Contribution of Early Arab Grammarians to Sound Study: Classification of Speech Sounds and Distinctive Features and Phonological Terminology

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Abstract

This paper deals with an important phase of the development of sound study and classification of speech sounds. This led to the very first steps of the development of distinctive features which has paved the way to the distinctive feature theory later on. The researcher explores the linguistic literature of Classical Arabic and some of that authored by some orientalists about Arabic linguistics where they talk about the efforts of the ear;y Arab grammarians in the different fields of language studies. The researcher also tackles the idea about the level of influence of the Indian grammarians on Arab grammarians. Then the researcher attempts to establish a table showing the classification of speech sounds according to the general consensus of the Arab grammarians by using a binary (−/+) feature system. Because language study is developmental by its own nature, it is possible to find disagreement between later and earlier linguists on certain matters or features. The researcher tries to establish which feature to settle on when he comes to composing the table of the distinctive features toward the end of this paper.

1. Introduction

When the development of the study and classification of speech sounds is considered, linguists often start with the contribution of the ancient Indian and Greek grammarians,[1] and then they jump to the last two centuries, thus, paying little attention, or none, to the contribution of the early Arab grammarians to phonology. Even specialists in the field of linguistics are unaware of the fact that there had been serious studies of the phonological and syntactic structures of a natural language well before Port-Royal[2] and many other western schools of linguistics. Not only that, but some linguists, such as Holger Pederson (1953), deny the contribution of Arab grammarians. Pederson (1953) claims, "We have nothing to thank Mohammedanism [i.e., Islam] for in this respect [i.e. linguistics]." Thus Pederson does not recognize the profound contribution of Arab grammarians to the field of linguistics which is stated in the literature of Classical Arabic, though much of it has been available in Europe for a long time by means of translations.

In the literature of Classical Arabic, we find many well known grammarians and phoneticians whose works were translated into French or German a long time ago. Gustav Flügel (1862) wrote about the development of the linguistic Basran school, the Kufan school, and what was known as the "mixed school of Baghdad." We also find the famous Al-Khaleel Ibn Ahmad's dictionary **al-ʕayn**, which was authored on the basis of place of articulation of the speech sounds of Arabic, thus indicating advanced knowledge of articulatory phonetics. Also Sibawaihi's **al-Kitaab** has been one of the most famous

references.[3] Of almost equal importance, there have been al-Mubarrad's **al-Kaamil**,[4] and al-Zamkhshari's al **Mufassal**.[5]

One of the most famous works in Arabic phonetics was Risalat Ibn Sina (i.e. Avicenna, died in 1037 AD.[6]) "Fi Asbab Huduth al-Huruf" (i.e., Ibn Sina's treatise on the generation of speech sounds). In this essay, Ibn Sina introduced a new remarkable approach to the study of speech sounds and how they occur, as well as the organization of his essay. No less important in this field is Ibn Jinni's book **Sir Sinaᶜat al-Iᶜrab**. G. Han, the editor of Sibawaihi's **al-Kitaab**, refers heavily to Ibn Jinni's book. Moreover, Ibn al-Hajib's **aš-Šhafiya**[7] is another reference to the study of the sound system in Classical Arabic. To prove this point even further, the German orientalist Artoure says "[Sibawaihi]'s description of the point of articulation of sounds was so accurate and correct that we find addition and correction difficult."[8] Arab grammarians also realized that sounds can be of two forms: basic 'Usuul' and branching 'furuuc.' This stated the foundations for the phoneme-allophone theory in modern linguistics (Al-Hamd, 2004: 74; Al-Darkazli, manuscript). These are to mention but a few examples in this field.

Moreover, Ibn Jinni in his book **Sir Sinaᶜat al-Iᶜrab** (p. 7) talks about the influence of sounds on neighboring ones during the pronunciation of a string of sounds. He says that a person prepares himself for the articulation of the next sound before he is finished with the current one.[9]

The purpose of this paper is to investigate the study and classification of speech sounds and phonological terminology achieved by the ancient Arab grammarians and phoneticians of the sound system of Arabic.

2. Transcription

Since there will be some transcribed Arabic data in this paper, the following is a description of the symbols that are used to represent the sounds of Arabic (phonemes between / /; allophones between [ ]):

1. /b/ voiced bilabial stop.
2. /f/ voiceless labio-dental fricative.
3. /t/ voiceless alveo-dental stop.
4. /d/ voiced alveo-dental stop.
5. /ţ/ voiceless alveo-dental emphatic stop.
6. /θ/ voiceless interdental fricative.
7. /ð/ voiced interdental emphatic fricative.
8. /ḍ/ voiced dental emphatic fricative.
9. /s/ voiceless alveo-dental fricative.
10. /z/ voiced alveo-dental fricative.
11. /ḥ/ voiceless pharyngeal fricative
12. /ḍ/ voiced alveo-dental emphatic.[11]
13. /š/ voiced alveo-palatal fricative.
14. /j/ voiced palatal affricate.
15. /k/ voiceless velar stop.

16. /q/ voiceless uvular stop.
17. /x/ voiceless dorso-uvular fricative
18. /γ/ voiced dorso-uvular fricative.
19. /ş/ voiceless alveo-dental emphatic fricative
20. /ᶜ/ voiced pharyngeal fricative. [10]
21. /ʔ/ voiceless glottal stop.
22. /h/ voiceless laryngeal fricative.
23. /l/ voiced alveolar lateral.
24. [ḷ] voiced alveolar emphatic lateral.
25. /r/ voiced trill alveolar.
26. [ṛ] voiced trilled alveolar emphatic.
27. /m/ voiced bilabial nasal. [12]
28. /n/ voiced alveo-dental nasal.
29. /w/ voiced bilabial glide.
30. /y/ voiced alveolar glide.

