263.

McGregor, W. (1988). On the status of the feature rhotic in some languages of the North-West of Australia. *Aboriginal linguistics* 1: 166-187.

McKay, G. (1975). *Rembarnga: a language of central Arnhem land*. PhD thesis, The Australian National University (Australia).

Mielke, J. (2008). "Emergent feature theory". In: *Proceedings from the Panels of the 41st Meeting of the Chicago Linguistic Society*, Edwards, R., Midtlyng, P., Sprague, C., & Stensrud, K. (eds.) Volume 41-2. Chicago: CLS. 259-273.

Mitchell, T. (1993). *Pronouncing Arabic* (Vol. 2). Oxford University Press.

Montgomery, J. (2018). Al-Jāḥiẓ on Misarticulation: Bayān 1.34.4-74.8. *Journal of Arabic Literature, 49*(1-2): 1–22. https://www.jstor.org/stable/26571515

Morin, Y. (2013). From apical [r] to uvular [ʀ]: what the apico-dorsal r in Montreal French reveals about abrupt sound changes. In: *Studies in phonetics, phonology and sound change in Romance*, Miret, S., Recasens, F.&D. (eds.), Munich: Lincom Europa. 65-93.

Morony, M. (1984*). Iraq after the Muslim Conquest*. Princeton, NJ: Princeton University Press.

_________. (2005). *Iraq after the Muslim Conquest* (2nd edition). Piscataway, NJ: Gorgias Press.

Moscoso, F. (2003). "Textos en árabe Šāwnī (Marruecos): Algunos datos comparativos del habla masculina y femenina." *so* 95: 207–231.

Müller-Kessler, C. (2006). "Aramaic", In: *Brill's New Pauly, Antiquity volumes*, Cancik, H. & Schneider, H. (eds.), English Edition: Salazar, C. (ed.), Classical Tradition volumes: Landfester, M. (ed.), English Edition: Gentry, F. (ed.), Consulted online on 02 August 2021 <http://dx.doi.org/10.1163/1574-9347_bnp_e131280> First published online: 2006 First print edition: 9789004122598, 20110510

Myers, S. (2015). An acoustic study of Luganda liquid allophones. *Journal of African Languages and Linguistics*, *36*(1): 67-92.

Nandris, O. (1963). *PhoneÂtique Historique du Roumain*. Paris: Klincksiek.

Nasukawa, K. & Backley, P. (2005). 'Dependency Relations in Element Theory'. *Leiden Papers in Linguistics 2.4*: 77–93 (special issue: Proceedings of the Government Phonology Workshop, Leiden, December 3, 2004, Kula, N. & Van de Weijer, K. (eds.)).

_________. (2011). "The internal structure of 'r' in Japanese". *Phonological Studies* 14: 27–34.

Nasr, R. (1966). *Colloquial Arabic: an oral approach*. Beirut: Librarie du Liban.

Natvig, D. (2020). Rhotic underspecification: Deriving variability and arbitrariness through phonological representations. *Glossa: A Journal of General Linguistics*, 5(1): 48.

Nevo, M. (1991). *The Arabic dialect of the Jews of Aleppo: phonology and morphology*. PhD thesis, Hebrew University of Jerusalem (in Hebrew).

Newman, D. (2005). Contrastive analysis of the segments of French and Arabic. In: *Investigating Arabic: current parameters in analysis and learning*. Studies in Semitic languages and linguistics, 42: 185-206 Leiden: Brill

Nissen, H. (2006). (Berlin) and Oelsner, J. (Leipzig), "Mesopotamia", In: *Brill's New Pauly, Antiquity volumes,* Cancik, H. & Schneider, H., (eds.), English Edition: Salazar, C. (ed.), Classical Tradition volumes: Landfester, M.(ed.), English Edition: Gentry, F. (ed.), Consulted online on 19 July 2021 <http://dx.doi.org/10.1163/1574-9347_bnp_e800690> First published online: 2006 First print edition: 9789004122598, 20110510

Öpengin, E. (2020). "Kurdish" In: *Arabic and contact-induced change*, Lucas, C., & Manfredi, S. (eds.), Language Science Press.

Orthmann, E. (2002). *Stamm und Macht: Die arabischen Stämme im 2. und 3. Jahrhundert der Higˇra*. Wiesbaden: Reichert.

Owens, J. (2006). *A linguistic history Of Arabic*. Oxford: Oxford University Press.

Paradis, C. & LaCharité, D. (2001). Guttural deletion in loanwords. *Phonology 18(2)*: 255–300. DOI: http://doi.org/10.1017/S0952675701004079

Parker, S. (2002). Quantifying the sonority hierarchy (Unpublished doctoral dissertation). University of Massachusetts, Amherst.

________. (2011). "Sonority". In: *The Blackwell Companion to Phonology* (Vol. 2). Van Oostendorp, M., Ewen, C., Hume, E. & Rice, K. (eds.) doi: 10.1002/9781444335262.wbctp0049

Paul, H. (1880). *Prinzipien der sprachgeschichte*. Tübingen: Niemeyer.

Pellat, C. & Longrigg, S., "al-Baṣra", In: *Encyclopaedia of Islam, Second Edition*, Bearman, P., Bianquis, T., Bosworth, C., Van Donzel, E., Heinrichs, W. (eds.) Consulted online on 30 April 2021 <http://dx.doi.org/10.1163/1573-3912_islam_COM_0103> First published online: 2012 First print edition: ISBN: 9789004161214, 1960-2007

Ploch, S. (1993). *The vocalic systems of standard German and Augsburg Swabian and rhotic effects on the internal structure of vowels*. MA thesis, SOAS, University of London

_________. (1999) *Nasals on my mind: The phonetic and the cognitive approach to the phonology of nasality*. PhD. dissertation, SOAS

Pope, M. (1961). *From Latin to Modern French with especial consideration of Anglo-Norman: Phonology and Morphology*. University of Manchester. The University Press.

Prochazka, P. (1988). *Saudi Arabian dialects*. Library of Arabic Linguistics, No. 8. London: Kegan Paul International.

___________. (2018). The Northern fertile crescent. Arabic historical dialectology: *Linguistic and sociolinguistic approaches*, 257-92.

___________. (2020). Arabic in Iraq, Syria, and Southern Turkey. *Arabic and contact-induced change*, 1: 83.

Proctor, M. (2009). *Gestural characterization of a phonological class: the liquids*. PhD dissertation: Yale University.

_________. (2011). Towards a gestural characterization of liquids: Evidence from Spanish and Russian. *Laboratory Phonology*, *2*(2): 451-485.

Puech, G. (1994). *Ethnotextes Maltais*. Wiesbaden: Harrassowitz.

Punnoose, R. (2011). *An auditory and acoustic study of liquids in Malayalam*. Ph.D. thesis, Newcastle University.

Rahmouni, A. (2014). *Storytelling in Chefchaouen Northern Morocco: An annotated study of oral performance with transliterations and translations*. BRILL.

Recasens, D. (1991). On the production characteristics of apicoalveolar taps and trills. *Journal of Phonetics* 19: 267-280.

Recasens, D. & Maria P. (1999). A study of /ɾ/ and /r/ in the light of the "DAC" coarticulation model. *Journal of Phonetics 27(2)*: 143–169.

Recasens, D. (2018) "Coarticulation". *Oxford Research Encyclopedia of Linguistics*. Retrieved 27 Sep. 2021, from https://oxfordre.com/linguistics/view/10.1093/acrefore/9780199384655.001.0001/acrefore-9780199384655-e-416.

Rennicke, I. (2015). *Variation and change in the rhotics of Brazilian Portuguese*. PhD dissertation, University of Helsinki.

Ripper, T. (2000). *Die Marwāniden von Diyār Bakr: Eine kurdische Dynastie im isla-mischen Mittelalter*. Würzburg: Ergon.

Roberts, P. (2012). Latin rhotacism: A case study in the life cycle of phonological processes. *Transactions of the Philological Society*, 110(1): 80-93.

Roux, A. (1925). *Le parler arabe des musulmanes de Meknès*. Thèse de doctorat. Aix-en-Provence.

Sankoff, G. & Blondeau, H. (2007). Language change across the lifespan: /r/ in Montreal French. *Language 83*: 560-88.

Sankoff, G. (2015). The speech community as a social fact. *Asia-Pacific Language Variation*, *1*(1): 23-51.

Sassoon, D. (1927). The history of the Jews in Basra. *The Jewish Quarterly Review*, 17(4): 407-469.

Scheer, T. (1996). Une théorie de l'interaction directe entre consonnes: contribution au modèle syllabique CVCV. Ph.D. dissertation, Université Paris VII.

Scheer, T. & Kula, N. (2017). Government Phonology, Element Theory, conceptual issues and introduction. In: *the Routledge handbook of phonological theory,* Hannahs, S., Bosch, A. (eds.) 226-261. Routledge.

Scheer, T. & Cyran, E. (2017). Syllable structure in Government Phonology. In: *the Routledge handbook of phonological theory*, 262-292. Routledge.

Schulte, M. (1985). *The word and the syllable in the spread of emphasis in Cairene Arabic.* MA thesis, University of Arizona.

Scobbie, J. (2006). (R) as a variable, in: *'Encyclopedia of Language and Linguistics'*, 2nd (edn.), Vol. 10, Brown, K. (ed.) Elsevier, Oxford, 337–344.

Scobbie, J. & Sebregts, K. (2010). Acoustic, articulatory, and phonological perspectives on allophonic variation of /r/ in Dutch, In: '*Interfaces in Linguistics: New Research Perspectives*', Folli, R. & Ulbrich, C. (eds.), Oxford University Press, 257–277.

Sebregts, K. (2015). *The sociophonetics and phonology of Dutch /r/*. LOT University Utrecht.

Shaheen, K. (1979). *The acoustic analysis of Arabic Speech*. PhD Thesis. University of Wales.

Sharqāwī, M. & al-Sharkawi, M. (2010). *The ecology of Arabic: A study of Arabicization*. Brill.

Sībawayh, A. (1982). *Kitab Sībawayh.* Hārūn, A. (ed.) Vol. 4, Cairo: Al-Khanji.

Smith, R., & Hanson, K. (eds.). (2007). *Thesaurus syriacus*. Wipf and Stock Publishers.

Solé, M., Ohala, J., Ying, G., (1998). Aerodynamic characteristics of trills. *Proceedings of the 16th International Congress of Acoustics, and the 135th Meeting of the Acoustical Society of America,* 2923-2924.

Solé, M. (2002). Aerodynamic characteristics of trills and phonological patterning. *Journal of Phonetics*. 30: 655-88.

Straka, G. (1979a). "Contribution à la description et à l'histoire des consonnes L". In: *Les sons et les mots*, Straka, G. (ed.) 363-422. Paris: Éditions Klincksieck.

_________. (1979b) "L'évolution phonétique du Latin au Français sous l'effet de l'énergie et de la faiblesse articulatoire". In: Straka, G. (ed.), *Les sons et les mots*, 213-294. Paris: Éditions Klincksieck.

_________. (1979c) "Contribution à l'histoire de la consonne R en français". In: *Les sons et les mots*, Straka, G. (ed.), 465-499. Paris: Éditions Klincksieck.

Streck, M. (Munich), "Akkadian", In: *Brill's New Pauly, Antiquity volumes*, Cancik, H. & Schneider, H. (eds.), English Edition: Salazar, C. (ed.), Classical Tradition volumes: Landfester, M. (ed.), English Edition: Gentry, F. (ed.) Consulted online on 02 August 2021 <http://dx.doi.org/10.1163/1574-9347_bnp_e111900> First published online: 2006

Stroomer, H. (2004). The Arabic dialect of women in Meknes. In: *Approaches to Arabic dialects*, Haak, M., De Jong, R. & Versteegh, K. (eds.) Leiden: Brill, 291–307.

Stuart-Smith, J. (2004). *Phonetics and philology: sound change in Italic*, Oxford: Oxford University Press.

Suzuki, K. (1998). *A typological investigation of dissimilation*. Ph.D. dissertation, University of Arizona.

Sylak-Glassman, J. (2014). *Deriving natural classes: the phonology and typology of post-velar consonants*. Doctoral Dissertation, University of California, Berkeley.

Tawfiq, M. (2010). The /r/ phoneme in Mosuli Arabic: A phono-pragmatic study. *Adab Al-Rafidayn* 57: 31–45.

Toral-Niehoff, I. (2006). "Baṣra", In: *Brill's New Pauly, Antiquity volumes,* Cancik, H. & Schneider, H. (eds.), English Edition: Salazar, C. (ed.), Classical Tradition volumes: Landfester, M. (ed.), English Edition: Gentry. F. (ed.), Consulted online on 30 April 2021 <http://dx.doi.org/10.1163/1574-9347_bnp_e12220230> First published online: 2006 First print edition: 9789004122598, 20110510

Torre, E. (2003). *Dutch sonorants. The role of place of articulation in phonotactics*. Utrecht: LOT.

Trask, R. (1978). Basque (Western Low Navarrese dialect). *Journal of the International Phonetic Association*, 8(1-2): 75-79.

__________. (1996). *A dictionary of phonetics and phonology*. London: Routledge.

Van Oostendorp, M. (2008). Incomplete devoicing in formal phonology. *Lingua*, 118(9): 1362-1374.

Van Otterloo, K. (2011). *The Kifuliiru language. Volume 1 – phonology, tone, and morphological derivation*. Dallas: SIL International.

Vennemann, T. (1988). *Preference laws for syllable structure and the explanation of sound chang*e. Berlin: Mouton de Gruyter.

Versteegh, K. (2014). *The Arabic language* (2nd ed.). Edinburgh: Edinburgh University Press

Vihman, M. (1996). *Phonological development*. Cambridge, MA: Blackwell.

Walsh Dickey, L. (1997). *The phonology of liquids*. University of Massachusetts, Amherst.

Watson, J. (2002). *The phonology and morphology of Arabic*. New York: Oxford University Press.

Wetzels, W., & Mascaró, J. (2001). The typology of voicing and devoicing. *Language*, 207-244.

Wells, J. (1968). Nonprevocalic intrusive /r/ in urban Hampshire. *Progress Report*, Department of Phonetics, University College, London.

__________. (1970). Local accents in England and Wales. *Journal of Linguistics*, 6(2): 231-252.

Whitley, S. (2003). Rhotic representation: problems and proposals. *Journal of the International Phonetic Association*. 33: 81–86.

Wiese, R. (2001). The phonology of /r/. In: *'Distinctive Feature Theory'*, Hall, T. (ed.), De Gruyter, Berlin, 335–368.

__________. (2003). The unity and variation of (German) /r/. *Zeitschrift Für Dialektologie Und Linguistik,* 70(1): 25-43. Retrieved from http://www.jstor.org/stable/40504887

__________. (2011). The representation of rhotics. In: *The Blackwell Companion to Phonology, vol. 1.* Van Oostendorp, M. Ewen, C., Hume, E., Rice, K. (eds.) *711-729.* Blackwell. https://doi.org/10.1002/9781444335262.wbctp0030

Wigforss, E. (1975). Foreign accent and bilingualism. *Working papers/Lund University*, Department of Linguistics and Phonetics, 10.

