

# Relationship between the science of *tajwiid* and modern phonetic and phonological studies

Yousef Mokhtar Elramli

(Department of English, Libyan Academy, Misrata, Libya)

yelramli@art.misuratau.edu.ly

ORCID:[0000-0002-9111-3515](https://orcid.org/0000-0002-9111-3515)

## ABSTRACT

Early Muslim scholars devoted much time and effort to studying their Holy Book, the Quran. Thus, they concentrated on the pertinent linguistic fields included in the Quran, such as exegesis, rhetoric, phonetics, morphology, and phonology. This paper sheds light on the efforts made by scholars of *tajwiid* 'Quran recitation' related to phonetic and phonological studies, aiming to highlight the terms introduced by those scholars and to present some of the phonological processes they analysed. In this respect, the paper concentrates on binary and non-binary classifications of speech sounds depending on articulatory criteria. Likewise, some processes involving the bilabial and alveolar nasals are presented. We will see that these nasals are either assimilated (totally or partially), concealed, or fully realized. In particular, the paper will compare between the analyses of *tajwiid* scholars and those of present-day phonologists, specifically analyses of the nasal concealment process.

## المخلص

كرّس العلماء المسلمون الأوائل الكثير من الوقت والجهد لدراسة القرآن الكريم، وقد أولوا اهتماما خاصا بالجوانب اللغوية المتعددة التي يحويها الذكر الحكيم، كال تفسير والبلاغة وعلوم الأصوات والصرف. تركّز هذه الورقة على الجهود التي بذلها علما التجويد المتعلقة بالدراسات الصوتية والصّواتية، بهدف إبراز المصطلحات التي استحدثها أولئك الأفاضل وكذلك عرض العمليات الصّواتية التي قاموا بتحليلها. وبهذا الصدد فإن هذه الورقة تلقي الضوء على التصنيفات الثنائية وغير الثنائية للأصوات اللغوية استنادا إلى المعايير النطقية. وعلى النهج نفسه، تعرض الورقة بعض العمليات المتعلقة بالصوتين الأنفيين: الشفتاني والسنيخي إذ أن هذين الصوتين إما أن يُدغما كليا أو جزئيا وإما أن يُخفيا أو يُظهرا،

وبصورة خاصة سنقارن هنا بين التحليلات التي قدمها علماء التجويد والتحليلات التي يعرضها علما الأصوات المعاصرين، وخاصة تلك المتعلقة بعملية الإخفاء الأنفي.

**KEYWORDS:** *tajwiid*, recitation, Arabic, phonological processes

---

## **Introduction**

Arabic linguistic studies are closely related to the Holy Quran. No linguistic studies were known before Islam and the revelation of the Quran. In fact, these studies started with the aim of serving this sacred Book. People with different linguistic backgrounds and even those who were originally non-Arabs, and consequently had no native-like mastery of the Arabic language, embraced Islam. Those were most likely to commit mistakes in pronunciation, which in some cases resulted in change of meaning. Consider, for example, the verse "ʾinna Allaha bariʾun mina lmushrikiina warasuuluhu" 'Allah is disassociated from the disbelievers, and [so is] His Messenger.' During the time of Caliph Omar, a man read this verse pronouncing the last word as *warasuulihi*, in the genitive, rather than the nominative, case. This changed the meaning radically to 'Allah is disassociated from the disbelievers, and from His Messenger.' (Al-anbaari, 1960: 244; Al-aṣṣahaani (n.d.: 299; Al-Nassir 1993: 3).

Such mispronunciations abounded, and scholars felt it was imperative that they do something to overcome this serious problem and that it was their responsibility to keep the Quranic text to the letter. As a result, Abulʾaswad Al-duʾali used dots to indicate the different cases. Later on, Alfarahiidi used diacritics, which were more accurate than the dots. (Abduttawab, 1982: 12; Dandrawi, n. d: 5).