2.2. Vowels[13]

1. /i/ [-long] [-back] [+high].   4. /ü/ [+long] [+back] [+high].

2. /ï/   [+long] [-back] [+high].   5. /a/   [-long] [-back] [-high]. [14]
3. /u/   [-long] [+back] [+high]   6. /ä/   [+long] [-back] [-high].

3. The Generation of Speech Sounds

     In his Risala, Ibn Sina was the first to provide a thorough study of speech. Al-Fayyoumi (1991: 26) says that Ibn Sina did not rely on previous authoroties such as Al-Khaleel, Sibawihi, and Ibn Jinni. Al-Fayyoumi says:

> Ibn Sina's study of speech sounds was of a different kind from those of Al-Khaleel, Sibawihi, and Ibn Jinni. His study was phonetic and anatomic of the throat and tongue. Ibn Sina provides a three-fold study of sounds: production, acoustics, and auditory. And he also provides a comparative study of Arabic and non-Arabic sounds describing similarities and difference.

     Ibn Sina states the general rules for generating sounds in general and speech sounds in specific. In his Risala, Ibn Sina recognizes two sources for the generation of sounds: the qarᶜ (i.e., explosive movement of air) and qalᶜ (i.e., implosive movement of air). Ibn Sina says (as in Semaan, 1963: 13):

> Therefore, in my opinion, the immediate cause [of sound] is this wave-like motion (i.e., vibration) of the air. This wave-like motion may be due to (either one of) two causes: qarᶜ or qalᶜ.

     In both cases, Ibn Sina realizes that the violent, fast movement of air to fill the vacuum (in the case of qalᶜ [implosive movement] or forced out of the space, in the case of qarᶜ [explosive movement]) is the factor behind generating sounds, and the resulting undulation sets the still air into motion (Semaan, 1963: 22).

     Concerning speech sounds in particular, Ibn Sina (as cited in Semaan, 1963: 25) says, "It is the vibration itself that produces the sound. The state the vibration is in, i.e., the continuity of its parts, its evenness, or unevenness, and its branching producing the acuteness and the density of the sound. The first two cause the acuteness; the other two, the density."

     No other Arab phoneticians, I would think of, attempted to deal with the cause of sound generation in this way, i.e., with reference to the function of the focal folds. This could be attributed to Ibn Sina's knowledge of the anatomy of the vocal tract because he was basically a physician. The others simply moved to the descriptions of speech sounds of Arabic and their classification without specific reference to the function of the focal folds. However, Ibn Jinni (verified 1954: 9-10,) says that the vocal tract resembles the function of a wind pipe or the strings of a lute. When the player of the wind pipe closes and opens its holes, different sounds are produced. The same occurs when the player of the lute moves his fingers to shorten or lengthen the strings, producing different tunes. The loudness of the sound is determined by the amount of air blown into the wind pipe, and by the tension of the strings in the case of the lute. So the production of different sounds depends on what happens to the flow of air in the vocal tract (e.g. place of obstruction, constriction, or position of the tongue (for vowels) in the tract). The vocal folds are tensed (for vibration producing a voiced sound) or relaxed (for no vibration producing a voiceless sound). The degree of tension determines sharp a sound is.

4. The Classification of Speech Sounds

We find in the literature of sound studies in Arabic that the vocal tract is divided into several areas and points according to the articulation and other classifications (such as height) of the speech sounds of CA (there does not seem to be an agreement among Arab grammarians on the number of points of articulation for the speech sounds of Classical Arabic). While al-Khaleel counts up to seventeen points, Sibawaihi argues that there are sixteen, dropping the one that al-Khaleel (p. 64) describes as al-jawfiyyah 'the interior' or al-hawaiyyah 'the hollow' point of articulation[15] where the sounds /w, y, ä, ?/ are produced. But Ibn Sina (p. 49) states that there is some kind of closure with the production of /i, ï, u, ü/ because these sounds are high vowels, though this closure does approximate a constriction which a feature of consonant sounds. Other grammarians, like al-Jirmi and al-Fira, [16] reduce the points of articulation to fourteen, correctly assuming that /l, n, r/ are produced at one point. It seems that except for the sounds /w, y, ä, ?/, Sibawaihi, though he still calls /y, w, ä (alifu l-mad)/ hawaiyyah 'hollow' (but not /?/) (p. 534), has his rationale behind this redistribution. The other differences are related to whether an area is taken as a whole or as subdivisions, as in the case of Ibn Jinni (p. 52) and al-Zamakhshari (p. 394), who specify a point of articulation for each of /l/, /r/, and /n/. I do not see a significant controversy in these differences.

However, from the works of Arab grammarians, it is possible to put the speech sounds of Classical Arabic into the following categories (These features are summarized in a table at the end of this paper):

4.1 ħurüf şaħiħa (Consonants), ħurüfu l-mad (Semi-vowels), and ħarakät (Vowels)

In the pre-Islamic and early Islamic period, Arabic was written without dotted letters. Also no symbols were used for short vowels, and case markings (long vowels are written using corresponding semi-vowels). Punctuation reveals the fact that the Arab grammarians asserted that there were two different types of vowels: short and long, which was not just a matter of orthography. Therefore, they invented new symbols for the three short vowels of Classical Arabic and the name 'ħarakät' (plural of ħaraka) was given to these short vowels.