Wigoder, G., Paul, S., Viviano, B., & Stern, E. (1986). *Illustrated dictionary & concordance of the Bible.* Macmillan

Wikipedia contributors. (2021, July 19). "Mesopotamia". In: *Wikipedia, The Free Encyclopedia*. Retrieved 15:11, August 2, 2021, from https://en.wikipedia.org/w/index.php?title=Mesopotamia&oldid=1034369528

Wilhelm E. (1983). "Iran and Mesopotamia". In: *The Cambridge History of Iran*, vol. *3*, Yarshater, E. (ed.)*,* Cambridge: Cambridge University Press.

Wolff, G. (1958). The French R: A study in historical phonetics and phonemics. *Dissertation Abstracts*. 19: 322-323

Yoda, S. (2005). *The Arabic dialect of the Jews of Tripoli (Libya): grammar, text and glossary*. Wiesbaden: Harrassowitz.

Younes, M. (1982). Problems in the segmental phonology of Palestinian Arabic, unpublished thesis, University of Texas, Austin, USA.

__________. (1993). Emphasis spread in two Arabic dialects. In: *Perspectives on Arabic linguistics V*, Eid, M. & Holes, C. (eds.), 119–145. Amsterdam: John Benjamins. DOI: http://doi.org/10.1075/cilt.101.08you

_________. (1994). On emphasis and /r/ in Arabic. In: *Perspectives on Arabic Linguistics VI*, Eid, M., Cantarino, V. & Walters, K. (eds.) 215–235. Amsterdam: John Benjamins. DOI: http://doi.org/10.1075/cilt.115.16you

Youssef, I. (2013). *Place assimilation in Arabic: contrasts, features, and constraints*. Tromsø: University of Tromsø dissertation. https://munin.uit.no/handle/10037/5347.

_________. (2019). The phonology and micro-typology of Arabic R. *Glossa: A Journal of General Linguistics* 4(1): 131. 1–36.

Zawadowski, Y. (1978). *The Maghrib Arabic dialects*. Moscow: 'Nauka' Publishing House.

Zemánek, P. (2011). “Dissimilation”. In: *Encyclopedia of Arabic Language and Linguistics*, Lutz, E. et al. (eds.) Brill Reference Online. Web. 29 Sept. 2021.

Appendix

نموذج الموافقة اللفظي:
أجري اليوم هذه المقابلة كجزء من رسالة الدكتوراه في جامعة درم. الهدف من هذا البحث هو دراسة الاصوات الساكنة في اللهجات العربية. سوف أقوم بتسجيل هذه المقابلة بعد اخذ اذنك بالموافقة على المشاركة في هذا البحث. هذا الاجراء هو جزء من متطلبات جامعة درم في اخلاقيات البحث ولهذا السبب اريد التأكيد على أهمية موافقتك على المشاركة في هذه الدراسة مع اطلاعك على استخدامات هذه البيانات (المقابلة) وكيفية حفظها.

بإمكانك طرح أي سؤال او استفسار خلال هذه المقابلة.

1. هذه المقابلة هي جزء من حقل دراستي في اللهجات العربية. هدفي من هذا البحث هو دراسة النظام الصوتي للغة العربية.
2. خلال هذه المقابلة، لك كامل الحرية بطرح أي سؤال او استفسار عن طبيعة مشاركتك في هذه الدراسة. تستطيع الانسحاب من هذه الدراسة متى تريد. سوف يتم الاحتفاظ بهذه المقابلة على الكمبيوتر المحمول الخاص بي. اذا اردت التحفظ على خصوصية أي بيانات او معلومات قبل، خلال أو بعد المقابلة الرجاء اخبارنا بذلك. سوف أقوم بالاحتفاظ ببيانات شخصية تعريفية عن كل مشارك بهذه الدراسة مثل: الاسم، العمر التقريبي، اللهجة الام، ودولة المتحدث (لأن هذه العوامل تؤثر على لكنة المتحدث فنأخذها بعين الاعتبار). سوف أقوم أيضا بجمع ملاحظات خلال المقابلة الهدف منها مساعدة الباحث فهم العوامل الصوتية من خلال طرح أسئلة (مثل تاريخ معين او موقع معين). سوف يتم الاحتفاظ بهذه الملاحظات على الكمبيوتر المحمول الخاص بي. اذا اردت الإشارة الى متحدث بعينة في رسالة الدكتوراه، سوف اشير للمتحدثين في هذه الدراسة بـ (متحدث ١) او (متحدث ٢) الذي يعيش الان في تل ابيب أو لندن أو شيكاغو الخ.
3. الهدف من هذه المقابلة هو اجراء ملاحظات وتحليل للخصائص الصوتية للمتحدث بعد التسجيل وكتابة الصوت. سوف أقوم بنشر تحليلي لهذه الخصائص الصوتية برسالة الدكتوراه. هذا بالإمكان أن يتضمن تحليل ومناقشة للخصائص السمعية والصوتية للمتحدثين. سوف يتم استخدام هذه البيانات الصوتية في مؤتمرات، ندوات ونشرات اكاديمية عند الحاجة. اذا تفضل عدم الإفصاح عن أي بيانات دالة عليك بالاسم الرجاء أخباري.
4. الرجاء الادلاء باسمك وبموافقتك على المشاركة بهذه الدراسة.
5. هل لديك أي أسئلة أو استفسارات قبل البدء بالمقابلة؟
6. الآن بدوري أقوم بتوثيق تاريخ اليوم والوقت لفظياً قبل البدء بالمقابلة.

Verbal Consent
[NOTE: With most consultants, consent will be obtained in Arabic; a broad English translation is provided below for indicative purposes.]

I am conducting this interview as part of my doctoral research project at Durham University. The purpose of the study is to investigate consonant sounds in spoken dialects of Arabic. If you agree to participate in this study, I will record our interview. My university has Ethics Guidelines for conducting research with people, and in order to comply with the guidelines I would like to ensure that you consent to participate in this study and that you understand how the recording of our interview will be used and stored.

Please feel free to interrupt me at any point if you have any questions or concerns.

1. This interview is being conducted as part of my fieldwork research on spoken dialects of Arabic. I am researching the phonology (that is, the sound systems) of Arabic.

2. During our interview, please feel free to ask any questions about the fieldwork and your participation. If you wish to withdraw from this study, you may do so at any time. The recording of our interview will be kept on a secure laptop that only I will have access to. If you would like to keep any details confidential, please let me know. I will keep a spreadsheet with a note of all the speakers I interview, including name, approximate age, their mother dialect and their locations (because this can influence the dialect); I will also keep a record of observational data about the interview, such as date and location. This spreadsheet will be kept on a secure laptop that only I have access to. In my dissertation, if I need to refer to language speakers, then I intend to do that using just a 'number' I would decide on to refer to that speaker, i.e. 'speaker 1' who lives now in Tel Aviv, 'speaker 2' who lives now in London, etc.

3. This fieldwork is about observing and analyzing your speech patterns and this interview will be recorded and transcribed. In my dissertation, I will publish my analyses of the speech data. This may include acoustic details and discussions of speakers' pronunciation. This data may also be used in an article or conference paper or other research publication. If you would prefer me not to acknowledge you by name, please let me know.

4. Please confirm your name and that you agree to take part in this study.

5. Before we begin, do you have any questions?

6. (Me) say the time and the date of this interview.

Ethical Approval Reference: MLAC-2020-07-21T12:30:22-jfnh44

Table A: Metadata of Language Consultants

Speaker	DoB	Education	Where recorded	Corpus	Topic(s)
Female 1 (F1)	N/A	N/A	UK	Timan	Life of Iraqi Jews from 1930s to 1974
Female 2 (F2)	14th Feb, 1921	Elementary	Israel	Timan	Life in Iraq
Female 3 (F3)	1922	Secondary	UK	Timan	Home Life in Iraq 1930 to 1960
Female 4 (F4)	1914	Secondary	Canada	Timan	Early Life in Iraq and India
Female 5 (F5)	1944	Secondary	Israel	Timan	Her journey out of Iraq through Kurdistan and Iran, and to Israel

Male 1 (M1)	16th Dec, 1921	N/A	UK	Timan	Life of Iraqi Jews from 1930s to 1974
Male 2 (M2)	15th April, 1929	University	Israel	Timan	Kursi-Jafuf, Kaparot
Male 3 (M3)	Sep 1926	University	Israel	Timan	Early Life
Male 4 (M4)	14th Feb, 1921	Master's	UK	Timan	Home & Education
Male 5 (M5)	1952	Secondary	UK-Israel	Uthman	Children rhymes, children games, kinship structure, proverbs, traditional medicine, myths and superstitions, types and names of jewelleries and Jewish Iraqi folklore. Also, cities in Iraq & areas in Baghdad, animal terms, means of transportation, ordinal and cardinal numbers, colour terms, identifying ethnic groups, food, taboo words, swear words, and loanwords
Male 6 (M6)	14th Oct, 1932	PhD	USA-UK	Uthman	Proverbs, Food, colour terms, means of transportation, myths & superstition, traditional medicine
Male 7 (M7)	18th Nov, 1949	University	Israel	Timan	His life in Iraq & his New Life in Israel

JBBA Raw Data: Timan's Corpus: **460 T**; Own Corpus: **497 T = 957**

Timan Corpus: M1 & F1:[168] Life of Iraqi Jews from 1930s to 1974

Etymological *r > r

	JBBA	Gloss	Time	Remarks
1.	[həlɪˈkɔb̥tər]	'helicopter'	(28:22)	A recent borrowing [ˈhəlɪˌkɔb̥.tər] <ENG shows that /r/ is retained. It also shows that /r/ is already available in the native speaker grammar. Compare to [tˤəjjɑːʁˈʁɑt] 'planes' at (28:21) both tokens by M1.
2.	[ʔərˈbɑʕ]	'four'[169]	(22:19-20)	One token only by F1 (his wife) and another by M0 (the interviewer) approximately within the same time slot. It could be approximant /ɹ/?. Vs. [ʔəʁˈbɑʕ] (18:53, 19:23, 22:19, 23:09, 23:45), vs. [oːˈbɑʕ] (5:11). Also [obˈʕin] 'forty' in <1942, -46, -48> at (1:49, 3:39, 3:45, 5:52, 8:11, 10:35, 10:59, 11:01, 11:21, 12:03, 12:16). The last two vocalized tokens have to be checked again in case there could be a very light [ʁ].
3.	[ˈʁʊbɪʕ][170]	'quarter'	(9:10, 40:33)	Refer to the notes above on 'four' and 'fourty'. Also cf. [tlɛt

[168] M1 (Male born Dec 1921) and F1 (Female) recorded on July 10th, 2006 in London.
[169] Compare to (3.)
[170] This token has been added to compare it to (2.) 'four, forty'

			ʔəʁˈbɑ·ʕ] ‘three quarters’ (3:37).
4. [bəl-ʔərbɑʕ au-sɪˈtin]	‘in 1964’	(19:32)	By F1 at (19:32) vs. [bəl-ʔəʁbɑʕ au-sɪˈtin] ‘in 1964’ by M1 (20:14).
5. [ħaˈrir]	‘silk’	(40:39)	And by M0.
6. [ʔəkˈθi·ɹ]??	‘a lot’	(6:35)	Vs. [ʔəkˈθi·ʁ] ‘many/much’ (3:24, 5:56, 12:51), [ʔəkˈθi·ʁ-i] DIM? *Imala* at (31:10). Also, [ʔəkˈθɑʁ-ʌm] 'most of them' (9:16, 11:09)
7. [ʕɛ-l-bɑsˤˈɹɑː]	‘to Basra’	(22:10)	Not clear for F1 as it could be also /r ~ ʁ/ but more likely / ʁ/. Again, this token was expected to show /r/ as is the case in (proper nouns).
8. [ʕəʃˈɹin]	‘20’	(35:06)	A bit unclear could be also very light /ʁ/ vs. [ʕəʃˈʁin] in (2:01 ‘in 29’ 23:25, 26:41-44 F1, 38:01).
9. [ʕɑʃɑr-ˈɑt]	'10s'	(13:10)	[ʕɑʃər ʔəsˈni·n] ~ʁ ‘10 years’ F1 (21:18), But [ˈʕɑʃʌʁɑ] ‘10’ (8:50, 12:33, 12:40, 14:20, 14:55, 14:58), [ˈʕɑʃʌʁ] ‘10’ (9:05), [aw ˈʕɑʃʌʁ] (14:06) [ʔəl-ˈʕɑʃʌʁ] (9:08) [ʕɑqʊb ˈʕɑʃəʁ t-əʃhʌʁ] ‘after 10 months’ (7:30). F1: [ʕɑʃər ʔəsˈnin] /r ~ ɹ/’10 years’ (21:18).
10. [ʕɛ-l-bɑsˤɹɑː]	‘to Basra’	(22:10)	By (F1) could be also /ʁ ~ r/. vs. [ʕɛ-l-bɑsˤˈʁɑː] (22:12). Also, [ɛl-bɑsˤˈʁɑː] ‘Basra’ (9:30, 10:03,

			10:38). All of these tokens are interesting as ‘Basra’ is a (proper Noun) and the /r/ was subject to change.
11. [tɪkˈɹi·t]	‘tikrit’	(33:06,07)	Twice by M1. Cf. ‘Basra’ above in 7. & 10.
12. [ta·ˈriːχ]	‘history’	(32:55)	F1. From <(Modern) Standard Arabic??
13. [məʃtərˈk-in]	‘subscribers’ PL	(22:45)	M1 /r/ is devoiced? But [ʃəʁˈk-an-u] 'his business partners' (9:37, 9:45)
14. [ˈmasˤɹiː]	‘Masri’ PN.	(25:10)	It’s not really clear as it could be /ɹ ~ ʁ/.
15. [ˈmariðˤ-e̞]	‘sick/ill’	(28:58)	One token only by F1
16. [ˈrɑħ-ət]	‘she went’	(29:05)	By F1. Also, [ˈʁɑħ-ət] < to the college> by F1 at (29:01).
17. [bˤɑsˤˈb̥ɔɹt]	‘passport’	(21:10)	By F1. Also, [bˤɑsˤɑˈbˤɔrt] (19:22) by M1. A recent direct borrowing from < ENG.
18. [ˈqɑri·b]	‘near/close by’	(20:00)	Could be from <(Modern) Standard Arabic
19. [ˈmʊd͡ʒrəm]	'criminal'	(3:35)	<(Modern) Standard Arabic?
20. [farˈhu·d]	'Farhood' Proper N.	(3:41)	(Proper Noun)
21. [ˈðˤʊru·f]	'circumstances'	(1:52)	<(Modern) Standard Arabic?
22. [ˈʃaːrɪʕ]	'street'	(4:36)	<(Modern) Standard Arabic
23. [ˈb̥e̞kər]	'Baker' Proper N.	(1:59)	(Proper Noun)
24. [ʌkˈtubər]	'October'	(2:02)	(Proper Noun)
25. [ʔɪstəmˈraːr]	'continuous'	(4:33)	<(Modern) Standard Arabic?
26. [ʔəl-ˈbarq]	'lightening'	(2:18)	In this context it was meant to refer to <Albarq wa albarid wa

				talifun>. Post, Telephone and Telegraph administration. Thus, it is a calque from <ENG and borrowing from <(Modern) Standard Arabic.
27.	[dʊmˈrowaː]	'destroyed'	(4:43)	<(Modern) Standard Arabic?
28.	[ʔəl-baˈriːd]	'post'	(2:19)	<Albarq wa albarid wa talifun>, cf. [ʔəl-ˈbarq]. <(Modern) Standard Arabic>
29.	[ˈnuri·]	'Nori' Prop N.	(2:21)	(Proper Noun)
30.	[ʔəl-χˈðˤu·ri]	'Alkhthori' Prop N.	(2:22)	(Proper Noun)
31.	[ˈnə-ʕtərəf]	'admit/confess'	(6:19)	<(Modern) Standard Arabic
32.	[ˈhɪtlər]	'Hitler'	(2:48)	< ENG <(Modern) Standard Arabic>
33.	[ʔəl-ʔəˈmu·r]	'Issues/matters'	(7:41, 8:21)	<(Modern) Standard Arabic
34.	[ʔəs-saməˈraːʔiː]	'Alsamirai' Prop N.	(3:19)	(Proper Noun)
35.	[ˈdarad͡ʒaː]	'level'	(3:23)	<(Modern) Standard Arabic
36.	[ʔərˈtaħ-u]	'relieved' Pl.	(7:45)	<(Modern) Standard Arabic???. Also, [ʔəʁˈtaħ-u·] 'relieved' PL (7:46)
37.	[d͡ʒɑˈridaː]	'newspaper'	(3:27)	<(Modern) Standard Arabic
38.	[ʔəl-ˈħɑ̣ɹb]	'war'	(7:59, 08:07)	<(Modern) Standard Arabic
39.	[ʔər-raˈʃiːd]	'Alrashid'	(4:40: 11:20, 8:27, 8:19, 22:32)	(Proper Noun)
40.	[ʁɑrˈm-u·-həm]	'charged them'	(09:00)	<(Modern) Standard Arabic
41.	[ʔəʃ-ˈʃɑrd͡ʒi]	'Eastern'	(3:56)	(Proper Noun??)./g/ for F1 (6:37)
42.	[səkˈrɑb̥]	'scrap'	(09:05)	Loanword from <ENG, only for car parts?