Aljamal (2019) contends that *tajwiid*, as a science pertaining to places of articulation, properties of speech sounds and the phonotactics governing these sounds, was not known until the fifth century AH.

However, the anecdote we have just mentioned, Al-farahīdi's arrangement of his dictionary according to their places of articulation (from innermost to outermost), and Sibawayh's devotion of a substantial part of his book to phonetics and phonology evidently indicate that this science began much earlier. In fact, Al-farahīdi, Sibawayh's teacher (died in 170 or 175 AH), was one of the narrators of the various *qiraʔaat* 'Quranic readings' (Farraj 2019).

### **Linguistic terminology**

The early scholars of *qiraʔaat* left us a legacy replete with terms related to various phonological processes and naming different segments according to their functions and environments. Due to their accuracy, most of the terms have been kept verbatim for centuries, actually for more than a millennium. The following are examples of such terms.

### **Articulatory system**

*ʔaalat annuṭq* 'speech apparatus'; more recently, *jihāaz annuṭq*. It is called *ʔaalah* because speech production is not the responsibility of just one organ. Rather, a group of organs are involved (Buhoosh 2018).

### **Places of articulation**

*Tajwiid* scholars made precise, detailed descriptions of articulation places. Each of these places was named *maxraj* 'outlet' (pl. *maxaarij*). According to Alqaysi (2002: 36), "the *ḥuruuf* 'speech sounds' have outlets at which they are produced, from the end of the chest up to the pharynx, mouth, lips and nasal cavity. If a sound is produced at a place of articulation other than its place, it will inevitably be different."

All scholars, former and subsequent, agreed on this term, but they were not in agreement as regards the total number of places of articulation. For Alfarahiidi and Ibn Aljazari the outlets are seventeen, whereas Sibawayh and Alshaṭibi list sixteen. On the other hand, for Alfarraaʔ, Yaḥya and Quṭrub, the number is fourteen (Ibn Aljazari 2001: 113; Acruur 2001: 242; Buhoosh 2018)

After labelling the places of articulation, *tajwiid* scholars named the different speech sounds articulated at these places, and it was Alfarahiidi who was the first to coin such labels (Ibn Aljazari 2001).

(i) *ḥalqiiyah* 'guttural': /ʔ, h, ḥ, ʕ, x, ʁ/.

(ii) *lahawiiyah* 'uvular': /q, k/.

(iii) *fajriiyah* 'palatal': /ʃ, j/

(iv) *asliiyah* 'laminal': /s, z/

(v) *niṭṭiiyah* 'alveolar': /t, d/

(vi) *liṭwiiyah* 'alveolar': /θ, ð, z/. Note that *liṭwiiyah* is the term used by Alfarahiidi. Sibawayh locates the place of these sounds "between the tip of the tongue and the tips of the [upper and lower] incisors" (Al-Nassir 1993: 16). Sibawayh's location of these segments is more accurate than Alfarahiidi's.

(vii) *ḍilqiiyah* 'apical': /n, l, r/.

(viii) *fafawiiyah* 'labial' /f, b, m/.

(ix) *jawfiiyah*: 'fronto-palatal': /w, y/. According to modern classification, these two sounds are grouped together as glides, functioning as consonants but produced like vowels. In terms of their places, however, /w/ is labiovelar while /y/ is palatal.

### **Classification of speech sounds**

Considering articulatory criteria, Sibawayh implements a binary classification when describing the Arabic consonants (Al-Nassir 1993: 50).