The name 'kasra' was given to /i/. It was also called 'al-yaa?u ş-şaɣira' (lit. the minor /y/). The 'kasra' was symbolized as a dash-like sign subscripted under the orthographic letter (i.e. the consonant) it follows in pronunciation. They gave the name 'dhamma' for /u/. It was also called 'al-wawu ş-şaɣira' (lit. the minor /w/.) The 'dhamma' was given a small version of the symbol used for /w/ in Arabic script. The 'dhamma' was superscripted over the letter it follows in pronunciation. And the name of 'fatħa' was given to /a/ which was symbolized as a dash-like sign over the letter it follows in pronunciation. A small circle (zero in Arabic figures) was used over a letter to show the lack of any short vowels after it in pronunciation. Sibawaihi (p. 535) states that these 'ħarakät' "vowels" are counterparts of 'ħurüfu l-madd' "semi-vowels" which are /ä, y, w/. Ibn Jinni (who was mainly a phonetician) (1985: 8) says, "The letters [sounds] which have wider mouth openings for production are three: /ä, y, w/." He means the ones that are produced without obstruction or constriction. Abu Ali Al-Farisi (pp. 487-488) recognized the differences between short and long vowels asserting that they are all sounds. [17]It should be noted here that, in Arabic, /y/ and /w/ glide from high positions (/i/ for /y/ and /u/ for /w/) to a low position /a/.

Sounds other than the vowels (short and long) and the semi-vowels are considered consonants (ħurüf şaħïħa), as shown in the table.

4.2 Shadïda (Stop), Rikhwa (fricative), and Mutawassiţa (Intermediate)

The feature shadïda (or stop) is associated with stop sounds; the lenis (fricative) sounds are given the feature rikhwah. Sounds which are neither stop nor fricative are given the feature intermediate (mutawassiţa) or 'bayna bayn' (falling in between) [= intermediate]. The intermediate sounds seem to be the [+ sonorant] ones even though /h/ is not with them, maybe, because it is voiceless.

Al-Zamakhshari (p. 395), as well as Ibn Jinni (pp. 69-70), groups the sounds of Classical Arabic as follows:

Shadid = Stop:	/ʔ, j, d, t, ţ, b, q, k/.
Rikhw = Fricative:	/h, ħ, x, γ, š, s, ş, z, ḍ , ð, θ, ð̣ , f, ʕ [18]/.
Mutawassit = Intermediate:	/ l, m, n, r, y, w/.

The sound /ḍ/ has undergone change. Its pronunciation in the past, as described by Arab grammarians, different from today's. Ibn Sina describes /ḍ / differently. He (p. 40) says, "… and the obstruction [of the air-stream] in the process of articulation of /ḍ/ is complete as it is the case with /j/." So Ibn Sina considers /ḍ / as a stop (shadid) sound. It might be worth mentioning that except for the point of articulation, which is palatal lateral, Ibn Sina's description of /ḍ / as a stop agrees with the articulation of /ḍ / in Modern Arabic.[19] This leads to the conclusion that this sound (i.e., the lateral /ḍ /) no longer exists in Arabic. Many linguists, such as Ferguson (1959: 616-30) and Moscati (1964) address this point. It seems to me that today's /ḍ / is a partial counterpart of /ļ/. That is if, while producing /ļ/, the lowered side of the tongue is raised to touch the side of the mouth, the resulting sound is /ḍ /.

As a matter of fact, in today's colloquial Arabic in a few regions in Jordan, the remnants of /ð̣ ļ/ are still traceable. For example, the word /mirħāḍ / "lavatory" is pronounced /mirħāļ/. There is no /ḍ / in this dialect, unless imposed by Modern Standard Arabic context; it either merges with /ð̣ / in most cases or becomes /ļ/ in very few cases. The remnants of this sound are also traceable in Spanish. Bridgschtrasar (1929: 10) says that the Arabic word القاضي /ʔal-qaḍi/ "the-judge" is borrowed into Spanish as "alcalde." This indicates that the Arabs used to pronounce /ḍ / as a lateral emphatic fricative, i.e. a counterpart of /l/.

Since the changes between Classical Arabic and contemporary Arabic are not at issue in this paper, I will abandon this issue at this point.

4.3 Muţbaqa (Emphatic) and munfatiħa (Open/Plain) Sounds

Arab grammarians gave the name muţbaqa (lit. covered), or mufakhkhama (i.e., velarized) for emphatic sounds. Ibn Jinni (p. 70nd al-Zamakhshari (p. 395) say that an emphatic sound is articulated by raising the tongue to cover the upper jaw (the alveolar ridge and hard palate). Ibn Sina (p. 54) relates the production of emphatic sounds to velarization. He says: [20]

… there is a velarized [ļ] the relation of which to /l/ is the same as that of /ţ/ to /t/.[21] This velarized [ļ] is in the language of the Turks, and is considered

an independent speech-sound [i.e. a phoneme], but those (among them) who commonly use the Arabic language treat it (i.e., the velarized [ḷ] as the one and the same /l/.

Ibn Jinni (pp. 70-1) states that the emphatic sounds /ṭ, ṣ, and ð̣ / are counterparts of the plain sounds /t, s, and ð/ respectively. He does not give any plain counterpart to /ḍ /.[22] Ibn Jinni asserts this point saying that should these sounds (i.e. /ṭ, ṣ, ð̣ /) lose their emphatic feature, they would become nothing but their plain counterparts, except /ḍ / which had no plain counterpart, in the sound system of CA. This view obviously indicates that /ḍ / does not have a plain counterpart in CA. This emphasizes the idea that /ḍ / was a continuant lateral sound. In some Arabic linguistic literature, it is reported that /ḍ / was confused with the emphatic /ḷ/. Cantineau (1960) says that the old /ḍ / was produced as /ð̣ḷ/ where it would terminate as a lateral sound. Similarly, Fleitch (1966: 37) argues that /ḍ / was an emphatic lateral sound. So this sound has been among the emphatic sounds even though it has undergone some changes with regard to other features.