43. [wi-sˤʌdˈruː]	‘and export’	(9:52)	<(Modern) Standard Arabic
44. [farˈhad-u·]	'to separate??'	(4:52)	Or a geminate/longer trill [farˈrad-u·].
45. [li-ˈdarad͡ʒaː]	'to the extent'	(10:09: 34:15)	<(Modern) Standard Arabic and it seems analogical to [ˈdarad͡ʒaː] Cf. 35.
46. [θaʊˈraː]	'revolution'	(10:21)	From <(Modern) Standard Arabic
47. [tˤʌrd-u-ˈhʊm]	'kicked them out'	(11:13)	From <(Modern) Standard Arabic???
48. [ʔəl-ˈfɑqiri]	'impoverished'	(13:06)	Imala is in process in the last syllable
49. [ʔənˈtarakk]	'left'	(16:18)	From <(Modern) Standard Arabic?
50. [ˈrɑqɑm]	'number'	(17:07)	From (Proper Noun Also, this more likely is a pharyngealized /r/
51. [ʔəl-ˈʕɑskari]	'militery personale/ surname'	(7:16)	In this time slot it refers to <Jaffar Basha Alaskari> (surname). Thus, (Proper Noun).
52. [ʔəl-atˤˈrˤɑf]	'parts/areas'???	(20:06)	Pharyngealized /r/ triggered by the process of pharyngealization in an adjacent segment within the same syllable.
53. [ˈmʊħtarmɛ]	'respectful, reputable'	(20:06)	Most likely from <(Modern) Standard Arabic. Imala is in process in the next syllable.
54. [tə-tðɑˈkʌɹ]	'remember' F.	(8:01-3)	It’s not really clear and speakers overlapped in this time slot M1 and M0. It’s either

			approximant /ɹ/ which could be also devoiced or a very light uvular /ʁ/.
55. [raʔis ʔəl-wʊˈzaraʔ]	'prime minister'	(8:33)	From <(Modern) Standard Arabic. Could be also Pharyngealized /r/ in this lexical item.
56. [ʔəl-ˈbira·]	'beer'	(23:22)	From < ENG in <sharikat alibra >
57. [waˈzir]	'minister'	(8:37, 8:42)	From <(Modern) Standard Arabic in <wazir addifa’>.
58. [ʔɪnd͡ʒɑbˈr-u]	'forced/pushed' PL	(24:09)	I still have no comments on this token.
59. [wara ˈmʊdda]	'after a while'	(25:23)	__mudda 'period'. No comment yet.
60. [d͡ʒɑbˈr-u-na]	'forced/pushed us'	(25:26)	Cf. 58. /r/ occurs in the same syllable here again.
61. [ˈd͡ʒɑbri]	'forced/pushed'	(25:27)	The same root as in 60. and 58.
62. [zanˈgir]	'rich'	(9:14)	Note from M0: it ends with a final /n/. Could be approximant or devoiced in this environment. The /r/ also occurred after a high front vowel.
63. [ˈʃɑrad]	'run away/escaped'	(28:15)	No comments yet on this token. From <aw sharad hui aw sit…>
64. [mɪn ˈʃard-u]	'after they escaped'	(28:19)	Plural form of the word in 63. From <mən shardu ‘ala d’ariq..>
65. [ˈdawaʔɹ̥]	‘circles’	(11:11)	From <(Modern) Standard Arabic in <dawair alhikuma>. It’s most likely an approximant that could be also devoiced.

66. [ˈrad͡ʒəʕ-ət]	'she went back'	(29:06)	F1: <radg’et lilbet> onset /r/ and a clear intial trill. Note from M0: r ~ ʁ are acceptable.
67. [ˈtad͡ʒər]	'merchant'	(31:08)	M1: sounds devoiced.
68. [b-əl-maˈdaːrɪs]	'schools'	(12:38)	Short trill occlusion(s). Thus, I would suggest a tap here.
69. [ˈmʌqbɑrɑː]	'cemetery'	(31:41)	Perhaps from <(Modern) Standard Arabic. cf. <Arm and <Hr
70. [ˈrɑd͡ʒʊl]	'man'	(34:20)	Perhaps from <(Modern) Standard Arabic.
71. [ˈmʊħtaram]	'respectful'	(34:22)	Cf. 53 & 76. from <(Modern) Standard Arabic.
72. [ˈma-rɪd͡ʒʕ-u]	‘they didn’t come back’	(34:47)	Cf. 66 & 79. Onset /r/ <msafrin aw maridg’u>.
73. [ˈʕɔ̰bˤarˤɑ·]	'consist of'	(35:06)	Evident pharyngealized /r/ in <aw ‘obarā ‘ishghin..>. Syllable shape [Cˤɑrɑ#].
74. [ˈnɑfar]	'individual'	(35:07)	In <’abara ’ishrin nafar> most likely a trill but need to confirm voicing. Syllable shape [Car#].
75. [ʔəðˤ-ˈðˤɑhr̥]	‘afternoon’	(14:38, 17:36)	In <aw lithnen althuher yalla..>. Vs. [ʔəðˤ-ˈðˤɑhɔʁ] (15:26, 16:00, :06). Syllable shape [Cr̥#].
76. [ʔəħtərˈaːm]	'respect'	(36:40, 37:49)	Cf. 53 & 71. Syllable shape [Cər#].
77. [ˈɹəħ-na]	'we went'	(37:41)	Double check Syllable shape [ɹəC#].
78. [ˈtədri]	'do you know!'	(17:39)	Just right before a high front vowel. Syllable shape [ri#]. “Reported speech”

79. [ˈræd͡ʒɪˈʕ-un]	'return'	(39:14)	from < Standard and or Classical Arabic.: <ina lilah wa ina ilaihi radg’u:n>. Syllable shape [ræCv#].
80. [ˈmɑrtʰ]	‘March’	(12:40)	(Proper Noun). Syllable shape [rɑC]. Note from M0: it is a mispronunciation.

Etymological *r > ʁ

1. [ˈkb̥i·ʁ]	'big'	(21:33, 36:53)	Always *r > ʁ for both language consultants: [kbɑ·ʁ] 'big' PL (38:02), [ʔəl-ɪkˈbɑ·ʁ] 'the big ones' (23:28), [ˈʔəkbɑʁ] 'bigger' (3:32)
2. [qa-jə-diˈʁ-aː]	'he manages'	(35:08)	*r > ʁ PROG-manage-3.SBJ.F. [qa-] seems to me is a progressive prefix particle of the verb stem slot [qa-jə-C_1iC_2-aː]. Thus, for now, I will treat the prefix [qa-] as such throughout this analysis unless it later proves to be something different. Testing grounds to see if the [qa-] particle persists would be: 1. testing the structure in negation; 2. Testing verbs of psychological state (mental verbs) in the same morphosyntactic structure.
3. [ˈʁɑħ]	'went'	(17:57)	F1 also [ʁɑħ] (35:30, 35:32, 23:00) and [aw-ˈʁɑħ] 'and he went'

			(35:36). Also, [ˈʁɑħ-ət] ‘she went’ (29:01) but [ˈrɑħ-ət] (29:05). M1 [jə-ˈʁuħ] 'go to' (10:02) and [tʁu·ħ ʔəl-d͡ʒənsiji] 'to lose citizenship' (12:57), [qaɪ-ˈʁu·ħ] 'to go' PROG (7:05), [aw-ˈʁɑħ] 'and he went' (35:36), [ˈʁəħ-na] or ~ɹ 'we went' {double check}. There is an evident intra-speaker variation in F1’s idiolect using this lexical item.
4. [ˈtˤɑʁɑd-aː]	'kicked her out'	(36:06)	M1: [tˤʌʁˈɑd-uː] 'they kicked out' (11:08), [tˤʌʁˈd-un-aː] 'they kicked us out' (22:43), [tˤʌʁd-u-ˈhʊm] 'they kicked them out' (22:49), [tˤʌrd-u-ˈhʊm] ~ [ɹ] 'they kicked them out' (11:13), [ˈtˤɑʁɑd-ʊm] 'kicked them out' (36:08, 36:12). There is some intra-speaker variation here.
5. [jə-ðˈkʌʁ]	'remember'	(36:05)	F1. [tə-tðɑˈkʌɹ] It’s not really clear and speakers overlapped in this time slot M1 and M0. It’s either approximant /ɹ/ which could be also devoiced or a very light uvular /ʁ/. [tə-tðɑˈkʌʁ] (30:26). [ˈma-ʔəðkʌʁ] 'as far as I remember' (4:55). [tə-tðɑˈkʌr] (8:02). [ʔəðˈkʌʁ] 'remember' (8:57, 8:59). [tə-tðəkˈʁ-ẹn] 'do you rememebr? F. (22:34). There

				is an evident inter-speaker and intra-speaker variation here.
6.	[ˈmaʁʌt]	'wife of'	(31:05)	Also, [lə-mʁˈʁɑt-u] 'his wife' (36:07). The syllable shape is [#ʁVC].
7.	[jə-ˈʁid]	'want' 3.SBJ.M	(31:12)	[jənˈʁɑd] 'want' they?(16:16, 17:36, 25:17, 25:44, 36:52). Also, [ʔənˈʁid] 'we want' (32:03, 32:00).). The syllable shape is [#ʁVC]
8.	[ˈsˤu·wɑʁ]	'pictures'	(37:14, 37:19, 37:33)	Also, F1 (37:36). ˈsˤu·ʁɑ 'picture' (20:52) by F1. Also, [ˈtə-sˤɑwwəʁ] 'imagnie!' (11:41). The syllable shape is [#CVʁ].
9.	[saːˈfɑʁ]	‘travelled’	(22:06, 34:40)	By F1. [ʔəs-ˈsaffɑʁ] (19:28, 21:16, 21:18, 21:29). Also, [jə-safəˈʁ-u·n] 'travel' (13:50). Then, M1 (12:53, 21:29) .F1 [qaɪ-jə-safəˈʁ-u·n] ‘travel’ (13:50). [ma-jə-safəˈʁ-u·n] 'to not travel' PL (21:47). [qaɪ-jə-safəˈʁ-u·n] 'travel' M. PROG (14:16). [safəˈʁ-u·-ha] 'they sent her' (29:18). /ɹ/ F1. [ˈma-jə-safəʁ] 'not become/ not go?' (1:58). The syllable shape is [#CVʁ] ~ [#ʁV(n)].
10.	[ʔaʕˈʁɑf-a]	'know'	(10:40, 21:06)	F1. [ˈtʌʕʁəf] 'you know' 2.SBJ.M (filler exp.) (23:20), [tʌ-ʕˈʁɒf-aː] 'you know!' 2.SBJ.M.3.SBJ.F (25:55, 31:43). [ʔə-ʕˈʁɒf-aː] 'you

			know!' 1.SBJ.M.3.SBJ.F (27:06). [ˈnɑ-ʕʁaf] 'know' 1.PL (27:21) F1. [ˈnə-ʕʁəf] '(we) know' (4:19, 4:29). [maʕˈʁʊfa] 'well-known' (9:43). [ma-ə-ˈʕʁɑf] 'I don't know' (29:11, 33:15). The syllable shape is [#ʁɑC#].
11. [jə-ʃˈʁʊb]	'drink' 3.SBJ.M	(29:47)	/ɑ/??. [tə-ʃˈʁʊb̚] 'drink' 3.SBJ.F (29:56)
12. [ʔə-qˈdɑʁ]	'I can'	(5:34, 22:26)	It could also be a dorsal trill, similar to [ʀ] in in both instances. [ˈma-jəqdʌʁ] 'he can't (12:59), [ma-naqˈdʌʁ] 'we can't' (30:50), [ma-ʔəqˈdʌʁ] 'I can't' (30:51,52,54). The syllable shape is [#Cɑʁ].
13. [ˈʁɑqqʌt]	'flooded'	(31:51)	The syllable shape is [ʁɑC#].
14. [d͡ʒiˈʁɑn-a]	'her neighbors'	(33:07)	F1 [d͡ʒiˈʁɑn-əm] 'their neighbors' (32:56). The syllable shape is [#ʁɑC].
15. [sˤɑʁ]	'took place/happened'	(2:30, 22:27, 3:40, 5:22, 6:58, 6:55, 8:24 23:06)	F1. M1: [ˈsˤɑ·ʁ-u] 'became' (24:19). [ˈsˤɑʁ-ət] 'happened' (24:54) by F1. [ʔənˈsˤiʁ] 'we become' (25:05). [ˈsˤɑʁ-ət] 'became' (13:52, 29:00) by F1. Also, [ˈsˤʌʁn-ɑː] 'went?' (19:58). The syllable shape is [Cˤvʁ].
16. [ʔə̃nˈləʁət]	'cancelled'	(12:27)	The syllable shape is [#ʁəC].
17. [ʕɔʁˈfan]	'day of Atonement'	(27:16)	< Ar? /ʁʊfran/ -- mal Kippur /ʁ/ < Hr <*r Akkadian. The syllable shape is [#cɔʁ].