The first distinction was between *mahmuus* 'voiceless' and *majhuur* 'voiced' speech sounds. These two terms are not exactly identical to the modern terms *voiceless* and *voiced*.

a. *mahmuus* literally means "whispered, hushed" while *majhuur* means "loudly and clearly uttered" Al-Nassir (ibid: 35).

b. *shadiid* 'fortis/hard'. This class includes the following segments: the seven plosives /ʔ, q, k, ʧ, d, t, b/, the affricate /j/, the two nasals /m, n/, and the liquids /l, r/. (Sibawayh 1982; Al-Nassir 1993). The glides /w, y/ are excluded from the classification *Shadiid/rikhw*.

c. *rikhw*: 'lenis/loose'. The following consonants are classified as *rikhw*: /f, z, ɖ, θ, ð, ʒ, ʂ, s, ʃ, x, ɣ, ħ, h/. Note that Sibawayh groups the fricative /ʕ/ as both *shadiid* and *rikhw*, saying that it is "between *shadiid* and *rikhw*" (Al-Nassir 1993: 38). It should be added that the Buhoosh (2018) excludes the voiced pharyngeal fricative /ʕ/, the liquids /l, r/, the nasals /m, n/, and the glides /w, y/ from the list.

d. *muṭbaq* 'closed'. These are the four velarized sounds /ʔ, ɖ, ʒ, ʂ/. Sibawayh describes this class and implicitly refers to the dual articulation required for the production of the four sounds it includes (Al-Nassir 1993: 38). Primarily, the tongue tip is between the front teeth for the production of the interdental fricative /z/, against the alveolar ridge for /ʧ, ɖ/ and almost touching the alveolar ridge for /ʂ/. Secondarily, the back of the tongue is raised towards the velum, giving the sound "a distinctive back (or 'dark') resonance" (Crystal 2008: 509). Recent studies, using modern technology, from Marçais (1948) through Jacobson (1957), Finch (1984), Al-Nassir (1993), Davis (1995) agree with Sibawayh's description, though some studies show that the pharynx is also involved in the production of these segments. For instance, Spencer (1996) says that it is sometimes difficult to distinguish between velarization and pharyngealization, since "the acoustic effects are similar" (p. 19).

e. *munfatiḥ* 'open'. This class comprises all other plain sounds, apart from the *muṭbaq* ones.

f. *mustaʕliyah* 'elevated'. These make up a total of seven consonants: the four *muṭbaq* segments in addition to the three uvular sounds /q, x, ɣ/.

g. *mustafilah* 'lowered'. These include the remaining twenty-two consonants, excluding the seven *mustafliyah* just referred to.

Sounds are also classified in terms of their manner of articulation, but on a non-binary basis, as follows:

a. *ʔinfijaariyah* 'plosives'. Here the airstream is stopped completely at some point. Then it is released suddenly, giving rise to some sort of plosion. The sounds produced this way are seven: /b, t, d, ʔ, ɗ, k, ʔ/.

b. *ʔihtikaakiyah* 'fricatives'. The articulators (active and passive) come so close to one another that the air passing through them causes audible friction: /f, θ, ð, z, ʂ, s, ʒ, ʃ, ʒ x, ʁ, ħ, ʕ, h/.

c. *muʕaʔʔaf* 'affricate'. /j/ is the sole affricate in classical Arabic. Teachers of recitation insist that students in the early stages of learning to recite do not replace it with the post-alveolar fricative /ʒ/.

d. *ʔanfiiyah* 'nasal'. The production of nasals entails lowering the velum so that the air can pass through the nasal cavity. Two nasal phonemes occur in Arabic: /m, n/.

e. *saaʔilah* 'liquids'. The class of liquids is divided into two types: lateral /l/ and trill /r/.

### **Phonological processes**

*Tajwiid* scholars paid attention to the various phonological processes that affect speech sounds when they are contiguous. Here we will focus on the behaviour of the nasal sounds in the neighbourhood of other sounds.

#### **The alveolar nasal**

The alveolar nasal /n/ has either of four cases, depending on the sound immediately following it. The first of these cases is the one known as *iqlaab* 'place assimilation' whereby /n/ is realized as [m] when immediately preceding /b/. This means that the alveolar nasal acquires the articulation point of the bilabial stop but retains its nasality, an

instance of regressive partial assimilation. Consider the following forms, in which I embolden the relevant sounds for ease of exposition:

- (1) a. **an**batna → **amb**atna 'and We cause the grain therein to grow' (Quran 27/80)  
 b. **min** baʕd → **mim** baʕd 'after' (Quran 100/12)

The assimilatory process in (a) takes place word-internally, while that in (b) is attested across a word-boundary.