It should be pointed out that there are sounds that are emphatic phonemes and other ones which are emphatic allophones (i.e. sounds that are conditioned to be velarized). The emphatic phonemes are /ṭ, ṣ, ð̣ /, but the sounds that can have velarized allophones are [ḷ] and [ṛ], which are phonetic variations of /l/ and /r/ respectively. Othman (1974: 75-7) says that Arab grammarians stated the conditioning environment for the emphatic allophones arguing that they occur after high, back sounds.

4.4 Mustaᶜliya (High) and Munkhafiđa (Low)

Al-Zamakhshari (pp. 75-7) says that the high sounds are the emphatic sounds and the ones articulated by the back of the tongue and the uvula. It is clear that al-Zamakhshari's definition misses sounds like /i/ and /y/ because they are not articulated by the back of the tongue, but with the tip of the tongue raised towards the alveolar ridge.

Considering the definition of Ibn al-Hajib (p. 342) of high sounds that "high sounds are those in which the tongue is raised towards the upper jaw," we can include /y/, and /i/ sounds with them (the high sounds). Ibn Jinni (p. 71) gives a similar definition, thus listing the high sounds as /x, γ, q, ḍ , ṣ, ṭ, ð̣ /. Al-Zamakhshari's definition would allow us to include /u/ with the ones that Ibn Jinni describes as high sounds because it is articulated with the back of the tongue.

Ibn al-Hajib (p. 336) says that /k/ is higher than /q/, and, since al-Zamakhshari says that /q/ is a high sound because it is articulated with the back of the tongue and the velum, it follows, then, that /k/ can be added to the high sound. Therefore, Ibn al-Hajib adds /k/ to the high sounds category. Ibn Jinni defines high sounds as those for which we ascend toward the upper jaw.[23] So the high sounds are the following ones: /x, γ, q, ḍ , ṣ, ð̣ , ṭ, k, y, w, i, u/. The category of low sounds would, then, contain these sounds: /ʔ, h, ᶜ, j, ħ, š, s, z, d, t, θ, ð, r, l, n , m, f, b/.

4.5 huruf al-halq (Pharyngeal) Sounds

The feature pharyngeal refers to the sounds articulated below the velum down to the glottis (al-Khaleel, p. 65); the rest of the sounds, i.e., those sounds articulated at the velum

and forward to the lips, are non-pharyngeal. This means that the pharyngeal sounds are /x, γ, ʕ, ħ, ʔ, h/.

Most other scholars, like al-Zamakhshari (p. 393), and Ibn Jinni (p. 52), do not use the feature pharyngeal for the sounds / x, γ, ʕ, ħ, ʔ, h / as a general point of articulation; rather they go to the exact points of articulation of these sounds–a point that Jacobson, who does not accept the term pharyngeal as a point of articulation, would agree with them on. Al-Zamakhshari details these sounds in the following way: /ʔ, h/ at the far end; /ħ, ʕ/ at the middle; and /x, γ/ at the front end of the pharynx. Ibn Jinni says that there are three points of articulation in the pharynx: /ʔ, a, h/ at the lowest point; /ħ, ʕ/ at the middle point; and /x, γ/ at the highest point at the beginning of the mouth (the oral cavity).[24] This means that he makes a distinction between the pharynx and the oral cavity (the mouth) which, for him, starts with the point of articulation for /q/ in Arabic.

4.6 Basiṭa (Simple) and Murakkaba (Complex) Sounds

Only Ibn Sina (pp. 25-6) talks about this classification. He says:

> In reality, some speech sounds are simple entities whose formation is the result of complete obstruction of the air which produces the sound followed by a release impulsion. Others are complex entities produced with incomplete obstruction (with constriction) of the air though with release.

To Ibn Sina, then, the speech sounds which are specified to be simple are /b, t, j, d, ḍ , ṭ, q, k/, from one point of view, and /l, m, n,/ from another. Ibn Sina does not explain his second point of view for /l, m, n,/, especially /l/ which is a continuant sound; to Ibn Sina, / ḍ / is stop.

Ibn Sina (p. 26) says that the simple sounds occur "in the period between the time of obstruction and that of release." He adds that as long as there is obstruction, these sounds cannot be heard; therefore, we could only produce them by the removal of the obstruction (i.e. making a release). If I do not misunderstand him, I do not see how this explanation applies to the sounds /l, m, n/, especially /l/ because, contrary to what Ibn Sina says, it could be extended, unless he talks about a /l/ sound that no longer exists in CA, if such a sound is phonetically possible. Moreover, there is no explanation why he does not include /ʔ/ with the simple sounds. So, the sounds which are complex entities are[25] /h, x, γ, r, z, s, š, ṣ, θ, ð, ʕ, ḍ f, ħ, w, y/. About these sounds, Ibn Sina (p. 26) elaborates,

> their articulation may extend for a period of time then ceases after the period of releasing has been completed. Their articulation will extend during the period of time in which the obstruction (of the air) is connected with its release.

Ibn Sina argues that these categories differ from each other because of the different speech organs by and at which these sounds are articulated. It seems to me that Ibn Sina uses the features, simple and complex, as redundant ones for stop and fricative respectively. However, we should have in mind the problem with /l/ being described as a simple sound. I find this a good reason to ignore this classification in the table of features.