18. [ʔəd-ˈdɑʁəb̥]	'the road/way'	(27:18)	[bədɑʁəb̥] 'in the pathway/doorstep' (5:39). The syllable shape is [#ʁəC].
19. [ˈnɑʕ.ʁaf]	'know' 1.PL	(27:21)	F1. The syllable shape is [#ʁaC].
20. [nɑsˤˈʁɑ̰n-i]	'Christian'	(20:45)	(Proper Noun). It was expected to retain the coronal /r/. The only reason why it is not the case is because the term is archaic and was introduced to the lexicon of Jewish Iraqi Arabic a long time ago. Cf. 7. of *r > r 'Basra'.
21. [ˈʁḛʁ]	'different'	(20:55)	By F1, /ʁḛʁ/ M1 (20:56). Syllable shape [Cḛʁ].
22. [ʔʌsˤ-sˤɔfʁˈʁɑ·ʔ]	'yellow'	(19:26, 20:16, 20:24)	Syllable shape [ʁ#ʁɑ·C].
23. [ʔətħɑˈðˤɑʁ]	'prepared'	(2:13)	mətħʌðˤˈʁ-in 'on standby' (4:27)
24. [ðˤɑʁˈb-u·]	'hit/did'	(2:27)	[jən-ˈðˤʊʁəb] 'shooting/ being shot?' (4:04). [ʔən-ðˤɑˈʁʌb] 'shot' (13:18). [ʔəðˤ-ˈðˤʊʁəb] 'shooting' (5:21). [ˈðˤʊʁəb] 'shooting' (6:49). [ˈðˤɑʁb-u·] 'shoot' (13:31). [ʔənˈðˤɑʁəb-ət] 'shot' Fem. (13:36).
25. [ziˈjaʁaː]	'Easter??'	(3:58, 59)	F1 and M1. Syllable shape [Caʁa:#].
26. [ʔəl-ʁəˈsˤsˤɑsˤ]	'bullet'	(04:03, 6:49)	
27. [ʔɪnʤ͡ʒʌˈʁɑħ]	'injured'	(4:59, 5:05)	By M1. Syllable shape [#ʁɑC].
28. [ʔəl-ˈʕɑsˤʌʁ]	'late afternoon'	(5:08, 5:12, 5:14)	Cf. 75. for semantic differences. Syllable shape [_Cˤʌʁ#]
29. [jʌsˤˈʁɑ]	'on the left'	(5:36)	By M1. Syllable shape [#ʁɑ]

30. [jə-ʃəˈtəʁi-lɪm]	'he buys (for) them'	(6:11)	[jəʃˈʁ-un] 'they buy' (9:47).Syllable shape [#Cəʁi]
31. [χəˈjɑ·ʁ]	'cucumber'	(6:12)	By M1. Syllable shape [#Cɑ·ʁ]
32. [ʁɑdˈdi-na]	'then again/over again??' PL INC.	(7:47)	By M1. Syllable shape [#ʁɑC]
33. [ˈʁẹħ]	'will do'	(10:20)	There is imala in process here.
34. [ˈjə-ʁ.fɑʕ-ɑ·]	'put it in/up'	(18:14)	By F1. Syllable shape [#ʁCɑC]
35. [ʁɑdˈd-u·]	'went back'??	(14:39 14:46)	Both tokens by F1. Syllable shape [#ʁɑC]
36. [ˈχɑːtˤəʁ]	'to/for??' N.Prep.	(13:33)	In <khat'igh jekhaufu:hum aljuhud>. Syllable shape [#Cˤəʁ]

Timan Corpus: F2[171] (Interview)[172]

1. [ʔəl-ˈmɑʁɑː]	'the woman'	(00:04)	
2. [ʔəl-ʁəd͡ʒˈd͡ʒal]	'the man'	(00:05, 03:49)	[ˈʁəd͡ʒˈd͡ʒɑl] 'man' (03:07)
3. [jə-ˈʁid-un]	'they want'	(00:18)	Also, [ˈma-ʁid] 'I don't (want)' (03:32). Then, [ʔəˈʁid] 'want' (03:33). Also, [ˈʁid-tu]. '(I) wanted' (5:49). Then, [qaˈʁid] 'I want(ed)' (6:36). Also, [ˈmɑ-ʁɑd] 'don't want' (8:38).
4. [ˈʕabʌʁ]	'through'	(00:25)	Also, [ˈʕabʌʁ-tu] 'went through' (02:46)
5. [ˈd͡ʒʌʶff]	'route'	(00:26)	In <je(R)f hAdha mshinAnu>. <we passed this event> by M0 Assimilation of /r/ < /ˈd͡ʒʌrff/ ? ~ /ˈd͡ʒʌʁff/
6. [ʔəkˈbɑ·ʁ-tu·]	'grew up'	(00:37, 00:55, 01:05)	Also, [ʔəkˈbɑ·ʁ] 'significant or big' (02:49). Also, [ˈkbi·ʁ] 'big' (03:09).

[171] Female born in Baghdad (1921-02-14) left Iraq Feb 1951. This was recorded on April 22nd, 2008 in Israel.
[172] Side notes: [gall-i] 'told me' (03:54, 04:15, 4:40)

			Then, [kəbˈʁɑtɑ] ‘important/significant’ (4:21).
7. [dʌʁˈbu·naː]	‘path/lane?’	(00:41)	
8. [ʔər-ˈrujəl]	‘the royal’	(00:44, 00:46)	Referring to: the royal cinema. And [ˈrujəl] (00:50).
9. [ˈʕʊmʁ-i] ?	‘my age’	(00:57)	In <'emRi khMeSTA'esh sana tHewwalna l-el keRRAda>. Also, [b-əl-ˈʕʊmʁ] /~ [ˈʔʊmʁ]?. Also, [b-ˈʕʊmʁ-u] ‘in his age’ (8:33).
10. [l-əl-kɔʁˈʁɑ·da]	‘Karrada’	(00:59)	Karrada refers to an affluent religiously diverse area in Baghdad.
11. [ˈʔərd͡ʒʌʕ]	‘going back’	(01:02)	Also, [ʔərˈd͡ʒʌʕ-tu] ‘I went back’ (01:08)
12. [ˈfɑrħɑː]	‘Farha’ Prop. N.	(01:23, 03:05, 3:54, 4:16, 4:19)	
13. [ˈχɑ·tˤər]	‘for’	(01:29)	Vs. [ˈχɑ·tˤəʁ] (03:05, 8:17)
14. [rəʃˈʃɑːd]	‘Reshad’ Prop. N.	(01:29, 01:49, 02:27, 02:28, 02:33)	
15. [ˈħɑrɑːm]	‘pity!’	(01:33)	
16. [ˈʁɑħət]	‘went’	(01:39)	In <RAHet snIn ana qeddastu>. Also, [ˈnʁu·ħ] ‘go’ (03:21). [ˈrɑħ-u] ‘they went’ (7:23, 7:25) it could be also ~/ʁ/. [ˈʁɑħ-u] ‘they went’ (9:07). [jə-ˈʁuħ] ‘goes’ (9:19). Also, [ˈʁɑħət] with an approximant rhotic articulation at (9:30).
17. [əb-ˈʃɑːrɪʕ]	‘on street’	(01:41)	
18. [ʔər-ˈrɑʃiːd]	‘Alrashid’	(01:42)	
19. [bɑʁˈʁɑ]	‘outside’	(02:01)	

20. [ˈtə-sɑwwəʁɑ]	‘(you) imagine!’	(02:13)	
21. [ˈʔəʁisˤ]	‘groom’	(02:16)	
22. [jənˈʁɑd]	‘must/want’	(02:21)	In <ash yenRAd aTla' menna>. [ˈʁɑd] ‘want’ (8:44) cf. also 3.
23. [ʔətˈʕɑrrɑf]	‘introduce’	(02:29)	Also, [tˈʕɑrrɑf] ‘introduced’ (02:32)
24. [ʔəkˈθi·ʁ]	‘many/much’	(02:47)	Two tokens in the same time slot. [kˈθi·ʁ] ‘many’ (8:32).
25. [ʔəzˈʀɑ̝ʁ]	‘small’ PL.	(02:49)	More likely a dorsal trill, similar to [ʀ].
26. [ʔəʃ-ˈʃɑrɑf]	‘honor’	(03:02)	
27. [ˈma-jə-ftəkʁ-un]	‘can’t think’	(03:16)	[ˈma-ʔəftəkər] ‘don’t think’ (7:16, 7:18).
28. [tʌ-ʕˈʁɒf]	‘do you know?’	(04:20)	[jə-ʕˈʁɒf] ‘(he) knows’ (4:54). Also, [ˈʔəʕʁʌffəm] ‘I know them’ (6:33). [ʔəʕˈʁɒfɑ] ‘ I knew’ (6:55). [jə-ʕˈʁɒf-un] ‘(they) know’. [ʕəˈʌʁɒf-na] ‘we know’ (8:21). [ʕʌˈʁɒf] ‘know’ (8:34, 8:37) in <lA-a'Ref men Taraf flUs>.
29. [ˈʃərtˤi]	‘policeman’	(04:25)	[ʔəʃˈʃərtˤɑ] ‘police’ (4:26, 5:08).
30. [b-ˈmadrasat]	‘in school’	(04:26)	The /r/ here could be also an approximant rhotic or at least a very light /r/. Also, [w-ʔəlˈmadrasaː] a tap /ɾ/ (4:48, 5:10).
31. [ˈʔəstʌʁfʌr]	‘God forbids’	(4:56)	In <estakhfar alla>
32. [ˈħɑrɑ·mijjɑː]	‘thieves’	(5:16)	
33. [ˈməqtadrȩ]	‘Capable’	(5:54, 7:00)	Imala in process
34. [ˈʔəðkʌʁ-əm]	‘remember’ 1.PL	(6:00)	Also, (6:01).
35. [ˈʔəmbart͡ʃi]	‘Ambarchi’	(6:09)	(Proper Noun)

36. [ˈsˤɑʁu]	‘became’	(7:03)	
37. [b-ˈʔəsra·ʔil]	‘Israel’	(7:07)	(Proper Noun)
38. [qsˤaijˈjəʁ]	‘short’	(7:29)	[w-əlqsˤaijˈjəʁ] (7:35)
39. [qa-ˈʕʌbbɑʁʌk]	‘taking/showing you’	(8:10)	
40. [ˈharu·n]	‘Haroon’	(8:30)	(Proper Noun)
41. [ˈtˤɑrɑf]	‘from’	(8:35, 8:50)	
42. [ˈjə-ʁwi]	‘show’	(8:38)	
43. [əl-ˈwɑʁ̞̊θ]	‘inheritance’	(8:50, 9:19)	Devoiced approximant
44. [ˈrʊppiji]	‘Ruppees’	(9:10)	(Proper Noun)
45. [ˈma-ʕɪrɑqijə]	‘not Iraqi’	(9:22)	(Proper Noun)
46. [ˈqʊ̞ʀʃ]	‘peenie(s)’	(9:48)	Uvular trill
47. [ˈsɑfɑʁ]	‘travelled’	(10:32)	
48. [ʔəlˈbarid]	‘the post office’	(10:49, 50)	
49. [dawˈwaʁ]	‘looked for’	(10:56)	

Timan Corpus: M2[173] (Kursi-Jafuf)

1. [b-ˈʔəʕtəbɑr]	‘considered/known’	(0:04)	(MSA)
2. [ˈkʊʁsi]	‘Kursi:.lit. chair’	(0:10)	(Proper Noun): in <ysewwola keRsi jafUf>
3. [ˈʧ͡ɑʁpaiji]	‘bedstead’	(0:14)	~ or approximant. In 1965, Cf. Blanc p.149, it was *čarpāyi* < Persian *čarpaye* ‘bedstead or stool’
4. [ˈfɑ̞ʁɑ·d͕]	‘indefinite article :. Lit.(a)’	(10:32)	Grammaticalized lexical item to signal indefiniteness as in <fared ridgal> ‘a man’. It’s a syntactic

[173] Male born in 15/4/1929 in the city of Baghdad, Iraq. Left Iraq in 1950 and now lives in Israel. Speaks Jewish Iraqi, Muslim Iraqi, and Classical Arabic. Also speaks Classical Hebrew (language of religion) and Modern Hebrew (L2, perhaps in his 20s), English (learned from school), French (learned from school), and Persian. University education.

				feature of the qəltu varieties of Arabic.
5.	[ˈʔəzʁaijəʁ]	‘small’	(00:21)	Also, [ˈʔəzʁɑʁ] ‘small’ PL (00:27).
6.	[ˈjə-si·ʁ]	‘become(s)’ 3.SG	(10:56)	
7.	[ˈħɑʁ]	‘hot’	(00:25)	
8.	[ˈda·jəʁ-ma-da·jəʁ]	‘all around’	(00-27-28)	I.e. in a circle
9.	[ˈʔərriħ]	‘Al-reeh:. the wind’	(00:35)	(proper Noun). In < 'anqa 'anqa bent el rIh> (the story of Rapunzel).

Timan Corpus: M2 (Kaparot)

1.	[ʔəl-ləχχi]	‘the other’	(00:33)	< *ʔəl-ʔuχrɑ

Timan Corpus: M3[174] Early Life

1.	[ʕɑʁɑq]	‘Arak’	(16:56)	Traditional alcohol drink
2.	[ʔəl-ləχned͡ʒəʁ]	‘daggers’	(17:04)	
3.	[nəsˤʁɑ̣n-i]	‘Christian’	(25:44)	

Timan Corpus: M4[175] Home Life

1.	[ʔəɹsaˈmuː]	‘(he) sketched (him/it)	(0:30)	Or ɛ-/-ə
2.	[ʔɛsˤˈsˤu·ʁɑː]	‘sketch’	(1:11)	
3.	[ʔənˈnɑ·ɹ]	‘fire’	(15:02)	<ymuw'Onu 'ala-el-(NAr)> ‘they melt it on the fire’ ie. The butter.
4.	[ʔəlˈʀɑ̣qqi]	‘water-melon’	(14:12, 13:54, 14:14)	<el Raqqi el qesheR> Uvular trill.
5.	[tˤɛɹʃi]	‘pickles’	(14:08, 13:46, 13:48)	<Kurdish ~ Persian

[174] M3 born in Baghdad in 9/1926, speaks Arabic and Hebrew. He left Iraq March 1951.
[175] Male born in Baghdad 14/02/1921

6. [ʔəlħʊsˤʁʊm]	‘unripe grapes’	(14:00)	<el el HeSRem ya'ni>
7. [ʕəʃˈɹin]	‘20’	(12:13, 12:14)	Two tokens: In <EHna qad-aHki 'al 'eshRIn u 'ala-el khamsI-u-'eshRIn>
8. [ˈʁʊbɪʕ-in]	‘40’	(12:10, 12:11)	Two tokens.
9. [ˈħɑʁ]	‘hot’	(12:01)	
10. [ʔəlˈħʊfʁɑ]	‘pit/hole’	(11:44)	
11. [ʔəbˈʁiːq]	‘pitcher’	(11:18, 11:25)	
12. [ˈʃʌhəʁ]	‘month’	(10:50)	
13. [ᵊd͡ʒʁɑ·dəq]	‘papadum’	(5:24)	Type of bread <Persian, may be?
14. [ˈkb̥i·ʁi]	‘big’	(4:17)	Also, ˈkb̥i·ʁ (4:13)
15. [ʔəðˤ-ˈðˤɑhɔʁ]	‘afternoon’	(3:49)	
16. [ˈʔəbʁɑ·d]	‘colder’	(3:09, 3:46)	Also, [beʁəd] ‘cold’ (3:30) in <w-yeji hawa bIRed biHayth annahu>
17. [səʁˈdɑːb̥]	‘cellar’	(3:04)	Two tokens.
18. [jʌsˤˈʁɑ]	‘left’	(2:57)	
19. [fɑχχɑːr]	‘clay’	(1:36)	
20. [qɑd-ˈɑwwi]	‘telling’	(1:02)	< ɑrwi < ɑʁwi < ɑwwi
21. [ʔəʃhɑr]	‘the most famous’	(00:42)	In <ashhar waiHed mal kurat salla>