*Izhaar* 'full realization' is the term given to the other manifestation of /n/. This is attested when the alveolar nasal is in the vicinity of a following guttural, a class of sounds containing six segments: glottal /ʔ/, pharyngeal /ħ, ʕ/, laryngeal /h/, and uvular /x, ɣ/. When any of these gutturals follows /n/, this /n/ is realized as is without any change, e.g. *naarun haamiyah* 'fiercely blazing fire', *ʔajrun ɣayru mamnuun* 'a reward without end (Paradise)'. (Ma'bad 1980: 15; Sibawayh 1982: 454; Al-Hosary 1996:168-171; Sheikh 2001: 53). These two examples and examples (2c and 2f) show that what we are saying about the alveolar nasal is true of nunation, which, in essence, is a vowel-less /n/.

McCarthy (1994) also classifies gutturals as a class in terms of their place of articulation. He adds that “[u]ltimately, the thesis I develop is not unlike the earliest classification of these sounds by the Arab grammarian Sibawayh.” (p. 192)

In a similar vein, /n/ is assimilated when it occurs before the following segments /w, y, r, l, m, n/, from which they made up the acronym *يرملون yarmuluun* so that the segments involved can be easily remembered (the letter (و) has two phonetic values: [w] and [uu]). Moreover, these six segments are further subdivided into two subgroups, depending on whether the assimilation is "complete" or "incomplete". It

is complete before /r, l/, but incomplete before /y, w, m, n/, out of which the acronym *yanmuu* is coined.

- (2) a. **min rabbik mir rabbik** 'from your Lord'  
b. **ka?n lam** → **ka?l lam** 'as he had never' (12/10)  
c. **tijaaratun wala bayʕun** → **tijaaratuw wala bayʕun** 'neither trade nor sale' (37/24)  
d. **faman yaʕmal** → **famay yaʕmal** 'whosoever does' (7/99)  
e. **sulṭaanin mubiin** → **sulṭaanim mubiin** 'a clear reason' (21/27)  
f. **wa?in naʕa?** → **wa?in naʕa?** 'and if We will' (43/36)

In examples a. and b, assimilation is complete because we end up with a geminate sequence [rr] and [ll] respectively, with no nasality in the first member of the geminate. In the other four examples, on the other hand, /n/ assimilates to the sound it precedes but its nasality is intact.

It should also be added that those scholars are aware that this process takes place only across a boundary. They observe that /n/ can be immediately followed by /w/ or /y/ only in four words of the Quran: *dunya* 'world', *bunyaan* 'building', *ṣinwaan* 'single roots', *qinwaan* 'clusters of dates' (Ma'bad 1980: 18). In these words, the nasal preceding the glide surfaces unchanged. Thus, the forms \**duyya*, \**buyyaan*, \**ṣiwwaan*, and \**qiwwaan* are unattested.

Moreover, Sibawayh states that vowel-less /n/ cannot be followed by /l/ or /r/. Therefore, the clusters \*/-nl-/ and \*/-nr-/ do not exist in Arabic. He accounts for this, saying that the proximity of their points of articulation makes them difficult to articulate (p. 456; Al-Nassir 1993: 67). They not only have adjacent places of articulation; they are also adjacent on the sonority scale.



So we have seen that /-nw-/ or /-ny-/ may occur word-internally, but do not assimilate. Likewise, /-nl-/ or /-nr-/ cannot cluster word-internally. This means that the adjacency between these segments yields fake geminates, obtained across a word boundary, rather than true geminates, which are part and parcel of a word (for more on the difference between true and fake geminates, see Spencer 1996).