4.7 ħuruuf shajariyya (Palatal Sounds)

This area is the first part from the back end of the front region (i.e., the hard palate). Al-Khaleel (p. 65) says that the palatal sounds are /š, j, đ/. Sibawaihi (p. 533) describes / đ / as a lateral sound not a palatal one. Al-Zamakhshari (p. 396) does not include /đ/ with the palatal sounds.[26]

Ibn Jinni (p, 52) classifies the sounds /j, š, y/ as palatal. He says that / đ / is a lateral sound. So the palatal sounds would, then, be those ones: /š, j, y/. Even though / đ / was controversial as being a palatal or a lateral, I support the view that it was not because, when we examine what other linguists say about it, it seems to me as an emphatic lateral which could have been a counterpart of the /l/ sound. Or, as stated earlier, it could have been a sound that started with / đ / and terminated with an emphatic lateral.

4.8 ħuruf niʈꟲiyya (Alveo-palatal Sounds)

Al-Khaleel (p. 65) and al-Zamakhshari (p. 396) say that the hard-palatal sounds are /t, d, ʈ/. Ibn Jinni does not give a specific name for these sounds as a category although he puts them in one group with regard to their point of articulation.

4.9 ħuruf asliyya (Apical Sounds)

The sounds in this category are described in reference to the tongue rather than the roof of the mouth. These sounds are articulated by using the blade of the tongue. Al-Zamakhshari (p. 396) and al-Khaleel (p. 65) say that this category includes the sounds: /s, z, ş/. Also, Ibn Jinni (p. 53) groups these sounds together as having the same point of articulation, but, again, he does not give a term for their class.

4.10 ħuruf lithwiyya (Alveolar Sounds)

Al-Khaleel (p. 65) and al-Zamakhshari (p. 396) put the sounds /θ, ð, ð̣ / in this class. Again, Ibn Jinni groups these sounds together with regard to the point of articulation, but does not specify a category for them.

4.11 ħuruf thawlaqiyya (Fleet) and Muşmata (Non-fleet) Sounds

Ibn Jinni (p. 74) considers the following sounds: /l, r, n, f, b, m/ as fleet, and the rest of the speech sounds as non-fleet. Al-Khaleel (p. 57) and Sibawaihi (p. 534) divide fleet sounds into these two sub-categories:

1. Liquids, which are: /l, r, n/, and
2. Labials, which are: /m, f, b/

Al-Zamakhshari (p. 396) goes with the same sub-categorization for the fleet sounds, but he adds /w/ to the labials. It seems that this category includes the labial sounds and the anterior sonorant sounds. So, we can assume that the fleet sounds are /l, r, n, f, b, m, w/.

4.12 (ħuruf hawaʔiyya) Hollow

Al-Khaleel (p. 65) says that the sounds /y, w, ä, ?/[27] are hollow sounds because they share a common feature among them; they differ from the rest of the speech sounds in that they do not have the least kind of obstruction that the others do. Al-Zamakhshari (p. 396) says that the sounds /y, w, ä, u, i/ are hollow, but he does not include /?/ with them. Sibawaihi does not consider al-jawf (the interior) as a place of articulation, and, though he calls /y, w, ä/ hollow sounds, he too does not include /?/ with them, maybe, because of the kind of obstruction it has (he does not say why). Moreover, he specifies different points of articulation for them. He says that /ä/ is laryngeal, /w/ bilabial, and /y/ alveolar. Also, he does not include /?/ with them. Moreover, he says that /ä/ is more open than /y/ and /w/, (p. 536).

4.13 ħuruf jänibiyya (Lateral Sounds)

According to Ibn Jinni (p. 52), and Sibawaihi (p. 533), the lateral sounds are /l, ḍ /. As it has been shown earlier in this paper, Ibn Sina (p. 40) describes /ḍ / as a stop sound, but he does not specify its point of articulation. It seems that there were dialectical differences with regard to the pronunciation of this sound. While in some dialects it was continuant lateral, it was stop in some others. However, the general consensus among Arab grammarians was that it was a lateral counterpart of /l/. This means that it was a continuant sound.

4.14 al-mahtut (The Weak Sound)

Ibn Jinni (p. 74), and al-Zamakhshari (p. 395) say that the /h/ is a weak sound. It is described as such because of the low effort it requires to produce. No specific point of articulation is stated for this sound other than being a middle pharyngeal sound.

4.15 mukarrar (Trilled Sound)

The only sound that is described as trilled is /r/, Ibn Jinni (p. 72) and al-Zamakhshari (p. 396). This sound can also be velarized (h) in the vicinity of emphatic sounds. To some people, in modern times, this sound may be described as trilled. However, the ancient Arab grammarians do not say that it is a trilled sound. In fact, in the recitation of the Holly Qur'an, people are told not to trill the /r/ sound. Rather, they are taught to pronounce it as a flap.

4.16 muqalqala (Sounds with Delayed Release)

Ibn Jinni (p. 73) and al-Zamakhshari (p. 395) put the sounds /q, j, ţ, d, b/ in this category.

4.17 ħuruf şafir (Sibilant Sounds)

According to al-Zamakhshari (p. 395), the sounds /z, s, ṣ / fall in this category. Ibn Jinni, Sibawaihi, and al-Khaleel do not have this category in their classifications.

