

# Ibn Jinni's Phonetics and Phonology

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## Abstract

The aim of this paper is to focus on the works of early Muslim scholars and to rebut the assertion that those scholars played no role in the field of linguistics. There were many influential syntactic, morphological, semantic, phonetic and phonological studies. It can be claimed that some of those studies paved the way to some of the recent linguistic analyses. In particular, the paper concentrates on a specific scholar, Ibn jinni, and his phonetic and phonological efforts.

## 1. Introduction

In much of linguistic discussion, little attention is paid to the contributions of the ancient Muslim scholars to the field of linguistics. Some scholars believe— due to bias or misconception— that the Muslims contributed nothing to this field. For example, Pedersen (1931, p. 4) says "the ancient world [Greek and Rome] bequeathed to Europe a legacy heavy with misunderstanding of the history of language. ... The spread of Christianity marks one of the stages in the history of European Linguistic Science ... it brought with it the first great expansion of the linguistic horizon ..." (quoted in Shawish, 1984, p. 113). Pederson further says "... we have nothing to thank Muhammadanism for in this respect".

In fact, Muslim scholars made major contributions, most of which are compatible with recent linguistic findings. There had been detailed descriptions of speech sound classification on the one hand, and syntactic and morphological structures of language on the other.

One of the most famous and influential Phoneticians was Ibn Jinni. His full name was Abul-fath̄ Othman Ibn Jinni. He was of a Roman origin and his father was affiliated to Suliman Ibn Fahd Al-Azdi Al-Maosili and he was born around 322 AH<sup>1</sup>. He was a student of Abu-Ali Alfarisi (288-377AH) for forty years. This can be clearly seen in his book *Sirr şinaa<sup>c</sup> at al-i<sup>c</sup> raab*, in which Abu-Ali's name is frequently mentioned. It is noteworthy that both Ibn Jinni and his teacher followed the Basran School of grammar. He was also taught by Ahmed Ibn Mohamed Almaoşili and Abu-Bakr Mohamed Ibn-Alhasan, known as Ibn-Miqsam (Ibn Jinni, 2007, i, p. 7).

Ibn Jinni worked hard and wrote abundantly in different fields: grammar, prosody, morphology, phonology, and the like. The editors of *Sirr şinaa<sup>c</sup> at al-i<sup>c</sup> raab* list fifty-

<sup>1</sup> The editors of *Sirrşinaa<sup>c</sup> at al-i<sup>c</sup> raab* say that Ibn Jinni was born in 334. This is unlikely, given the observation that Ibn Jinni accompanied Abu-Ali Alfarisi as a student for forty years. This would mean that Ibn Jinni became a student of Alfarisi at the early age of three.

four of his books. Bohas et al say that Ibn Jinni "wrote the first book exclusively devoted to Arabic phonetics and phonology: the *Khasā'is*." (as cited in Brierley, et al 2016, p. 161). Ibn Jinni died in Baghdad in 392 AH.

## 2. Phonetics

On the first pages of *Sirrṣinaa<sup>c</sup> at al-i<sup>c</sup> raab*, Ib Jinni defines the speech sound as follows:

The Ṣawt [sound] is a phenomenon that accompanies the Nafas as long as it continues, till it encounters an obstruction in the pharynx, mouth or lips which impedes its flow and continuity. Wherever such an obstruction occurs, a ḥarf is realized. Letters have different properties according to the different obstructions [they encounter].

Al-Nassir 1993, p. 10

Ibn Jinni goes on to say that the difference between speech sounds can be shown by producing more than one of them. For instance, if you start producing a sound at the pharynx and then move forward towards the front of your mouth, you will hear different timbres as you pass by different places of articulation. Thus /k/ has a certain echo different from that of /q/ which in turn has an echo that is quite distinct from the echo of /dʒ/, and so on (Ibn Jinni 2007, i, p. 19).

In order to clarify the idea of different speech sounds, Ibn Jinni makes a useful analogy between the production of speech and playing a recorder.<sup>2</sup> Producing speech sounds entails sending air from the lungs through the windpipe (trachea) and then out through the oral cavity. The sound produced, however, will be pure, having no specific qualities. In order to get different melodies and sound qualities, the recorder player needs to use his fingers to close certain holes of the recorder and open some other holes at various intervals.