Timan Corpus: M4 Education Life

1. [fadd]	‘one’	(5:10)	Two tokens. Also, two tokens at (5:09)
2. [maˈdaːrɪs]	‘schools’	(00:12, 00:24)	
3. [bəmʁuʁ]	‘for/anniversary of’	(00:50)	
4. [lu-ʔəl-ʔəʁˈbɑʕ au tləθin]	‘or 34’	(00:44)	Also, [ʔəʁˈbɑʕɑː] ‘4’ (5:04)
5. [mʊrɑbbi]	‘teacher’	(1:04)	
6. [mʊdir]	‘school principle’	(00:32)	

7. [ʔət-tədris]	‘teaching’	(00:53)	
8. [ləl-ʔəχir]	‘to the end’	(1:12)	
9. [ʔəʁuħ]	‘(I) go’	(1:36)	(1:54)
10. [jə-ʕʁɒf-u-ha]	‘they know (it)’	(1:47)	Maybe /r/ on another token on (1:50)
11. [bəl-əʕ.ʁɑ̞ː.sˤɑ̞ː]	‘At weddings’	(1:57)	
12. [ləl-ʕɒ̞ʁ̞sˤ]	‘to the wedding’	(2:00)	Uvular approximant.
13. [ðəkrijat]	‘memories’	(2:24)	
14. [jə-qqɑ̞hɑ]	‘(he) reads (it)’	(3:12)	
15. [ʔəl-məʃabbirɑ]	‘The Mishembarakh??’	(3:14)	<Hr ‘blessings’ /r/ always in Hebrew words.
16. [fərqɑ]	‘band’ music band	(3:34)	
17. [wə-jəʁəddun]	‘and they respond’	(3:47)	As a chorus
18. [ʁʊddɑda]	‘chorus’	(3:48)	
19. [tɑqrib-an]	‘approximately’	(4:01)	

Timan Corpus: F4[176]: Early life in Iraq and India

1. [l-əlˈbɑsˤˈʁɑː]	‘to Basra’	(1:18)	Also, [b-əlˈbɑsˤˈʁɑː] (1:23)
2. [ˈʕɑʃʁɑː]	‘10’	(10:24, 10:51, 11:02)	
3. [ˈʕəʃˈʁin]	‘20’	(10:28)	
4. [b-tˤijjɑːrɑ·]	‘by plane’	(14:24)	
5. [ʁʊbʕɑʔ]	‘Wednesday’	(20:53)	
6. [ʔəl-kɑʁʁɑ·dɑ]	‘neighborhood in Baghdad’	(23:15)	Lit. < Turkish meaning: coastline

176 Female born in Baghdad 1914. 1918 left to Basra and lived there.

Timan Corpus: F5[177]: Her Journey out of Iraq through Kurdistan & Iran to Israel

1. [sijjɑɻɑ]	‘car’	(0:31: 2:27)	[sijjɑɹɑːt] ‘cars’ (0:34; 0:38)
2. [ʁəħna]	‘we went’	(0:35; 0:53)	
3. [ʔəftəkəʁu]	‘I remember’	(0:36)	
4. [ʃəɹtˤɑ]	‘police’	(1:16)	
5. [ʔəl-ʕɪrɑq]	‘Iraq’	(1:21)	
6. [ʔəðˤˈðˤɑhɔʁ]	‘afternoon’	(1:29)	
7. [ʔəzʁaiʁi]	‘small’	(1:31: 3:58)	
8. [ʔəkʁuːd]	‘Kurds’	(1:39)	Also [kəʁdi] (4:19; 4:56)
9. [ma-ʔəkθi·ʁ]	‘not much’	(1:43)	
10. [ma-naqˈdʌʁ]	‘we can’t’	(2:43)	
11. [sˤɑʁ]	‘took place’	(2:49)	
12. [ʁɑħu]	‘they went’	(4:49)	
13. [la:td diʁin bal]	‘don’t worry’ F.	(5:13)	
14. [ħɑ̝·ʁ]	‘hot’	(6:55)	
15. [qitˤɑ:ɹ]	‘train’	(7:44)	
16. [ʔəsra˙ʔili]	‘Israeli’	(8:02)	

Timan Corpus: M7 May 2008[178] (His life in Iraq & his new life in Israel)

1. [ˈsɑ̠miːʀ̥̆]	‘proper name: Samir’	(0:07)
2. [ʕəbəˈʀ̆ɑ̠ːni]	‘Hebrew’ Adj	(9:47)
3. [ʕəʃˈʃɑ̠ːʀ̆]	‘area in Basra’	(0:44, 14:14)
4. [ˈbɑ̠̝ʀ̆ɑ̝ːʔɑ̝]	‘innocent’	(11:44)
5. [tɑd͡ʒəˈʀ̆ibi]	‘trial’	(10:59)
6. [ħəʀ̆iːjɑ̠]	‘freedom’	(5:11)
7. [ɑ̝qqɑ̝b]	‘nearest’ <aqrab	(4:44)

177 Female born in Baghdad in 1944. She is a native Jewish Baghdadī Arabic speaker. She lived in Baghdad most of her life and went to the Jewish school while there. She escaped from Baghdad in 6/12/1970 through Kurdistan to Iran and then to Israel.

178 He was born in 18/11/1949 in Basra. He finished all his education in Basra. In 1970, he earned a B.S in Electrical Engineering from Basra University. In 1971, he left Iraq smuggled to Iran. He speaks Arabic, Hebrew and English.:

8. [ɑ̞qqɑ̞ː]	‘I read’	(11:35)
9. [ʕɑ̞bbˤɑ̞ːʀ̆ɑ̱]	‘ferry’	(3:29)
10. [suːʀ̆iː]	‘Syrian’	(4:04)
11. [tɑːd͡ʒəɹ]	‘merchant’	(5:29)
12. [mˤɑ̱ʕo̞ː.fĩːn]	‘(they are) well-known’	(9:26)

Timan Corpus: F3 Home Life in Iraq 1930 to 1960[179]

1. [tʁɑːb]	‘dirt’	(00:09)	
2. [ləmmən n-ʁuħ]	‘when we go’	(00:15)	
3. [beʁdi]	‘cold’	(00:18)	
4. [b-əl-ʕəmɑ·ʁɑː]	‘in Amara’	(00:34, 2:34)	Town between Basra and Baghdad
5. [ʔəl-d͡ʒəzʌʁ]	‘carrot’	(00:36, 00:39)	
6. [nɑhɑr]	‘river’	(00:55)	[nɑhɑr dəd͡ʒla]
7. [ʔəl-ʔəʁʌðˤ]	‘the soil’	(01:01)	
8. [ʔəl-əfrut]	The fruit’	(1:04, 1:39)	<Eng ‘fruit’
9. [ʁeħi]	‘smell’	(1:06, 1:35)	
10. [nə-ʃtʌʁi]	‘(we) buy’	(01:09)	
11. [ʁəbʕin]	‘40’	(01:11)	
12. [wi-tˤer]	‘and it flies’	(01:12)	~disappear
13. [ʔəʁbʌʕ mijat fəls]	‘400	(1:18, 1:23)	
14. [ʔəʃʃord͡ʒaː]	‘Shorja’	(1:25)	It is a district in old Baghdad.
15. [ʔəʁuħ]	‘(I) go’	(1:25)	
16. [ʔəʃtʌʁi]	‘(I) buy’	(1:27, 1:28)	
17. [dinar]	‘Dinar’	(1:30)	
18. [ʕʌtˤiRɑ]	‘aromatic’	(1:40)	[ʕʌtˤirɑ] (1:43)
19. [karatʃi]	‘charcoal’	(1:53, 2:32)	< Karachi Pakistan?

[179] Female Born in Amara in 1922 and speaks Jewish Iraqi, relative knowledge of Classical Hebrew, English, and French. This recording was taken at her home in London.

20. [bʌRRɑː]	‘outside’	(1:55)	
21. [rɑbbenu]	‘prophet’	(2:10, 2:19)	
22. [beʁədi]	‘cold’	(2:36)	
23. [ʔəl-bʌʁʌd]	‘the cold’	(2:37)	
24. [qɑːrisˤ]	‘severe cold’	(2:38)	
25. [bəħram]	‘blanket’	(2:40)	
26. [ʃɑrqijə]	‘oriental’	(2:45)	
27. [ma-jəqdaʁ]	‘cannot	(2:55)	Not sure about this token
28. [ʔəkbɑʁna]	‘grow up’	(3:22)	
29. [ʔəzʁaiʁi]	‘small’	(3:35)	
30. [t͡ʃɑppɑːjɑ·]	‘bedstead’	(3:38)	In 1965, Cf. Blanc p.149, it was *čarpāyi* < Persian *čarpaye* ‘bedstead or stool’ tʃɑhɑr ‘4’ and pajja ‘columns’
31. [d͡ʒiʁɑn]	‘next to?’	(3:39, 3:57)	<u le wlAd ynamOn eb qebba-b-BaHed>
32. [qai-jəsˤiʁ]	‘happen’	(3:51)	Not sure here as well. <bas ya'ni kel shain qa-ysIr bel-deni>
33. [ʔəʃwandəʁ]	‘beetroot’	(4:10)	<ii kAnu ysewwOn shalgham eshwandaR> <Arm < Sumerian
34. [mχʌðˤðˤɑʁ]	‘vegetables’	(4:11, 4:14)	
35. [mətwɑfri]	‘available’	(4:17)	
36. [təqdʌʁ]	‘can’	(4:28)	More like a retracted /r/ or uvular trill.
37. [ʁɑqbɑ]	‘neck’	(4:37)	
38. [sˤʌdʌʁ]	‘breast’	(4:39)	As in chicken breast
39. [mɑrɑg]	‘stew/soup’	(4:44)	
40. [pʌrtʌqalaji]	‘oranges’	(5:32, 5:35)	
41. [mrɑbbɑ]	‘jam’	(5:55, 6:01)	
42. [ʔəkθi·ɹ]	‘a lot’	(6:07)	
43. [daiʁa]	‘surrounded’	(6:14)	

44. [fɑʁʃɑ]	‘beds’	(6:34)	
45. [tˁrəmbˁɑ]	‘tap’	(6:59)	‘Water pump’
46. [kɑhrɑbaː]	‘electricity’	(7:07)	
47. [ʔətrik]	‘electricity’	(7:29)	
48. [ʁʊrɑf]	‘rooms’	(8:03)	
49. [gədir]	‘cooking pot’	(8:19)	
50. [ʔəl-ʕɑʁɑ·b]	‘the Arabs’	(9:02)	
51. [fadd]	‘one’	(9:28, 9:29)	
52. [ʔəħd͡ʒɑʁ]	‘stones’	(9:30)	
53. [siːʁʌd͡ʒ]	‘sesame oil’	(11:14)	[ʃerʌd͡ʒ] in gelet

Own Corpus: M5 Proverbs, myths/superstitions & traditional medicine 17/09/2020

1. [ʔəl-ʃɑmxɑrɑ malu]	‘his ego?’	(3:18)	
2. [jə-ftəxər]	‘show off’	(2:59, 3:13)	
3. [lɑːxi]	‘another’	(2:50, 15:59)	
4. [jə-tmɑʁʕɑl]	‘disappear/destroy’	(3:35)	
5. [jə-siʁ]	‘become’	(6:50)	
6. [rɑziːn]	‘content’	(6:53)	
7. [tɑʁɑː]	‘will/aux’	(7:12)	
8. [ʔəħd͡ʒɑːʁ]	‘stones/rocks’	(7:13)	
9. [wɑħdi td͡ʒib ʔəlləx]	‘one after another’	(7:44)	
10. [ʕɑ̯ʃʁ^{H} a̯wla̯ːd]	‘10 children’	(9:39, 9:44)	(9:40-10:00)
11. [jəʁtaħ]	‘to be relieved’	(9:58)	[məʁtaħ] (9:45)
12. [bfəkʁəna]	‘in our minds’	(11:21)	
13. [jə-ʁid-un]	‘they want’	(11: 11)	
14. [ʔəld͡ʒɑʁʁɑ]	‘clay jar/ bottle’	(14:21)	
15. [jə-ʁəkkəb]	‘formulate’	(15:58)	
16. [ʔəlxɑʁəz]	‘beads’	(17:40)	
17. [ħɑbarbɑʃ-i]	‘worthless’	(18:09, 18:14, 18:20:, 18:44)	
18. [ʔəʁbɒʕmijat sɑna]	‘400 years’	(19:38)	

19. [ħaʁʁ]	‘hot’ n.	(24:01)	
20. [ʔəsˤsˤadɒʁ]	‘chest’	(24:00, 24:15, :30)	
21. [lumi basˤʁa]	‘dried lime from Basra’	(26:45 -49)	
22. [jə-d͡ʒʊʁ]	‘pull’	(31:29 34, 35)	[jə-d͡ʒʊʁ-u] (31:29)
23. [jə-ħtaʁəq]	‘burn’	(31:28)	
24. [ʔən-kəsaʁ]	‘broken’	(36:48-59)	
25. [doʁat]	‘rounds/circles’	(38:00, 04, 05, 30)	
26. [ʔətˤfʊʁi]	‘jump’	(38:00, 05)	
27. [ʁazuna]	‘shelf’	(40:10, 12, 14)	
28. [jə-ʁabbon]	‘to have/rise pets’	(40:54, 56 41:11)	
29. [dʊʁbuna]	‘pathway’	(42:52, 43:01, 04)	
30. [ʁoħi]	‘go to’ IMP	(43: 33)	
31. [ʕaʁi̠sˤ]	‘groom’	(43: 44)	[ʕaʁusˤ] ‘bride’ (43:45) & [ʕaʁʌsˤ] ‘wedding’
32. [maʁaː]	‘woman’	(44:37)	
33. [tˤhoʁ]	‘circumcision’	(44:44, 52)	
34. [jə-fəʁħon]	‘they celebrate’	(45:15)	

Own Corpus: M5 Proverbs, city names & animal terms 20/09/2020

1. [baʁʁaː]	‘outside’	(00:47)	
2. [faxar]	‘pride’	(5:24)	
3. [tarakni]	‘left me’	(6:28, 6:30)	
4. [ʃaʕʁi]	‘my hair/ a lot’	(6:47,59)	Also, [[ʃaʕaʁ] (6:51), (7:21.22)
5. [ʁʊbʕin]	‘40’	(7:44, 52)	In a proverb اقعد ويالقوم ٤٠ يوم واصيغ مثلم
6. [ʁiħi]	‘smell’	(10:32)	Also, [əʁʁ̞iħi]
7. [ʔəl-xaʁaz]	‘beads/children’	(9:34, 10:08, 11)	
8. [ʔəbʁēʁ]	‘in a different’	(10:03)	
9. [diʁ balak]	‘watch out!’	(10:55)	
10. [jə-fqaʁ]	‘become poor’	(12:55, 13:05)	But [faqir] (13:07)