4.18   ħuruf majhura (Voiced) and ħuruf mahsusa (Voiceless) Sounds

Arab grammarians, such as Sibawaihi, and, later, Al-Mubarrad, and Ibn Jinni, realized that there are two classes of sounds: majhura (voiced) and mahsusa (voiceless). Sibawaihi (Vol. 4, p. 434) and Ibn Jinni (p. 60) are agreed that during the production of a voiced sound, there is no free flow of air into the mouth, while there is such a flow during the production of a voiceless sound.[28] Ibn Jinni (p. 60) does not talk about a flow that results in a friction sound, for he includes some stop and some friction sounds in both categories. We know that when a voiced sound is produced, the vocal folds are half open and half closed to produce vibration. So pressure build up for a voiced sound relatively takes longer time than that needed for a voiceless sound during the production of which the vocal folds are relaxed (i.e. wide open). However, Ibn Sina, who came at a later time than Sibawaihi, Al-Zamakhshari, and Ibn Jinni, was the only one who referred voicing to the function of the vocal folds. He (p. 44) says, "/ð / differs from /q/ in that its (i.e. /ð /) production requires vibration" (cf. section 3 in this paper). We know that the only speech organs capable of producing vibration are the vocal folds. It is worth mentioning that some current phoneticians, such as O'Connor (1980) and Roach (1995), do not mainly relate the distinction between sounds to the function of the vocal folds. Rather, they refer to the time needed for pressure build up, and they describe these sounds as 'weak' and 'strong.' A voiceless sound needs less time than a voiced one does. So they are actually in agreement with the Arab phoneticians in this regard.

Anis (1961: 89) (quoting from a manuscript about Sibawaihi's al-**Kitaab**) says:

> The difference between a voiced and a voiceless is that you cannot get voicing without the vibration that you get from the chest. All voiced sounds are like this; their voicing comes from the chest. But the voiceless ones are articulated in the mouth only.

Ibn Jinni (pp. 68-9) and al-Zamakhshari (p. 394) are agreed that whispered (**mahsusa**) (=[-voiced]) sounds are /s, t, š, ħ, q, k, x, ṣ, f, h, ʔ/.[29] So the rest of the sounds which are /ʕ, γ, j, y, ḍ , l, r, n, ṭ, d, z, ð, ð̣ , b, m, w/ are non-whispered (**majhura**) (= [+voiced]).

4.19. ħuruf khayshumiyyah (Nasal Sounds)

Ibn Jinni (p. 435) describes /n/ as nasal. He says, "The /n/ is a voiced **nasal** letter [sound]."[30] Al-Zamakhshari, as interpreted by Ibn Ya'eesh Al-Musili (p.518), says that /m/ and /b/ are bilabials; however /m/ is also nasal.[31] Sibawihi (Al-Kitab, vol. 7, p. 343) realizes that /n/ and /m/ are nasal sounds. He says, "/n/ and /m/ have two features: oral and nasal; therefore, they have nasalization."[32]

Ibn Sina (p. 83) classifies /n/ and /m/ as nasal sounds. Ibn Al-Jazari (died 833) specifies a separate category for /n/ and /m/ as nasal sounds, which is the seventeenth point of articulation in his classification. Also, Fakhru d-Din Al-Musalli (died 621), as in Al-Hamad, 1986), specifies category number 19 for the two nasal sounds /m/ and /n/.

5. Indian Influence on Arab Grammarians

This matter could be discussed with regard to the following three different points of view.

5.1 The Total Influence

Some linguists, such as Ayyub, 1968, argue that Arab grammarians were very much influenced by the ancient Indian grammarians in sound studies. Ayyub (1968: 7) says: "It is possible to summarize the characteristics of the Indian linguistic studies in these points:

1. They were interested in the study of sounds and their articulation.
2. They ignored any mental theories and classification.
3. They considered the shape of the words to divide them into kinds.

Considering Sibawaihi's **al-Kitab**, we find that, contrary to the later grammar books, it has these [the above] three features…"

Haywood (1960: 9) also says, "Perhaps the Greeks gave the Arabs the idea of dictionaries, and the Indians gave them the alphabet." Other linguists adopt this point of view. For example Dheef (1968: 132) says, "Al-Khaleel wrote his dictionary according to the point of articulation of sounds influenced by Indian arrangement of the sounds of their language."

5.2 No Influence

Other linguists suggest that it is not possible to prove any foreign influence from Indian or Greek sources. Brokelman (1961: 123-4) asserts that there was no influence in Arabic phonology. If there had been any casual agreements, they could be only because of the nature of the field. Darwish (1956: 2-3) says that al-Khaleel invented the way of compiling his dictionary.[33] Darwish rejects the idea that al-Khaleel borrowed it from the Indian grammarians.

Along the same line, Sara (1993) says

Even when no explicit mention of the sources of the linguistic tradition for the Arabs are made, often the choice of terminology employed in discussing the contribution of the Arabs to linguistics betrays the writer's belief towards its derivative nature. It is the contention of this presentation that there are elements of this tradition that are genuinely native and show no dependence nor borrowing from any other source except the native genius of its creators. This native creativity we find fully fledged in the very early stages of Arabic linguistic writings in the major centers of language studies of Basra, Kufa and Baghdad . . . the eighth century of the common era. One should state at the outset that it is an honor for the Arabs to be associated with such great traditions as that of the classical Greece, or India in any intellectual endevour , . . .

5.3 Partial Influence

This idea amounts to the claim that Arab grammarians may have utilized the Indian phonetic knowledge in their works. Al-Sa'ran (1963: 99) says (my translation from the Arabic text):

Did the Arabs take the foundations and descriptions of sounds from the Indians? Were they [the Arabs] influenced by them [the Indians] in that [field]? For that [kind of study] appeared in the Arabian area all of a sudden, and completely in Sibawaihi's works. In theory, it is possible that the Arabs took [something] from the Indians, or were influenced by them, but we do not have a clear-cut evidence of that [matter].