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<sup>2</sup>We first read this analogy in Roca and Johnson 1999 (pp. 4-5). Several years later we realized that the analogy was in fact Ibn Jinni's rather than Roca and Johnson's.

Likewise, someone who plays a lute needs to move his fingers, pressing certain strings at different points and leaving some other strings free. Pressing the strings tight at some points and bringing the fingers close to one another gives rise to different echoes. This will, of course, be different depending on how solid or how loose the string is (Ibn Jinni 2007, i, p. 19).

## 2.1 Description of sounds

Ibn Jinni begins his description of speech sounds by saying that these sounds total twenty-nine. Then he lists these sounds according to their places of articulation, starting from the pharynx and out towards the lips. Ibn Jinni states that the order of speech sounds given by Alkhalil Ibn Ahmad in his book *Al<sup>c</sup> ain* is imprecise and inconsistent. Consequently, Ibn Jinni follows the same order given by Sibawayh (Ibn Jinni 2007, i: 59).

Furthermore, and again following Sibawayh's classification, Ibn Jinni divides the sounds into 'mahmuus' and 'majhuur'<sup>3</sup>. These two terms mean respectively "whispered, hushed" and "loudly and clearly uttered" (Al-Nassir 1993: 35). At first sight it seems that these two terms are equivalent to the two modern linguistic terms 'voiceless' and 'voiced'. However, a closer look at the sounds classified as such shows that this is not the case. The mahmuus sounds are: h, ḥ, x, k, ʃ, ʂ, t, s, ʈ, f. The majhuur sounds, on the other hand, are: ʔ, a:, ʕ, ʁ, b, q, dʒ, y, d, l, n, r, t, d, z, z, d, b, m, w.

As these lists show, the mahmuus sounds pose no problem to modern analysis of sounds, as all these sounds have the specification [-voice]. By contrast, three of the majhuur sounds (namely ʔ, q, and ʈ) are problematic, since these three sounds are classified as voiceless in contemporary linguistics. Some scholars (for example, Dawood. n.d.) believe that this mismatch can be attributed to either of two reasons, (a) sound change which rendered these sounds voiceless through centuries or (b) ancient linguists were imprecise in their classification of speech sounds in terms of voice. Al-Nassir (1993: 35-38) gives a detailed analysis in which he concludes that some sort of

<sup>3</sup>These two terms "appeared for the first time in Arabic linguistics in Sibawayh's *sal-kitaab*" (Al-Nassir 1993: 35)

sound change has taken place and, consequently, the classification presented by ancient linguists- Sibawayh in particular- was precise.

After talking about the sounds in this general fashion, Ibn Jinni allocates a separate section to each sound. Here each sound is described in terms of whether it is voiced or voiceless and whether it can be a radical, an alternant or an extra.

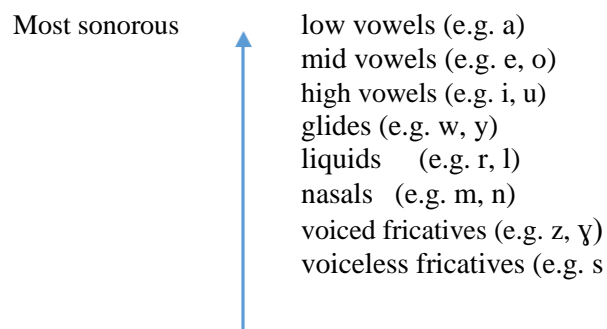
Moreover, Ibn Jinni specifies the positions each sound may occupy within the word. Thus a sound can be a *faaʔ*, *ʕayn* or *laam*. This specification is based on the trilateral root *ʕl*. For example, the *faaʔ* of *ktb* is *k*, the *ʕayn* of this root is *t*, and its *laam* is *b*. As can be seen, this is identical to the modern phonetic terms *initial position*, *middle position*, and *final position*, respectively.

Importantly, Ibn Jinni's accounts for speech sounds articulation are consistent with laboratory findings based on modern technological advances. These technologies include acoustic techniques like sound spectrograms and articulatory techniques such as X-ray, palatography, MRI (Laufer & Baer 1988).