11. [ʔədafatər]	‘notebooks’	(13:17)	[ʔədafatəʁ] (13:35, 36. 39, 42)
12. [jə-dawwəʁ]	‘look for’	(13:10)	
13. [ʔəl-wɑʁda]	‘flower’	(16:34, 38, 43)	
14. [ʁiħita]	‘its/her smell’	(16:36)	
15. [ʔəl-ʁəd͡ʒɑːl]	‘the man’	(26:27, 34)	
16. [bɑħɑʁ]	‘the sea’	(26:29, 37)	
17. [ʁɑðˤðˤi]	‘satisfied’	(28:04, 29:17)	
18. [ʁɑqʊsˤ]	‘danced’	(31:38, 32:--)	
19. [ʁɑʁɑq]	‘drawn’	(33:27, 34)	
20. [bɑsˤʁɑ]	‘Basra’	(0:40, 1:08)	[ʔəl-bɑsˤʁɑ] (1:11)
21. [lə-ʕəmɑʁɑ]	‘Amara’	(1:27, 33)	
22. [ʕɑqquːbɑː]	‘scorpion’	(13:45)	[ʕɑqqubɑ sudɑ] [ʕɑqqubɑ sˤɑfʁɑ], [ʔəʕqɑːʁib] (15:00, 15:02, 05)‘scorpians’PL
23. [sˤʊʁsˤʊʁ]	‘cockroach’	(16:37, 41, 45)	
24. [ʔəd͡ʒʁede]	‘mouse/rat’	(19:51,54,59)	[d͡ʒəʁdin] ‘rats’ (20:00)

Own Corpus: M5 2020-09-26 Means of transportation, animal terms, number, colour terms, cities, belonging and ethnicities

1.	[sijjɑrɑːt]	‘cars’	(00:17)	[sijjɑrɑ] ‘car’ (00:25, 26)
2.	[qitˤɑrɑːt]	‘trains’	(00:44)	
3.	[tˤijjɑrɑːt]	‘planes’	(00:47)	
4.	[ʔəl-ʔəħmiʁ]	‘donkeys’	(00:53)	
5.	[ʔəqʁun]	‘horns’	(3:24)	[qəʁən] ‘horn’ (3:57), [qəʁnen] ‘two horns’ (4: 04, 05)
6.	[qʁənfəl]	‘clove’	(3:33, 35)	[qʌrʊnfʊl] (M0)
7.	[ʔəl-ʔəħʁuf]	‘letters’	(4:31)	
8.	[ʕɑqʁoːq]	‘frog’	(6:32,33,35)	
9.	[ʕɑsˤfuːʁ]	‘sparrow’	(6:45, 47 48)	
10.	[ʔəl-fɑʁʁoːd͡ʒ]	‘chicklet’	(7:55, 8:00)	

11. [sˤɑqɑʁ]	'falcon'	(8:27)	
12. [bɑʁbɑʁɑːʔ]	'parrot'	(8:55, 57, 59)	
13. [bumɑt ʔəl-xɑrɑijəb]	'ruin owl'	(9:36)	
14. [tˤeʁ]	'bird'	(10:36)	
15. [ʔəl-ʔɑħmɑʁ]	'red'	(11:28)	[ʔɑħmɑʁ ʁɑməq] (13:11) [ʔɑħmɑʁ fatəħ] (13:13); also, [əl-ʁ̞ɑ̠·məq] 'the dark (color)'
16. [ʔəl-ʔɑsˤfɑʁ]	'yellow'	(11:29)	
17. [ʔəl-ʔɑxðˤɑʁ]	'green'	(11:37)	[ʔɑxðˤɑʁ ʔəl-ʁɑməq] (11:43)
18. [bʌrtʌqɑli]	'orange color'	(11:51)	
19. [ʔəl-ʔɑzɹɑ̞q]	'blue'	(12:32)	
20. [ʔəl-b̪ᵝʊrtˤʊ̞qɑ̠ːli·]	'orange'	(12:51)	Breathy bilabial stop and a short trill. Lowering and cooccurring retraction shows that the alveolar voiceless stop is pharyngealized.
21. [hɑluma d͡ʒarrɑ]	Etc.	(13: 50)	
22. [ʃwɑndɑʁ̞]	'the color of the beetroot'	(15:09)	But [ʃamɐ·ndɑɹiː] 'the color of beetroot'
23. [bˤɑ̞hɑ̞ːri]	'shade of grey'	(15:44)	From the speaker description it is a light color and not white.
24. [ɻsˤɑ̞ːsˤi·]	'grey'	(16:04)	Higher F2 towards F3 (convergence) which suggests a retroflex articulation.
25. [wɑrdi·]	'the color of pink flowers?'	(17:12)	But [wɑʁ̞d] (17:50, 58) and [wɑʁ̞dɑ·]
26. [ʔəl-jəsɑr]	'left'	(19:04)	

27. [wɑrdi·]	'pink'	(19:58)	Check (25)
28. [ʔəl-ʁ̞sˤɑsˤi]	'grey'	(20:29)	Check (24) or [lə-ʁ̞sˤɑ̠ːsˤi] and [əʁ̞sˤɑ̠ːsˤi].
29. [sˤɑfʁʁɑʔ]	'yellow adj'	(21:15)	[sijɑrɑ sˤɑfʁʁɑʔ] SG & PL Also, [ᵊsˤfaʁ̞ʁ̞] 'he went pale' by M0
30. [ħɑmʁʁɑʔ]	'red' adj	(21:23)	SG & PL
31. [wɑrdiji]	'pink' adj	(21:26)	SG & PL
32. [xɑðˤʁʁɑʔ]	'green' adj	(21:42)	SG & PL
33. [ʔəʁsˤɑsˤi]	'grey' adj	(21:58)	SG & PL
34. [ħmiʁ]	'donkeys'	(26:15)	
35. [wɑʁda]	'flower'	(26:27)	[wɑʁda əʁsˤɑːsˤi]
36. [wʊʁu·d]	'flowers'	(26:44)	
37. [sijɑrten]	'two cars'	(31:21)	
38. [bɑsˤʁɑ]	'Basra'	(33:29)	[bɑsˤʁɑwi] '(he is) from basra' (33:35), [bɑsˤʁɑwijin] (33:41) '(they are) from Basra' [bɑsˤʁɑwijin] 'two from Basra' (34:20)
39. [ʕɑmɑːʁɑ]	'Amara'	(34:35)	[huwi bəl-ʕɑmɑːʁɑ] 'he is in Amara' (34:45), [haða min ʔəl-ʕɑmɑːʁɑ] 'he is from Amara' (34:57).
40. [kəʁdi]	'Kurdish'	(35:44)	[kəʁdijin] 'two Kurds' (37:02), [ʔəkʁɑd] 'Kurds' (37:10, 12) [kəʁdiji] 'Kurdish F' (38:18), [kəʁdijiat] 'Kurdish F.PL' (38:22)

Own Corpus: M5 2020-09-26 Means of transportation, animal terms, number, colour terms, cities, belonging and ethnicities

1.	[baʁʁɑː]	‘overseas’	(12:58)	
2.	[lorijɑt]	‘lorries’	(11:58)	[lori] (12:00)
3.	[ʔətˤtˤjɑrɑn]	‘airlines’	(12:46)	
4.	[ʔəlqitˤɑr]	‘train’	(14:09)	
5.	[ʕəlbɑwɑxər]	‘to the ships’	(16:04)	
6.	[məʁkəb]	‘boat? /small ship’	(16:11)	
7.	[qeʁ]	‘tar’	(17:35)	
8.	[ʕɑrɑbɑnɑ]	‘wagon’	(19:08)	[ʕɑrɑbɑnt͡ʃi] (20:12) ‘the driver of the wagon’
9.	[nɑfɑrat]	‘individuals’	(20:25)	
10.	[sijjɑrɑt]	‘cars’	(21:27)	
11.	[motˤʊrsaijkilat]	‘motorcycles’	(25:35)	[motˤʊrsikəl] (27:10)
12.	[mɑtˤɑːr]	‘airport’	(28:52)	
13.	[tˤijjɑʁɑː]	‘airplane’	(29:05)	[tˤijjɑʁ] ‘pilot’ (29:49)
14.	[həlıkoptər]	‘helicopter’	(30:11)	

Own Corpus: M5 2020-10-05 Food, Car Parts, Loanword-list 20_20_36

1.	[ʔəlfɑ̘ːr̙əsi̙]	‘Persian’	(00:43)	
2.	[fərə̞̃n]	‘oven’	(1:52)	
3.	[ʔəttɑnno̘ːʁ]	‘tandoor/tannour’	(2:22)	Vowel is retracted and the uvular rhotic is fricative because of the random energy on the higher formants.
4.	[sˤɑmˤmu̘ːn]	‘small bread similar to a sandwich’	(4:30)	Mesopotamian Arabic *Sammūn* > Ottoman Turkish **Sômūn* > Medieval Greek ψωμίν **So:min* ‘bread’ > Koine Greek ψωμί **Somi*:

			‘bread’ > Ancient Greek **So:mos* ψωμός ‘bite or little food’
5. [mɑħʁᴴo̠q̚]	‘burned’	(2:57)	
6. [qo̠ːsˤɑ̠·ʰ]	‘a round piece of bread’	(3:45)	[qo̠ːsˤɑ̠·ʰ χə̠bəz̥] (3:47), [qᵊʁ̞əsˤtˤẽ̠ːn χə̠bəz̥] and [qəʁ̞əsˤtˤẽ̠ːn χə̠bəz̥] ‘two round pieces of bread’ (4:00), [ʔəʁ̠ˤbɑ̠ʕ qʌ̠ʁ̞ʌ̠sˤ] ‘four round pieces of bread’ (4:09) and [ʕə̠ʃʁ̞iːn qo̠ːsˤɑ̠·ʰ] ‘twenty pieces of bread’ (vocalized token)
7. [ˈʕəʃˈʁin]	‘20’	(4:16)	
8. [ʔəl-χɑmir] [ʁ]	‘Unleavened bread’	(10:04)	[ʁer məχtaməʁ] (10:08) [ma məχtaməʁ] (10:10)
9. [ᵊd͡ʒʁɑ·dəq]	‘a type of papadum’	(10:38)	Also [d͡ʒʁɑ·dəq] one token, [d͡ʒɑ̠̞ʁ̞dɐqɑ̠ij̞i] ‘one…’ (10:46), [d͡ʒə̞ʁ̞dɑ̠qqɑ̠iteːn] ‘two…’ (10:50) three and more would take /d͡ʒʁ̞ɑ·dəq/.
10. [tˤᵊqɑʁətˤuː]	‘to bite/chew really hard’	(12:11,-13-14)	
11. [ʔəʃʃɑkər]??	‘sugar?”	(14:03)	
12. [qemɑʁ]	‘creamy dairy food’	(21:04, -07, -21)	
13. [xummʁɑ]	‘fermented milk’	(22:58)	
14. [ʁ̞əzz]	‘rice’	(26:33)	
15. [mʌʁʁi]	‘side-mirror (in a car)’	(5:45, -53, -6:06)	

Own Corpus: M5 2020-10-05 Food, Car Parts, loanword-list 20_59_15

1.	[daʃbuːl] & [daʃbo̞ːɹd̪]	‘dashboard’	(0:34, 1:03)	
2.	[dɑ̞rɑ̞g]	‘glove box’	(0:47)	Or /t͡ʃəkmat͡ʃa/ < Turk?(1:39)
3.	[wələste̞ːɻə̞n]	‘steering weel’	(2:02)	Or [ᵊste̞ːɻə̞n] (2:06)
4.	[gi̞ːɽ]	‘gearbox/ stick shift’	(2:13)	Also, [giːɽ^{H}] or [giːr̥]
5.	[sˤɑːlɑnsˤɑː]	‘car exhaust /silencer’’	(2:22)	
6.	[hɛ̃nd ᵊbɹeːk]	‘hand break’	(3:10)	
7.	[tɑijəɹ]	‘tire’	(3:18)	
8.	[mɛʁ^{H}ɨˑ]	‘mirror’	(3:44)	Fricative because there is random energy on high frequencies.

Own Corpus: M5 2020-10-05 Colour terms, Taboo words & body parts

1.	[ᵊmqʌʁʁmʊz]	‘crimson’	(00:24,00:29)
2.	[ʕɑnbˤari]	‘a shade of red’	(00:27)
3.	[ʔəʃʃɑðˤðʁi]	‘a colour??’	(00:39)
4.	[ʕeʁ]	‘penis’	(2:05)
5.	[dʒʌħʌʁ]	‘buttocks’	(2:10, -17)
6.	[sˤɑdʌʁ]	‘breast’	(4:18)
7.	[ʔəsˤsˤʊʁʁɑː]	‘stomach’	(4:34)

Own Corpus: M5 2020-10-15 Taboo 20.46.07

1.	[jətˤʁʌb dʒʌlʌq]	‘masturbate (male only)’	(01:04)
2.	[dʁɑbin]	‘paths/ways Lit:. alleys’ Pl.	(9:40)

Own Corpus: M5 Taboo cont. 25/10/2020 20.05.18

1.	[ʁʌbbʌk]	‘your God’ M.	(1:51)	(in a swear)
2.	[bəzʁʌk] <r	‘your root’	(2:40)	(in a swear)
3.	[ʔəzzʌfʁɑ] <r	‘a stinky smell (usually associated with food)’	(4:51)	(in a swear)
4.	[ʔəbu ʔəlʕijuʁɑ]	‘reductive expression, Lit. father of penises’	(6:15)	(in a swear)
5.	[ʔəbn ʔəlʔəhrah]	‘son of a bitch’	(6:43)	(in a swear) /ʔ/ < /ʕ/
6.	[ᵊd͡ʒʁede]	‘rat’ Dim.	(8:40)	
7.	[ʕeʁ]	‘penis’	(16:03)	
8.	[χɑʁ̞ɑː bʁ̞̠o̞ːħu labuːk]	‘fuck off’	(16:45)	The uvular approximant is really weak and barely audible.
9.	[jətmʌʁʕʌl]	‘to roll over sand’	(19:52)	
10.	[tˤɑqq ʔənnɑðˤɑʁ mal ʕenʌk]	‘Wishing someone’s eye bursting’	(27:19)	(lit. tˤɑqq ‘burst’, ʔənnɑðˤɑʁ ‘vision’, mal ʕenʌk ‘your eyes’)
11.	[mʌsˤbuʁ ʔəddɑst]	‘dark or dirty pot’	(29:00)	< *ġ*
12.	[ʁeʁ weħəd]	‘someone else’	(31:45)	
13.	[xʌʁa biːk]	‘fuck you’	(32:28)	
14.	[ʔəndɑʁ mʌdɑʁ ʔəlkʌlb]	‘turned around and got distracted??’	(34:24)	
15.	[ðˤɑʁbˤ-ɑː]	‘hit’ F.SG	(35:54)	
16.	[jə-ðˤʁəb]	‘to hit’ 3.SG.Present	(35:35)	
17.	[tə-ðˤʁəb-u]	‘to hit’ 3.SG.2.SG	(35:40)	
18.	[ʁʊqbət-ʌk]	‘your neck’	(36:45)	

19. [naʁəl]	‘illegitimate child’	(37:01)	= [Ibn ʔəlħʌrɑ:m] from M5 and [naʁəl-a:] F.
20. [su:da: aw-mɑsˤbuʁa]	‘it’s clear, certain’	(42:21)	< *ġ* Lit. clearly black?
21. [ħʌmʁa:ʔ]	‘red’ adj	(43:35)	
22. [xʌðˤʁa:ʔ]	‘green’	(43:37)	
23. [su:da: ʕala ʁa:sək]	‘hoping the worst for someone’	(43:51)	
24. [ʕɑqlu mxʌrbʌtˤ]	‘confused or imbalanced in his mind’	(44:31)	