6. Comments on the Indian Influence

The Indian influence could be seen in certain areas, but not in many others. Some linguists, such as Haywood (1962), think that if there was any influence, then it was upon the Indians by Arab grammarians, especially in the field of lexicography. Haywood (1962: 2) says:

Moreover, it is a remarkable fact that, almost from the start, the compilers of Arabic dictionaries aimed at registering the complete vocabulary material of the language. Indeed, they were almost obsessed by the copiousness of the language, and were very mathematically-minded in this matter. In this, they differed from the early lexicographers of other nations, whose chief aim was to explain rare and difficult words … The truth is that in lexicography–as in many other fields–the Arabs occupy a central position both in time and space; **between the Ancient World and the Modern, between the East and the West**. If a Fifteenth-century Arab could be miraculously transported into Twentieth-century Britain, he would not be at all surprised to see the volumes of the 'Oxford English Dictionary' on the library shelves: in some European countries, he would be surprised to see nothing comparable yet completed.

Haywood (1962: 4) also says, "Whether the Sanskrit lexicographical works may be termed 'Dictionaries' is a debatable point."

After the advent of Islam, a number of non-Arabs who converted to Islam had problems with short vowels which, in some cases, function as case and gender markers (among others). So, Arab grammarians had to invent symbols to help out of that problem (i.e. reading Arabic), especially when the meaning of words of two different readings fit the context but with two overall meanings. They came up with ħarakat (i.e., short vowels) which have been discussed earlier in this paper. Arab grammarians did not borrow symbols from other languages such as Sanskrit, which already had symbols for short vowels. This fact shows that Arab grammarians were not entirely dependant on other nations in language studies.

Besides the classification according to point and manner of articulation, Arab grammarians put the speech sounds of Classical Arabic into natural classes, but they (especially early ones) did not refer voicing to the function of the vocal folds, a fact which was first discovered by the Indian grammarians. Robins (1967: 142) argues that the discovery of the function of the vocal folds is one of the greatest achievements of the ancient Indian grammarians. Actually, Arab grammarians made the distinction between voiced and voiceless sounds with regard to the duration of the time that oral pressure build-

up takes during the articulation of such sounds and the amount of effort needed to produce them (i.e. as being lenis or fortis). O'Connor (1980) and Roach (1995) rely on this distinction between such sounds rather than voided vs. voiceless. Moreover, the Indian grammarians could make a distinction between vowels, semivowels, and consonant sounds. They could also divide consonants into occlusive and spirant sounds (Deshpande, 1995).

7. Summary and Conclusion

Sound study and classification by Arab grammarians dates back to about the 8th century AC. Arab grammarians were able to establish the points and manners of articulation of the speech sounds of Classical Arabic. They also put these speech sounds in natural classes other than those based on points of articulation; an achievement that may be considered as the basis of the establishment of the distinctive features theory in modern phonology. They were able to state the conditioning factors for allophonic phenomena in Classical Arabic.

Except for Ibn Sina, the Arab grammarians, such as Ibn Jinni, did not relate voicing to the vibration of the vocal folds as the Indian grammarians did. But they related voicing to a phenomenon associated with the production of speech sounds, namely, the speed of oral pressure build-up. If we take two sounds, a voiced stop and its voiceless counterpart, for example /t/ and /d/, and measure the time of pressure build-up while they are produced until their release, we will find out that the /d/ sound takes more time but needs less effort to produce than the /t/ sound does (for a more detailed presentation, see Pickett, 1980: 133-38). The phenomenon could be related to the fact that during the production of voiceless sounds, the vocal folds are in a relaxed state (i.e., they are wide open), thus free air flow. Probably Ibn Jinni (p. 69) refers to this phenomenon when he says, "… the breath flows with it [the voiceless sound]." With the production of the /d/ sound, there is a rapid opening and closing of the vocal folds to produce voicing, which means that, for almost half the time, the vocal folds are tightly closed. Ibn Jinni (p. 69) says, "… the breath is prevented from flowing with it [the voiced sound]."

Some linguists think that the Arabs were influenced by the Indian grammarians in language studies; others adopt the idea of partial influence; and others go to the extreme that there was no influence at all. I think that the extreme ideas, namely, the total influence and the no influence, are too exaggerated. All human knowledge is o cumulative nature over time; linguistics is no exception. It would not belittle the contribution of Arab grammarians to say that they took something from Indian grammarians, or from any other nation. I would accept the point of view that there was a partial influence in the process of linguistic knowledge build-up, but Arab grammarians have undoubtedly contributed to the development of speech-sound studies and classification.

Endnotes

[1] The researcher intends to publish a paper about the Greek and Indian influence on Arab Grammarians
[2] This school was founded in 1643 near Port-Roual-des-Champs. See Sandy, J. E.; II 290, 1958.
[3] His book was translated and published in French by Hartwig, as Le Liver de Sibawaihi: traite de grammaire Arabe, Paris, 1881-89. It also appeared in German by G. Jahn, entitled Sibawaihis Buch uber die Grammatik, Berlin, 1895-1900.
[4] This book was edited by W. Wright, Leipzih, 1864.
[5] This book was published by J. P Broch, Al-Mufassal: Opus de re grammatical arabicum, Christaniae, 1879. Also by G. Jahn, Ibn Jais Commentary zu Zamachsaris Mufassal, Leipzig, 1882-86.

[6] Ibn Sina was known in the West for his works in medicine rather than linguistics. His Risalal "essay" about how speech sounds are produced actually reflects his scientific and medical background and approach to the study of speech sounds.

[7] This book was edited by Jarbardi in Pakistan as **Šarhu aš-Šhafiya**; date of publication unknown.