### 2.1.1 Fortis and lenis

In terms of the classification of speech sounds into fortis and lenis, Ibn Jinni realizes such classification and says that the glottal stop /ʔ/ is the sibling of and is stronger than the /h/. Likewise, he says that /ʔ/ is the sibling of and is stronger than the /ʕ/ (A l-khaṣaa'iṣ, part ii: pp.144-45). Both /h/ and /ʕ/ are fricatives whereas /ʔ/ is a stop. Today, it is well-known that the process of lenition "involves the change from a stop to a fricative, a fricative to an approximant, a voiceless sound to a voiced sound, or a sound being reduced (lenite) to zero" (Crystal, 2008: 274). Ibn Jinni adds that vowels are the weakest of all sounds. Vowels, of course, are the most sonorous. This can be depicted through the following diagram, known as the sonority hierarchy.

#### Sonority hierarchy



	voiced stops (e.g. b, d)
Least sonorous	voiceless stops (e.g. t, k)

As can be clearly seen, low vowels are the most sonorous whereas voiceless stops are the least sonorous.

### 2.1.2 Emphatic sounds

Additionally, Ibn Jinni introduced an account of emphatic or pharyngealised speech sounds. He agrees with other scholars (Al-Ani 1914; Hassan & Esling 2011; Laufer & Baer 1988) that emphatic sounds are articulated in the region from below the velum to the glottis. Thus, he distinguishes emphatic /t, s, z/ from their plain, i.e., non-emphatic counterparts /t, ð, s/. In this regard, Ibn Jinni's position is that when emphatic sounds are produced without the feature 'emphasis' they will be rendered 'plain'. Also Saraireh (2011) says that Ibn Jinni asserts that /d/ has no plain counterpart. It should be added here that in the sound system of contemporary Arabic, /d/ is the plain counterpart of /d/. Saraireh argues that /d/ (for the transcription of which he uses a peculiar symbol)<sup>4</sup> was a continuant lateral sound and that it was "confused with the emphatic lateral /l<sup>ʕ</sup>/" (p. 9).

The articulatory configurations of the pharyngealised sounds are complicated to determine, and it might be that there is no consistently defined single articulatory exponent of pharyngealisation. More clearly, it seems that speakers have access to a number of articulatory strategies. These strategies include constriction degree and height of the larynx. It might be the case that each strategy is determined by different factors. It has been reported that this variation is triggered by prosodic structure (Bukshaisha 1985; Hassan & Esling 2011; Maiteq 2013). For example, more pharyngealisation degree is found within words than between them (Maiteq 2013; Bukshaisha 1985).

Marcaise (1948, as cited in Laufer & Baer 1988: 185), studied pharyngealisation in the dialects of Maghreb. His data was analysed using a kymograph, x-ray and photography. Marcais found that during a pharyngealised utterance, the hyoid bone and the larynx are raised. This raising is accompanied by a lowered tongue dorsum

<sup>4</sup> Notice that Saraireh's transcription should be treated with caution. For /z/ and /d/ he uses almost identical symbols. In addition, he sometimes uses the same symbol to represent different sounds. For example, he uses the symbol /ʔ/ to represent our different phonemes: voiceless interdental fricative, voiceless pharyngeal fricative, voiced dorso-uvular fricative, and voiceless glottal stop.

and a retracted tongue root. These articulatory gestures, according to Marcaise, cause an almost complete closure in the pharyngeal cavity.

Ali & Daniloff (1972) studied pharyngealisation in Iraqi Arabic. Using cinefluorographic data, Ali & Daniloff reported that during pharyngealised utterances the root of the tongue is mainly involved causing a constriction in the pharynx. Ali & Daniloff also reported that the posterior pharyngeal wall and the velum do not significantly contribute to pharyngealisation.

Acoustically, Giannini & Pettorino (1982) examined pharyngealisation produced by a speaker of Baghdadi Arabic. Their acoustic results show that F2 is lowered during the articulation of pharyngealised sounds. This pattern, according to Giannini & Pettorino, is consistent with their articulatory findings that there is a pharyngeal constriction during the production of pharyngealised sounds.