Own Corpus: M5 Swear Words 2020-10-25 21.05.33

1. [ʕɑzʁa:il ʔəxaðɑk]	‘wishing someone death’	(1:32)	Known as the Angel of death and it is [ʕʌzra:ʌl] in Hebrew by M5 (3:00)
2. [la:ddiʁ bal]	‘don’t worry’	(1:25)	
3. [karatʃi]	‘type of charcoal?’	(9:33)	Most likely refers to the city of Karachi in Pakistan as it is known for exporting quality charcoal.
4. [fɑssɑʁa]	‘someone interpreted it’	(11:30)	
5. [ʔɑʕʁəf]	‘I know’	(11:25)	
6. [qʌ̝zzʌ̝r qˤʌ̝rt̙ˤʰ]	‘wishing someone to choke twice’	(12:26)	<Turkish?
7. [ʔeʕədi ʕɑla ʕeʁi]	‘sit on my penis’	(13:54)	< ʔeqʕədi
8. [ᵊʁ̞mɑ̠:d ᵊb-ʁ̞ɑ̝:sɑk̙]	‘ash on your head’	(14:04)	ə-epenthesis is the maintenance strategy for the phonology of JIA to break CC-.
9. [ʁɑʕsˤɑ: bik]	‘you’re shaking’	(15:17)	Also, [ʁɑd͡ʒfa] (15:54)
10. [ʔeʃtəʕɑlət d͡ʒʌħʁɑk]	‘you got horny’	(16:00)	

11.	[jə-tmʌʁʕʌl bəl-xɑʁɑ]	‘he rolled over shit’	(20:08)	
12.	[tfɑnu ləbzɑʁʌk]	‘turn to who created you?’	(21:48)	
13.	[jə-tmʌʁʕʌl bə-tʁɑ:b-u:]	‘he rolled over his dirt’	(21:39)	
14.	[tˤəlʕət garwa b-ləʃət-ak]	‘wishing someone a hernia’	(21:54)	Most likely borrowed from Muslim Baghdadi

Own Corpus: M5 English Loanwords 2020-10-25 21.42.02

1.	[əlʔəspəɹiːn]	‘Aspirin’	(00:20)	Or a tap but there is no evident interruption or closure.
2.	[pɹo̞·tiːn]	‘protein’	(00:35)	There seems to be an initial perceptual vowel but there is no evidence for such in the spectrogram. And [ᵊpɹo̞·ti·nɑːt] Pl.
3.	[kɑ̠·r̝bʊhaidɹᴴɑ̠ːt]	‘carbohydrate’	(00:78)	The last rhotic is an approximant but sounds also a bit lateralized with evident random high frequency energy which suggests frication.
4.	[nəʕʁʌf]	‘we know’	(00:42)	
5.	[həlɪkɔ̞btəɹ̝̊]	‘helicopter’	(2:24)	Weak articulation of /r/ and devoices towards the end.
6.	[bəkɪn ˈpawdəɹ̝]	‘baking powder’	(3:24)	Weak rhotic almost devoiced at the end.
7.	[ˈbæ.tɹ̝i]	‘battery’	(3:33)	Weak rhotic. Also [bæ.tri̠ːje·n] ‘two batteries’, [bæ.tri̠ːjɑ·tʰ] ‘batteries’ PL.

8.	[pʌnt͡ʃar]	‘puncture’	(4:24)	Weak trill at the end. [pʌnt͡ʃə̠ɹeːn] ‘two punctures’
9.	[bə-ttaijər̩]	‘On the tyre’	(4:28)	Final trill. Interestingly, there is evidence so far that final trills and approximant to not trigger lowering or retraction.
10.	[sijjɑrɑ-t-ak]	‘your car’	(4:20)	
11.	[kæ.bre.tɐɹ̝]	‘car carburettor’	(5:06)	Also, [tˤrʌmbɑ̠ː] ‘water pump’
12.	[ɹə̠ˑdjɑːto̠ɹ̝̊]	‘car radiator’	(5:28)	Approximant and final retracted, weak and slightly devoiced /r/.
13.	[sˤɑːlɑnsˤɑː]	‘car exhaust silencer’	(5:38)	No evidence of rhotic here most likely borrowed as /ˈsaɪlənsə/ BE.
14.	[wələste̞ːɻ̝ə̠n]	‘steering wheel’	(5:80)	Raised F2 and lowered F3 after the /r/ are indication of a retroflexion.
15.	[ˈbˤɑ̠ɹᴴ.t͡ʃa]	‘brush’	(6:15)	Any kind of brush including a toothbrush.
16.	[kɑ̠hɾɑ̠bɑ̠]	‘electricity’	(6:35)	<Persian
17.	[ʔəbʁiːqʰ]	‘kettle’	(7:07)	There is evidence of random high frequency energy which suggests frication.
18.	[əlqṳːɾi]	‘teapot’	(7:34)	Tap and
19.	[lo̠ˑɾi]	‘lorry’	(8:55)	Also [lo̠ˑrijeːn] ‘two lorries’, [lo̠ˑrijɑːtʰ] ‘lorries’ PL.
20.	[neːɹəˑn]	‘Nairn’ ‘a motor transport company’	(9:33)	

21. [bˤɑ̪̃ntˤ̪rɔ̪̃ːn]	'pants'	(10:01)	< French /pantalon/ [bˤɑ̪̃ntˤ̪rɔ̪̃neːn] 'two pants' [bˤɑ̪̃ntˤ̪rɔ̪̃nɑ̪ːt] PL.
22. [məzrʌff]	'driller'	(10:24)	
23. [dʊktɔ̪ːr̪↓]	'doctor' M.	(12:45)	[↓] ingressive airflow which entails that the rhotic is characterized with an intake of airflow rather than proper full constriction because the rhotic is weakly articulated. Also, [dʊktɔ̪ːreːn] 'two doctors', [dɑkɑːtrɐ] M.PL., [dɪktɔ̪·rɑ·] 'Doctor' F.SG, [dɪktɔ̪rteːn] 'two' F., [dɑkɑːtrɑːt] 'F.PL'
24. [gir̪ᴴ]	'gear'	(13:34)	Also, [giɹᴴ] in another token.
25. [ʁɑmz]	'wink'	(16:26-38, 17:28)	
26. [rɑmz]	'symbol'	(17:40, 18:37)	
27. [ʁɑnn-a]	'my ear is ringing'	(19:06, 19:14, 19:23, 20)	In this example and the one below M5 had to review his tokens many times in different ways which shows both tokens are perceptually identical or almost similar. M5 by the end substituted the token for 'my ear is ringing' with /rɑnn-a/ (21:05, 21:14, 21:18). M0, however, disagrees with M5 on these tokens and agreeing to the examples in 65 and 66.

			Which also shows, if evident across many other speakers, feasible free variation.
28. [ʁɑnn-a]	'He sang'	(19:41, 19:43, 20:31, 21:58)	
29. [sˤɑ̠·ʁ̞ ʔəððɑhɑb]	'he casted the gold'	(23:04, 23:14, 24:26, 24:35, 24:47)	Approximant rhotic
30. [sˤɑ̠·ʁ̞ ʔəlwɑqət]	'Time passed'	(23:55, 24:01, 24:10)	Or Or [sˤ̞ɑ̠ʁ̞ ʔəlwɑ̠qt]. M5 here again self-corrected to [sɑʁ ʔəlwɑqət / ʔəlwakət] 'time passed' (24:37, 24:43, 24: 49, 24:57).
31. [zɑ̠·ʁ̞-ət zodʒa]	'she visited her husband'	(28:47, 29:36)	Also, [zɑ̠·ʁ̞-ət sˤɑdiqita]
32. [zɑ̠·ʁ̞ -ət ʕenu]	'he moved his eyes'	(28:46)	

Own Corpus: M5 Jewelry, body parts, animals 18-11-2020

1. [gəɽ̞dɐna]	'a type of necklace'	(00:34, 00:40, 4:52, 5:42, 18:09, 18:14)	Weak trill, not really audible but there is still evidence of voicing and repetitive interruption of the air stream, no evidence of frication or wider stricture either. (Turkish < Persian?)
2. [qʌ̠rə̠n]	'horn'	(00:45, 00:49, 00:53, 1:07, 1:10)	Tap, retracted schwa.
3. [χɑ·ɾˤṳ:f]	'sheep'	(00:47)	Pharyngealized tap and the vowel next to it is retracted F1 and F2 almost merge.

4. [χɑ̰rɐz]	‘bead(s)’	(1:27, 1:34, 1:36)	Tap
5. [ʔəzʁᴴɑ̰q]	‘blue’	(1:47, 1:48, 1:52, 9:14, 9:16)	[ʔəzʁɑ̰q] M5 used /r/ in (1:28, 1:30) [ʔəlʔəzʁɑ̰q] (9:14, 9:16). Also [ʔəlʔəzɹ̥ɑ̰q]
6. [jɑ.sɑ:r̥]	‘left’	(1:18, 1:19)	Devoiced trill
7. [ʁəmman]	‘pomegranate’	(3:16, 3:19, 3:24)	And also [ʔərrʊ̰mmɑ̰n]
8. [mɑðku:ʁ]	‘mentioned’	(3:31)	
9. [ʕɑsˤsˤɑdʌʁ]	‘on the chest’	(8:15, 8:21)	
10. [kɑ̰ɹᴴɑ̰·t͡ʃiː]	‘charcoal’	(3:68)	No sign of closure, closer to an approximant with random energy on higher formants.
11. [t͡ʃəngɑːl]	‘(necklace) clasp'	(8:40, 8:45)	/l/ <Persian *čāngal, & Otto Turk çengel, çatal.* But /r/ in Najdi
12. [zəndʒi:l]	‘(necklace) chain?’	(8:54)	*šənkār.*
13. [ʁɑqbi-t ʔəlmɑʁɑ:]	‘the woman’s neck’	(9:00)	
14. [ʔəlxɑʁʌz]	‘the beads’	(9:10)	
15. [ᵊmʁɑ̰·w.wəd]	‘earrings’	(9:47, 9:48, 10:03, 10:22)	<r etymology still unknown
16. [ˈbˤɑ̰ɹᴴ.t͡ʃa]	‘brush’	(12:27, 12:34, 12:38, 12:40)	
17. [swa:ʁa:t]	‘bracelets’	(13:06)	[sˤwa:ʁ] (18:52, 18:58)
18. [nwɑ:xi:ʁ]	‘nostrils’	(29:57, 30:00, 30:03)	
19. [dʒʌʁʁ]	‘pull’	(29:28, 29:30)	Or [d͡ʒɑʁ̥ʁ]
20. [ʁəmu:ʃ]	‘eyelashes’	(30:20)	
21. [ðˤɑhɑʁ]	‘back (body part)’	(32:24)	
22. [sˤʌʁʁɑ:]	‘stomach (exterior)’	(32:59, 33:04, 33:08)	

23. [ʁɑ:s ʔʌffɑ:d]	‘the heart (body part)’	(34:07, 34:12, 34:28, 34:34, 35:15)	Etymology?
24. [qʌzu:ʁ]	‘the lower part of the back’	(36:10, 36:15, 36:38)	
25. [dʒʌħʌʁ]	‘lit. hole’	(36:40)	And [ʔʌdʒʌħʌʁɑ:t] (36:42, 36:47) two or more.
26. [ʃəʕʁijəta]	‘pubic hair’	(37:50, 38:07)	
27. [bʌðˤʌʁ]	‘clitoris’	(38:11, 38:15)	
28. [ʁokbɑ:]	‘knee’	(39:12)	

Own Corpus: M5 Areas in Baghdad & terms of topography 2020-11-18 21.40.48

1. [tatˤrˤɑ:n]	‘an area in Baghdad’	(00:16)	
2. [ʔətawra:t]	‘an area in Baghdad’	(00:20)	(Tap here) (this area have the majority of the synagogues in Baghdad)
3. [qɑmbɑr ʕɑli]	‘an area in Baghdad’	(00:42)	
4. [kotʃʌ-t ʔənnɑsˤɑ:ʁɑ:]	‘an area in Baghdad’’	(37:50, 38:07)	[kotʃʌt] < Persian?
5. [daʁbu:na:]	‘alley’	(00:52, 00:54)	
6. [sərdɑ:b]	‘basement’	(2:39, 2:43)	Tap
7. [ʔɨɹˤq̝ˑd]	‘details, lit. import’	(3:66)	
8. [mˤq̝sˤrˤʌ̝f̘f]	‘details lit:. export’	(3:68)	
9. [su̟ːr͈]	‘wall’	(4:34)	
10. [ʔərrˤʉ̘sˤɑ̘ːf̙ɑ]	‘Area in Baghdad’	(5:00-6:00)	
11. [kəʁʁɑ̘ːdɑ̙]	‘an area in Baghdad’	(4:13 4:42)	
12. [ʕɑrɑ:sˤɑ:t ʔəlhindija]	‘an area in Baghdad’	(4:56, 5:03)	Tap

13. [su:r baʁdad]	'Baghdad wall'	(7:15, 7:50)	
14. [ʁɑ:s ʔəlħɑwa:ʃ]	'an area in Baghdad'	(7:52)	
15. [ʔəlgreʕɑ:t]	'an area in Baghdad'	(8:09)	
16. [rɑʁbʌt xa:tu:n]	'an area in Baghdad'	(8:15)	
17. [ʔəlkʌsra:]	'an area in Baghdad'	(8:43, 8:55)	Tap
18. [ʔəlwazirija:]	'an area in Baghdad'	(9:23)	Tap
19. [tʃɑ:dərija:]	'an area in Baghdad'	(13:04)	Devoiced Tap
20. [ʔələmrɑbʕɑ:]	'an area in Baghdad'	(13:33, 13:55)	Tap M5 shows a tap and M0 has /ʁ/.M5 also says he heard some Jews also use /ʁ/
21. [ʔəldʒəʕefər]	'an area in Baghdad'	(14:20)	Trill
22. [ʔəddo̜ːrɑ̜ː]	'an area in Baghdad'	(14:35)	Approximant
23. [ʔəlʕɑ:mrija:]	'an area in Baghdad'	(14:56)	Approximant
24. [nəhʌʁ]	'river'	(19:13, 19:24)	But [nəhʌr ʔəlfurɑ:t], but M5 says may be they could say [nəhʌʁ didʒla:].
25. [bɑħʌʁ]	'sea'	(19:52)	
26. [ʁ̥ʌt.rɑ̜ː]	'head scarph'	(16:58)	tap
27. [ʁarʁar]	'gurgle'	(17:34, 17:43)	Trill
28. [dʌʁb]	'way'	(18:49)	Unreleased final stop
29. [hɑ.rɑ̜m]	'pyramid'	(19:57)	Tap and [ʔəhrɑ:m] 'pyramids'

30. [ˈχɑ̝ɾɑ̝ː]	‘an exclamation of disgust/anger /annoyance lit:. shit!’	(20:55)	Tap
31. [χɑbbɑʁ-u]	‘he informed him’	(21:58)	
32. [ʔətχɑ̝rrʌ̝d͡ʒ]	‘he graduated’	(22:30)	
33. [χə̝ʁd͡ʒiːje]	‘budget’	(13:66)	
34. [mˤɑ̞sˤʁ̞ɑ̠f]	‘budget or money’	(13:77)	
			e.g. [d͡ʒo̞ˑɾˤɑ̞ː] ‘handkerchief’
35. [χəʁdʒiji]	‘budget money’	(23:33)	
36. [χɑ̞ɾˤɑ̠̠ːb̜ˤɑ̞ː]	‘ruin’	(23:50)	Pharyngealized tap, the first vowel is retracted F1 is high and F2 is low. The vowel after the tap is backed and have a strong articulation and have darker F5 which suggests high tone or frication. The pharyngealized bilabial consonant is somehow rounded and there is a final lowered and retracted long vowel at the end.
37. [χ̝ɑ̠rˤrˤɑ̞ˑb̚]	‘destroys or ruins’ 3SG PST	(14:84)	
38. [χə̞ʁ̞be̞ːn]	‘malfunctioned’	(25:22, 25:27, 25:32)	The uvular rhotic is approximant and is almost fully fused with previous vowel. Both vowels are retracted (high F1 and low F2).