The last process takes place before any of the other fifteen remaining segments. The process involved here is that known as *ikhfaaʿ* 'concealment/hiding', somewhat between *izhaar* and *idghaam* and cannot involve gemination (Al-Hosary, 1996; Addaani 2014; Buduuda 2021). In this case the /n/ is not enunciated clearly; rather it is "hidden in the nose" <http://heesbees.wordpress.com/tag/noon-saakinah/>. Here the tongue moves towards, but does not touch, the alveolar ridge, which is the place for producing /n/. This allows the air to pass both through the mouth and the nose, giving rise to "an oro-nasal sound" (Abdul-Fattah et al. 1989: 162). The duration of the vowel preceding vowel-less /n/ is prolonged (for about 2-3 seconds) and the sound is accompanied by some nasalization, "which gives the hearer an implicit feeling of the /n/ sound" (Matar, 2005: 11).

As an example, let us consider the form *ʔinfaaʿa* 'of special creation' (35/56). In this example, the vowel /i/ precedes the alveolar nasal. Thus, it is lengthened and nasalized, producing the long nasalized vowel [iː̃] (the tilde "̃" above a segment indicates that this segment is nasalized). This is the trace that is left from hiding the alveolar nasal. Once the nasalized vowel has been produced, the tongue gets very close to the pos-alveolar area to produce the [ʃ]. This process takes place both word-internally, as in the example just cited, and across a word boundary, as in *lan tastaʿi:ʕ* 'you will not be able' (Quran: 66/18).

### The bilabial nasal

The bilabial nasal /m/ has a behaviour somewhat similar to that of the alveolar nasal. When this /m/ is vowel-less, it is either assimilated,

fully realized or concealed. It is assimilated when it is followed by a /m/, as in *ʔaʔʕamahum min juuʕin waʔaamanahum min xawf* '(He) who has fed them against hunger, and has made them safe from fear' (4/106). Here we have a geminated /m/ with a prolonged *ghunnah* 'nasality'.

*Ikhfaaʔ shafawi* 'labial concealment' is another process which this segment undergoes when it immediately precedes homorganic /b/. This process is halfway between assimilation and full realization. What happens here is that the lips are close to one another but are not pressed tightly, and the nasality is prolonged. The lips are pressed tightly only when it is time to articulate the bilabial oral stop /b/. This can be observed in examples like the following.

(3) a. *naḥnu naquṣṣu ʕalaika nabaʔahum bilḥaq* 'We narrate unto you their story with truth' (Quran 13/18)

b. *qul ʔinnaḥma ʔunḏirukum bilwaḥi* 'I do but warn you according to revelation' (Quran 45/21)

This is opposite to what happens during the production of /m/ in other positions, where the lips are tightly closed so that the airstream is completely stopped at the lips. (The air will go out through the nose because of the lowered velum.)

Elsewhere, that is before segments other than /m/ or /b/, the bilabial nasal is fully realized and clearly enunciated. The following are examples representing this process, dubbed *izhaar*.

(4) a. *yamtaruun* 'they (vainly) dispute' (Quran 34/19)

b. *lahum rikza* 'a whisper from them' (Quran 98/19)

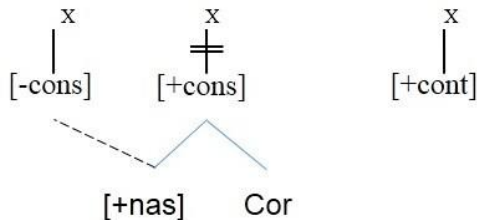
The example in (4a) is an instance of word-internal *izhaar*. In (4b), on the other hand, *izhaar* takes places across a word boundary.

### Related processes

We have seen that /n/ and /m/ may be concealed, assimilated, or fully realized before certain segments. Assimilation and full realization affecting the alveolar nasal are widely attested across the world's languages. Here I will concentrate on the process of concealment, which is less-occurring and which contemporary phonologists describe in some languages. In Dutch, for instance, /n/ is "deleted" before non-plosives and the vowel preceding it is nasalized and slightly lengthened (Gussenhoven and Broeders 1976; Trommelen 1984; Booij 1995). The following data set illustrates this process (Booij 1995: 148).