Ibn Jinni (p. 71) makes a list of elevated sounds (Musta Çliya) /s, t, z, d, x, q, y/. He defines elevated sounds as those for which the tongue is raised towards the palate. This class of speech sounds includes the emphatics and the ones produced by the back of the tongue and the uvula /x, q y/. On the other hand, Ibn Jinni describes the remaining speech sounds and treats them as non-elevated (Munkhafida or Mustafila).

### 3. Phonology

In addition to the place and manner of speech sound articulation, Ibn Jinni introduced accurate accounts of the segmental and suprasegmental or prosodic processes such as *i'lāl* (vowelization), *ibdāl* (replacement), *idghām* (assimilation), *naql* (transfer), *hathf* (deletion). He also discusses the differences between the letter and the sound, gemination and degemination.

In his book *Sirrşinaa<sup>c</sup> at al-i<sup>c</sup> raab* (p. 7, as cited in Saraireh 2011, p. 4), Ibn Jinni introduces a detailed account of coarticulation, i.e., how speech sounds affect adjacent speech sounds when they are combined in spoken utterance. In this regard, Ibn Jinni notes that speakers tend to prepare themselves for the articulation of upcoming speech sounds during the articulation of the current speech sound.

Moreover, in his books ‘Risālah fi Maddal-Aswāt wa Maqādīr Almaddāt’ and ‘Al-Khasāis’, Ibn Jinni extends his phonetic analyses to tackle phonological problems such as ‘vowel quality’ and ‘consonant lengthening (Bohas et al. 1990).

Interestingly, insight of linking segmental and prosodic analyses in Ibn Jinni’s work also exist in his account of emphasis, i.e., pharyngealisation. The terms *mutbaqa* (covered or lidded) and *mufakhhama* (i.e., velarized) were given by ancient Muslim scholars for emphatic or pharyngealised sounds. Ibn Jinni (p. 70) introduces an accurate account of the articulatory configuration in the vocal tract during the production of emphatic sounds. More precisely, he notes that, in order to produce an emphatic sound, speakers need to raise the tongue to cover the alveolar ridge and the hard palate.

### 3.1 Phonotactics

Finally, it is worth saying that the second volume of Ibn Jinni's book *Al-khasaa'is* contains a section on the phonotactics of the Arabic language. In this respect he says that the six guttural sounds (ʔ, h, ḥ, ʕ, x, ɣ) seldom occur in contiguity and are frequently separated by some other (non-guttural) sound. Only in three cases can this rule be broken. The first is when a glottal stop is followed by /h/, /ḥ/ or /x/. For some examples in which /ʔ/ precedes /h/, consider the following words: *ʔahl* (kinsmen), *ʔihaab* (skin) *ʔuhbah* (readiness). In this particular case, /ʔ/ and /h/ may swap places, that is the /h/ may precede the glottal stop. Therefore, the following words are well-formed: *bahaʔtu* "to like someone's company", *nahiʔallahmu* (medium-rare meat). As for a sequence of /ʔ/ followed by /ḥ/, consider the following words: *ʔahad* (someone), *ʔiḥnah* (grudge) (Ibn Jinni 2007, ii, 427-28).

The second is when /h/ and /ʕ/ are adjacent, in which case /ʕ/ must come first, as in *ʕahd* (covenant) and *ʕihn* (wool). The third and final case is when /x/ is followed by /ʕ/, and, again, this order is fixed, as in these examples: *baxaʕa* (to die of grief) and *naxaʕ* (a tribe from Azd or Yemen). As a result, two identical gutturals are rarely used in the same word; some of the few words where such sounds are used are: *ḍayyiyah* (garden), *rayyiyah* (soup-like food), *mahah* (beauty), *bahaḥ* (hoarseness), and *fuʕaaʕ* (ray) (Ibn Jinni 2007, ii, 428-29)

In the same vein, Ibn Jinni adds that dorsal sounds can never be contiguous in the same word. Hence all the following forms are ill-formed: *\*qadʒ*, *\*dʒaq*, *\*kadʒ*, *\*dʒak*,

\**kaq*, \**qak*. Today, some linguists (e.g Carr, 2008, p. 45) use the term *dorsal* to subsume velar and uvular sounds only. Thus /k/ and /q/ are included whereas /dʒ/ is excluded. However, Crystal (2008, p. 156) maintains that the palatal sounds are also dorsal. He adds that some authors "include other parts of the tongue under this heading" (ibid). This means that /dʒ/<sup>5</sup> can also be included under this cover term, supporting Ibn Jinni's analysis.