39. [ʔə̞mχʌ̞rbˤɑ̞·t̪ʰ]	'confused'	(25:47)	Alveolar trill, all vowels show retraction and the final pharyngealized consonant is weak and aspirated.
40. [tɐhᵊriːb]	'smuggle' n.	(15:05)	

Own Corpus: M6 (2020-10-13 Consent, Ice-breaker & Proverbs)

1. [ʁɑ:su ʕili: aw dʒebu: farəʁ]	'he thinks high of himself and he got poor'	(07:47)	Tap. Proverb
2. [basˤʁɑ:]	'Basra'	(13:27)	
3. [ʔəsˤfɑʁ]	'yellow'	(15:45)	
4. [χɑ·ɾˤu̞ːf]	'sheep'	(16:22)	Tap
5. [ʁoħa: bɑlɑ: rɑdʒʕɑ:]	'leaving with no return'	(18:10)	Approximant
6. [ʁədʒɑ:l]	'man'	(44:16, 44:20, 44:29)	
7. [mɑʁɑ:]	'woman'	(44:26; 44:40)	
8. [ʃɑ:tˤʁ-i]	'she's really good'	(44:55)	
9. [kəll ʔəsˤbɑ:ʕɑ: ʁədʒɑ:l]	'she's strong and independent'	(45:02)	Proverb
10. [qitˤɑ:r]	'train'	(45:51)	Tap
11. [mʌʁrəb]	'after sunset'	(45:58)	Voiceless approximant
12. [ʔənnɑ:sˤrija:]	'Nasiriyah'	(46:15)	Tap a city in Iraq
13. [qemɑʁ]	'creamy dairy food'	(46:17)	
14. [ʔəbneti]	'daughter'	(47:27-32)	
15. [ʕɑ̞ʃʁ əsniːn]	'10 years'	(47:18)	
16. [ʕəbˈɾɑ̞ːni]	'Hebrew'	(48:20)	Tap
17. [ʔəmʁɑ:-t-i]	'my wife'	(58:22)	

18. [bɑʁ̞̥ʁ̞̥ɑː]	‘outside’	(58:27)	Approximant trill or approximant fricative
19. [ʕʌmʁɑ-k]	‘your age’	(1:16:58, 1:17:03)	
20. [b-əl-xeʁ]	‘if you don’t’ mind’	(1:16:59, 1:17:01)	

Own Corpus: M6 20-10-2020 Food, color terms, means of transportation, myths & superstition, traditional medicine

1. [əl-ʕəbɹi]	‘The Hebrew’	(00:43 - 00:53)	
2. [mɑʕrɛf]	‘I don’t know’	(00:06)	
3. [ʕi·rˤɑ̞ːqi̞ːjaː]	‘Iraqi’ adj	(00:08, 1:05)	There also slight frication
4. [jəoːʶħ]	‘go to’	(00:45)	Also, [jəuːʶħ] (00:56)
5. [ət-tawrˤɑː]	‘the bible’	(00:58)	Not sure about
6. [əl-ʕɛbrɑːnijɑː]	‘The Hebrew’	(00:69)	pharyngealization here
7. [bɐːɾ̥mʌs̻wˠɑː]	‘Bar Mitzvah’	(00:50)	Partially devoiced
8. [ʔəl-mɐdrɑsɑː]	‘the school’	(00:85)	
9. [ʔəl-ʔərmɐn]	‘Armenians’	(01:34)	
10. [qemʊʁ]	‘creamy dairy food’	(5:38-46)	
11. [mɑʁɑː]	‘woman’	(5:02)	
12. [b-əl-bɑsˤʁɑː]	‘in Basra’	(5:47)	
13. [b-əl-ʔʌhwɑːɹ̞̤ᴴ]	‘in Iraq Marshes’	(5:32)	Devoiced approximant fricative.
14. [ʕʌmʁɑ-k]	‘your age’	(1:16:58, 1:17:03)	
15. [b-əl-xeʁ]	‘if you don’t’ mind’	(1:16:59, 1:17:01)	
16. [ʔətˤtˤɑɾi̞ːq]	‘the road’	(00:95)	
17. [ʔəl-bɑsˤɑ̞ː]	‘Basra’	(00:96)	No rhotic variant detected here
18. [ʔəl-ʕəʃʃɑːɹ̻̊]	‘Al-Ashar’	(00:97)	Partially devoiced (less intensity)

19. [ʔəl-bɑsˤʁ̥ɑ̞ː]	‘Basra’	(1:00)	Partially devoiced
20. [mɑʔəʢʁ̥ɛ̞f]	‘as I remember’	(1:23)	Epiglottal fricative Retracted and lowered barely audible
21. [sɐbʕ ɑ̞w ʁ̞ʊbʕĭːn]	‘47’ i.e. 1947	(1:74)	Barely audible rhotic
22. [qemʊʁ̥ˣ]	‘creamy dairy food’	(3:37)	Devoiced and frication
23. [tas̥ˤɑ̠wə̞ɹ̠]	‘imagine’	(3:63)	Retracted and maybe pharyngealized
24. [fɘdd]	‘one’	(3:67)	Total regressive assimilation no audible rhotic
25. [ˀʁ̠əbɛʕ]	‘quarter’	(3:69)	Slight glottal constriction most likely a stop because of formant interruption. Backing on rhotic
26. [nɛʕø̞ʶf]	‘we know’	(3:73)	Backing and lowering of rhotic very slight frication but not audible. There is a slight constriction and opening which suggests either an approximant or a vowel.
27. [kɛləstəɹɤn]	‘cholesterol’	(3:77)	Approximate and followed by high med back vowel F1: 451 and F2: 1261
28. [ʕəʃʁ̥ɨːn]	‘20’	(3:78)	Evidence of devoicing in the spectrogram with a narrower compressed waveform.
29. [χɑ·ɾˤu̞ːf]	‘sheep’	(3:90)	Slight tap and faded interruption on the spectrogram with Evident lowering of the F2. There is also a lower third formant.

30. [ʔəkbɛɹ̝]	‘the biggest’	(4:68)	A bit raised cause of lower F1 and higher F2 value
31. [mɑq̚b̥ɑ̠ɹ̠ɑ̝ː]	‘graveyard’ Adj	(4:69)	Backing on the preceding vowel and the rhotic
32. [qɑbər̥]	‘graveyard’	(4:72)	partially devoiced, audible trilling, narrower waveform, faded spectrums could also be an approximant if there was no trilling.
33. [mʊdiːɾ̠]	‘manager’		Short trill with few occlusions but there is no evidence of interruption.
34. [ʃɑːrəʕ]	‘street’	(4:95)	Very faint interruption
35. [ħɑ̠ːɻɑ̝ː]	‘neighbourhood’	(4:88)	Raised F2 rhotic that started from the proceeding vowel, with slight rounding articulation
			Raised and retracted with evident interruption. F3 is lowered. All these, acoustic cues suggest a retroflex approximant.
36. [sˤɑ̝ħɾˤɑ̝ːʔ]	‘desert’	(5:22)	Rhotic interrupts the airstream and is evident in the spectrum. The rhotic is pharyngealized because it shows a high frequency tone above the F5 and it shows cooccurring backing and lowering of the F1 & F2, respectively.

37. [ʔəzzʊbeːɹ̠̊˔]	‘al zubair’	(5:28)	Raised, retracted and slightly devoiced.
38. [rˤaʔəji]	‘my opinion’	(5:36)	Lowering of F3 and there is some frication evident on the spectrogram.
39. [b-əl-ʔʌhwɑːɹ̠̈ᴴ]	‘in Iraq Marshes’	(5:50)	Breathy rhotic I can’t say it’s devoiced but it is less audible and intensity falling dramatically down which indicate loss of tone and so voice.
40. [ʁɐɹb]	‘west’	(5:69)	Or tap but I can’t see evidence of interruption on the spectrum
41. [tɐnnuːɹ̥]	‘tannour’	(8:04)	The final rhotic devoices towards the end and it has a very lowered F1 opening and an increasing F2.
42. [ħɑ̹ɻb̚]	‘war’	(8:15)	Auditorily, Labialized [ʷ]/rounded [̹]. it is not quite clear but there is a very slight coarticulation here. These cues all together suggest a retroflexion. F3 and F2 converge as well.
43. [suːɹ̟jɑː]	‘Syria’	(8:40)	Fronted because of a dramatic increase in F1 perhaps due to an influence from the palatal glide next to it.

44. [mʉsˤʌ̞ɹ]	'Egypt'	(8:43)	Lowered and backed vowel and audible approximant rhotic
45. [fəʁ̞ɜ̃·n]	'oven'	(8:66)	Uvular approximant
46. [ʁ̞e̞ːɹ]	'different'	(8:75)	Lowered vowel and slightly backed toward the rhotic, the rhotic is very short but can't be a tap because of lack of interruption evidence
47. [gawɹɑ̞·gʰ]	'toasted bread'	(8:82; 8:84)	There is an evidence of frication here for the rhotic. This is a rhotic fricative. Etm. Perhaps Ottoman Turkish
48. [jəʃteʁ̞̟ɨː]	'he buys'	(9:32)	Advanced uvular approximant
49. [t͡ʃə̞ʁ̠ˤɑ̠ːdɪq]	'papadum'	(9:83)	Voiceless affricate, and retracted uvular approximant.
50. [mˤɑ̠ʁɑ̞ː]	'woman'	(1:14)	[mˤ] is lowered and retracted perhaps evidence of pharyngealization and the vowel next to it is lowered. Rhotic is uvular approximant.
51. [j̞əχʌme̞ʁ̞̊]	'to ferment'	(1:35)	Barely audible glide, and uvular rhotic have slight frication and devoices towards the end.
52. [b-əl-ʕɑ̞rˤɑ̠·bˤɑ̞ːnɛ̞ː]	'with a food cart'	(1:95)	Evidence of lowering and backing on the adjacent vowel to the rhotic. Rhotic here is either pharyngealized approximant [ɹˤ] or [rˤ]. F3 is lowered in rhotic.

53. [χˤɑ̞̠rɪ̞d͡ʒ]	‘outside’	(1:96)	Retracted voiceless uvular fricative. The coronal rhotic shows an evidence of frication and extends lowring on the next vowel.
54. [qe̞mʊ̞ʁ̞̥ˣ]	‘creamy dairy food’’	(2:24)	Devoiced or weak phonation similar or close to [x].
55. [mɑ̞ɹˤɹ̻ˤɑ̞̠ːt̚]	‘sometimes’	(2:30)	Evidence of F2 lowering and F1 rising where they both meet in midpoint at vocalic peak which suggests constriction. There is also slight devoicing as the waveform is a bit more constricted than other positions. Also, [bɑ̞ɹɹɑ̞ːd] ‘air cooler’, and [mʊʁ̞ʁ̞ɑ̞ː] ‘bitter’ by M0
56. [bɑ̞qe̞ɹˤɑ̥̞̠ːʰ]	‘cow’	(2:60)	No strong articulation of the rhotic here as it looks as it is a tap but there is an ongoing energy in the spectrum which suggests approximation and there is no interruption. The vowel next to it is barely audible and doesn’t have strong tone phonation. It also is aspirating towards the end. There is evidence of lowering and backing on the vowel next to the /r/ as well.

57. [mˤɑ̠·ɹɑ̝·ðˤ]	'illness'	(2:65)	The bilabial nasal shows a retracted coarticulatory effect on the next vowel where F1 and F2 are closer together. Rhotic is approximant
58. [jəbʁ̞ɑ̠̞·d]	'to cool down'	(2:70)	Uvular approximant.
59. [χˤɑ̠·rˤṷːf]	'sheep'	(2:90)	[χˤ] is because of F1 & F2 conjoin on the next vowel. This is a 'true' trill because it shows a series of interruption on the spectrogram. The vowels next to it is lowered and backed which suggests a constricted glottis.
60. [bˤɑ̝qɐ̞·ɹ̥̞]	'cows'	(2:93)	F1 and F2 closer together after the bilabial stop. The rhotic approximant devoices towards the end and is not very audible.
61. [ʔʌsˤfɑʁ̞]	'yellow'	(3:00)	Uvular approximant with lowered F3.
62. [ħˤɑ̠·ʁ̞ɑ·]	'hot'	(3:44)	Uvular approximant. Also [ħˤɑ̠·ʁ̞ɑ̝·] in (3:46).
63. [ʁˤɑ̠qqɨː]	'watermelon'	(3:49, 3:50, 3:51)	F1 & F2 are closer together, so vowel is retracted in all three tokens.
64. [qɑ̠ʁ̞ʁ̞]	'pumpkin'	(40:00)	Also, [faʁ̞ʁ̞] 'he poured/served food' [faɹɹ] 'he threw' confirmed and proposed by M0

65. [bˤɑ̠ɻħi]	‘a kind of dates’	(44:00)
66. [χɑnd͡ʒɑʁ̝]	‘dagger’	(26:00)
67. [ʁ̝iħaiji]	‘flour mill’	(37:00)

Own Corpus: Tokens produced and verified by M0 as reported in the literature

1. [əl-ʁ̝ɑ̠ːbɑ] ‘the forest’
2. [əl-ʁ̝ɑ̠ːsəl] ‘the washing’
3. [əl-ʁ̝eːmae̝] ‘the cloud’ SG.
4. [əl-bo̝ːħi ~ bo̝ːħi] ‘yesterday’
5. [ɑ̠χχɑ̠s] ‘dumb’
6. [əqqeːtu] ‘I read’ PST.
7. [qɑ̠d aqqɑ̠] ‘I’m reading’
8. [əqqib] ‘near’
9. [ɑqqɑ̠b] ‘nearer’
10. [əqqɑ̠ː] ‘read!’ Imp.
11. [ʁ̝ɑ̠ːɹ] ‘cave’
12. [ʁ̝əɹfɑ̠] ‘room’
13. [ʁ̝əɹɑ̠f] ‘rooms’
14. [ɹɑ̠ʁ̝wɑ̠] ‘foam’
15. [ʁ̝ɹɑ̠ːb] ‘crow’
16. [ʁ̝ɑ̠ɹiːb] ‘strange’
17. [ʁ̝ɹiːb] ‘stranger
18. [fɑ̠ʁ̝ʁ̝ɑ̠q] ‘he separated’
19. [fɑ̠ɹɹɑ̠q] ‘he distinguished’
20. [ʁ̝ɑ̠jjɑ̠ʁ̝] ‘he changed clothes’
21. [ʁ̝ɑ̠jjɑ̠ɹ] ‘he changed’
22. [fə̠ʷʁ̝.ħɑ̝ːn] ~ [fə̠w.ħɑ̝ːn] ‘happy or glad’
23. [əʁʁ̝eħɑ·n] ‘the basil’