- (5) on-fatsoenlijk 'indecent' /ɔn-fatsunlək/ [ʔfatsunlək]  
 on-zeker 'uncertain' /ɔn-zekər/ [ʔzekər]  
 on-gewoon 'abnormal' /ɔn-ɣəʊon/[ʔɣəʊon]  
 on-weer 'thunderstorm' /ɔnve:r/ [ʔve:r]  
 on-rustig 'unquiet' /ɔnrɪstəɣ/ [ʔrɪstəx]

It is obvious that nasal deletion sparks off nasalization and vowel lengthening. The rule in (6) depicts this process.



This is an example of delinking-cum-spreading in which the features of the nasal consonant are disassociated from the X-slot, and the feature [+nasal] is re-associated with the preceding vowel (ibid: 149).

It is evident that the segments triggering the two process are not identical in Arabic and in Dutch. In (5), only /f/ and /z/ are triggering segments in both languages. By contrast, in Arabic, /ɣ/ sets off *izhaar*, /r/ causes total assimilation, while /v/ is not part of the Arabic phonemic inventory.

Likewise, this process is also attested in English where a nasal followed by a voiceless stop may be dropped and the vowel nasalized. Examples are forms like *can't*, *bent*, and *think*, which may surface as [kãt̚], [bẽt̚], [θĩk̚], respectively (Tranel 1987: 73-4).

French also displays this process. For example, underlying forms like *bon* 'good' and *bonte* 'goodness' are pronounced [bõ] and [bõte], respectively (Bye 2011: 149).

In spite of these facts, and although the four processes are given different names by the *tajwiid* scholars and by the phonologists dealing with the Dutch, English, and French processes, the processes are very much similar in the two languages. Present-day phonologist talk about nasal deletion and nasality spread to the lengthened preceding vowel, while *tajwiid* scholars insist that the nasal is concealed rather than deleted.

## **Conclusion**

This paper has focused on the relationship between the science of *tajwiid* and modern phonetic and phonological studies. We have seen that many of the linguistic terms used by the *tajwiid* scholars several centuries ago are still valid to date. In addition, their classification of the speech sounds depending on their places and manners of articulation was precise to a large extent.

The phonological processes they dealt with, assimilatory ones in particular, and the descriptions and fine-grained analyses are compatible with the descriptions and analyses presented by contemporary, leading scholars.

No claim is made here that this paper is comprehensive and covers all the relevant aspects. This is a far-reaching objective which would require several books and dissertations. More research is needed to cover the various processes described by the old scholars, such as *tafxiim* 'emphasis', *muxyaarah* 'dissimilation', *imaalah* 'inclination, *waqf* 'pause', and many others.

## References

- Abdul-Fattah, A., Hassanin, A. and Saleh, S. (1989) *Tajwiid-l-Qur'an: a new approach to mastering the art of reciting the Holy Qur'an*. London: Bakkah Translation and Publishing LTD.
- Abduttawab, R. (1982). *Three books on letters*. Cairo. Al-Khangī Library. Dandrawī, (n. d.) *Al-khalīl Ibn Aḥmad Al-farahīdī Alazdī: his poetry, and his efforts for Arabic*. Dār almaṣārif.
- Acruur, M. (2001) *Aljaamiʿ liʾaḥkaam riwaayatay Warsh wa Qaluun*. Daar Alimaam Malik, Algeria.
- Addaani, O. (2014). *Attaysiir fil qilqiraʾaatis sabʿ*. Edited by K. Shaghдали. Daarul ʾandalus, Saudi Arabia.
- Al-anbaari, A. B. (1960). *Alʿaddaad*. Edited by M.A.F.Ibrahiim. Kuwait.
- Al-aṣṣpahaani, A. A. (n.d.) *Alʾayaani*. Ministry of Culture, Cairo.
- Al-Hosary, M. (1996). *Aḥkaam qiraaʾat Al-Qurʾaan*. Daar Albashaaʾir Alislaamiyah, Beirut.
- Aljamal, M. (2019). "Addirasaat aṣṣawṭiyah alḥadiiṯah waʾilm attajwiid" <https://www.aliftaa.jo/Research.aspx?ResearchId=222> accessed on 28/10/2023.