### 3.2 Sounds in sequence

Ibn Jinni pays some attention to the influence sounds may have on one another when they are adjacent. For instance, he focuses on the behavior of /ʃ/ when it is followed by /d/. In words like *qaʃd* and *yaʃdur*, the /ʃ/ may be partially devoiced, so it is somewhat between voiceless /ʃ/ and voiced /z/. He adds that some speakers of Arabic fully voice this voiceless alveolar fricative so that it becomes [z]. Notice that the /ʃ/ and the following /d/ are adjacent because the /ʃ/ is vowel-less. Thus voice assimilation takes place, causing the /ʃ/ to be more similar to the /d/ it precedes. However, when a vowel intervenes between these two consonants (i.e. /ʃ/ and /d/) no voicing of /ʃ/ is attested. Therefore, forms like /ʃadara/ 'happen/occur' and /ʃadafa/ 'avoid/shun' cannot be realised as \*[zadara] and \*[zadafa], respectively. (2007, i, p. 65).

Ibn Jinni's analysis can be linked to the modern linguistic term "sonorant transparency" where "obstruents retain their voicing specification before a sonorant" (See Elramli, 2012, p. 125, and references therein). A vowel is [+ sonorant] and, consequently, cannot spread voice to a preceding consonant. Similar to what was going on at Ibn jinni's time, today we notice that in many dialects of Arabic an obstruent frequently acquires voice from an immediately following obstruent, either within the same word or across a morpheme or word boundary. For example, in Egyptian Arabic /feɪsbok/ 'Facebook' is realised as [feɪzbok]; /ʔusbuuʃ/ 'week' surfaces as [ʔuzbuuʃ]. Here we see that the voiced bilabial stop has influenced the /s/ it follows, causing it to surface as [z].

Unlike the situation in Egyptian Arabic, Libyan Arabic /s/ and /b/ behave differently; the /s/ in /feɪsbok/, /ʔusbuuʃ/ and similar words is intact. Voice assimilation, however, is attested in other obstruents. For example, /t/ surfaces as [d] due to the influence of a

<sup>5</sup> For more information on this sound, see Watson (2002, p. 15-16)



following /d/ across a morpheme or word boundary. Hence, *reet dawwuud* 'I saw Dawwood' and *ʕaddeet dibbaabi* 'I went walking' surface as *reed dawwuud* and *ʕaddeed dibbaabi*, respectively. It should, however, be stressed that voiceless obstruents do not lose their [-voice] specification before a sonorant. The following examples illustrate this point: *reet looha* 'I saw a log', *reeta* 'I saw him'. This supports Ibn Jinni's observation that a vowel (or a sonorant, to be more specific) does not spread voice.

#### 4. Conclusion

This paper has shed light on Ibn Jinni's work in phonetics and phonology, thus refuting the claims of some authors that Muslim scholars contributed nothing to linguistics. The paper started by presenting Ibn Jinni's definition of the term *ṣawt* 'sound' and his description of the way each sound is articulated, besides his distinction between the different speech sounds and different categories of speech sounds. This is in addition to presenting Ibn Jinni's analogy between the production of speech sounds and playing a recorder, or a lute.

We have also presented Ibn Jinni's description of each speech sound and his specification of the different positions each sound may occupy, a description consistent with modern laboratory findings and a specification (based on the trilateral root *fʕl*) in harmony with contemporary classification.

The paper has also focused on Ibn Jinni's grouping of sounds into fortis and lenis and, his assertion that vowels are the weakest of all sounds. This is in addition to presenting his accurate account of emphatic or pharyngealised speech sounds.

Finally, attention has also been paid to his accounts of various segmental and suprasegmental processes, besides his focus on the phonotactic constraints of the Arabic language. Moreover, we have also shed light on Ibn Jinni's description of the influence that sounds may have when they come to be adjacent.

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