- Al-Nassir, A.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.
- Alqaysi, M. (2002) *ʔrriʕaayah litajwiidil qiraaʔah wataḥqiiqi lafʕit tilaawah*. Daaruş şahaabti litturaaḥ.
- Booij, G.E. (1995) *The phonology of Dutch*. Oxford: Oxford University Press.
- Buduuda, S. B. (2021). 'Tajlliyaatud darsiş şawtil hadiith fil qiraʔaatil qurʔaaniyah'. *Majallatul ibrahiimi lilʔadaabi walʕulumil ʔinsaaniyah*. 524-34, issue 1, vol. 2.
- Buhoosh, G. (2018). 'Ishaamtul qiraʔaati wattajwiid fid darsiş şawtil ʕarabi' *Almiʕyaar Journal*.
- Bye, P. (2011) 'Derivations', in Kula, N., Botma, B. and Nasukawa, K. (eds.) *The continuum companion to phonology*. London: Continuum International Publishing Group, pp. 135-173.
- Davis, S. (1995). 'Emphasis spread in Arabic and grounded phonology.' *inguistic Inquiry*, 26, 465-498.
- Crystal, D. (2008) *A dictionary of phonetics and linguistics*. Oxford: Blackwell.
- Farraj, A. (2019) 'Qiraaʔat Al-khalīl Ibn Aḥmad Al-farahīdi: diraasah luyawiyah.' pp. 1203-1301. Al-ʔazhar University, Egypt.
- Finch, R. 1984. 'The emphatic consonants in the Semitic languages.' *Sofia linguistica*, 17, 26-46.
- Gussenhoven, C. and Broeders, A. (1976) *The pronunciation of English: a course for Dutch learners*. Groningen: Wolreis-Noordhoff - Longman.
- Ibn Aljazari, M. (2001). *Attamhiid fi ʕilmit tajwiid*. Edited by G. Alhamad. Muʔassasat Arrisaalah, Beirut.

- Jakobson, R. (1957). 'Mufaxxamah: The "emphatic" phonemes in Arabic', in E. Pulgram (ed), *Studies Presented to Joshua Whatmough*. The Hague, 105-15.
- Ma'bad, M. (1980) *Almulaxxaṣ Almufiid fi Ṣilmit tajwiid*. Cairo, Darussalaam for Publication, Distribution and Translation.
- Marçais, P. (1948). 'L'articulation de l'emphase dans un parler Arab Magrebien'. AIEO, vol. 7, pp. 5-28.
- Matar, A. (2005) 'The phonetic assimilation in the Qur'an.' Unpublished paper.
- McCarthy, J.J. (1994). 'The phonetics and phonology of Semitic pharyngeals', in Keating, P.A. (ed.) *Phonological structure and phonetic form: papers in laboratory phonetics 3*. Cambridge, Cambridge University Press, pp. 191-233.
- Sheikh, A.M. (2001) 'Tajwid or Quranic Phonetics', in Fatihi, R. (ed.). *Aspects of Arabic phonology*. Delhi: Kalinga Publications, pp. 31-59.
- Sibawayh, A. (1982) *Al-Kitaab*.vol. 4. Al-Xangi Library, Cairo & Rafa'i Publishing, Riyadh.
- Spencer, A. (1996). *Phonology*. Blackwell Publishing.
- Tranel, B. (1987) *The sounds of French: an introduction*. Cambridge University Press.
- Trommelen, M. (1984) *The syllable in Dutch: with special reference to diminutive formation*. Dordrecht: Foris.