[8] As in Al-Tamimi (p. 15)

بلغ [سيبويه] في تعيين مواضع الحروف ومخارجها من الصحة والدقة ما يعسر علينا الزيادة والإصلاح يستطيع القارئ الرجوع إلى ذلك في (الكتاب ، سيبويه ، المجلد 4 ، ص 432).

[9] This is the Arabic text in Ibn Jinni (p.7):

فأما إذا وصلت هذه الحروف ونحوها . . . فإنك لا تحس معها شيئا من الصوت كما تجده معها إذا وقفت عليها، . . . وإنما كان ذلك كذلك من قبل أن أخذك في حرف آخر وتأهبك له، قد حالا بينك وبين التلبث والاستراحة

[10] The phoneme /ᶜ/ seems to have different dialectal pronunciations. Moukket (1986:5) describes it as fricative. To me it is fricative. Al-Najjar (1984:9) lists this phoneme with the stop sounds.

[11] This sound has undergone some changes that are discussed in the subsequent sections of this paper.

[12] Al-Khalil says that /m/ is mutbaq when articulated. (Ibn Manzur: look up under the letter "mi:m."

[13] Note that in Classical Arabic
a)[-high] vowels are [-rounded]
b)[-back] vowels are [-rounded]
c)[+high] [+back] vowels are [+rounded]

[14] The vowels /a/ and /ä/ may be conditioned to be [+back] in the vicinity of emphatic consonants.

[15] As a matter of fact, al-Khaleel gives them these names (i.e., hawaiyya or jawfiyya) because, as he thinks, there are no speech organs involved in their production as other sounds. He says that these sounds just go with the almost-free flow of air through the glottis and the mouth without obstruction.

[16] This appears as footnote number 2 by the editor of Ibn Jinni's book Sir Sinaat al-Icrab.

[17] Abu Ali Al-Farisi says:

وهذا الذي يسمية أهل العربية حركة حقيقة أنه حرف، فالفتحة كالألف، والضمة كالواو، والكسرة كالياء، في أنهن حروف كما أنها حروف إلا أن الصوت بهن أقل من الصوت بالألف وأختها، وقلة الصوت بهن ليس يخرجهن عن أن يكن حروفا

[18] Sibawaihi describes this sound as more than shadid but less than rakhw. This might explain the differences in the pronunciation of this sound in temporary Arabic. In Iraq for example it is more like shadid while in other Arabic speaking areas it is more like rakhw.

[19] Abu Sikkin (1978: 51) says that the difference between the modern /ḍ / and the ancient one is in the point and manner of articulation; the modern is a voiced plosive emphatic sound, but the ancient one is described as voiceless fricative lateral (or lateralized) emphatic and does not have a counterpart, the modern /đ/ being the emphatic counterpart of /ţ/ and /ḍ /.

[20] We notice a development of the explanation of the phenomenon of velarization, here. This indicates that later grammarians did not just take for granted what the earlier ones just said.

[21] It should be pointed out here that [ɫ] is an allophone of /l/ in the environment of emphatic sounds while /ţ/ and /t/ are different phonemes.

[22] In contemporary Arabic and Classical Arabic, the emphatic sounds come as counterparts of other plain sounds as follows:

	Contemporary Arabic counterparts	Classical Arabic counterparts
ţ	/t/ and /d/	/t/ and /d/
ş	/s/ and /z/	/s/ and /z/
ð̣	/θ/ and /ð/	/θ/ and /ð/
ḍ	/l/	/l/

It is noticed that in contemporary Arabic, these sounds come in triplets, except /ḍ /. From the descriptions of sounds in the literature of Classical Arabic, we can only think of /l/ as a counterpart of /ḍ /.

[23]

يقول ابن جني في كتاب سر الصناعة: "ومعنى الاستعلاء أن تتصعد في الحنك الأعلى."

[24]

يقول ابن جني: "ومما فوق ذلك [أي فوق مخرج العين والحاء وهما في وسط الحلق] مع أول الفم مخرج القاف."

[25]Actually, Ibn Sina says, "all the rest are complex …," and the speech sounds listed under complex entities are given in a footnote by the translator.

[26] I think that this is a print mistake because /đ/ does not appear in any of the other categories.

[27] In his dictionary, Al-ᶜayn, which is organized according to the point of articulation of speech sounds, Al-Khaleel starts by the most back, low sound, ᶜ , (called ᶜayn, thus the title of the dictionary, because he considers this sound the first from the back of the vocal tract, and not /ʔ/.

[28] Sibawaihi says:

فالمجهور حرف أشبع الاعتماد في موضعه، ومنع النفس أن يجري معه حتى ينقضي الاعتماد ويجري الصوت ، وأما المهموس فحرف أضعف الاعتماد في موضعه حتى جرى النفس معه

[29] Al-Mansuri (1987: 95) reports that Abu Ali Al-Nahawi Al-Farisi considers /ʔ/ as Majhuur.

[30] The Arabic text is النون حرف مجهور أغن

[31] He says: Between the two lips is the place of articulation of /m/ and /b/. But /m/ has a nasal feature; therefore, you hear it like /n/ (with regard to this feature), and nasalization is in the nostrils.

ومما بين الشفتين مخرج الميم والباء؛ إلا أن الميم ترجع إلى الخياشيم بما فيها من الغنة، فلذلك تسمعها كالنون . . .، والغنة من الخياشيم.

[32] He says:

إلا أن النون والميم قديعتمد لهما في الفم والخياشيم فتصير فيهما غنة.

[33] Al-Khaleel (p. 66) uses a mathematical procedure to write his dictionary. He divides words into four categories based on the number of consonants in their roots. He starts with roots which consist of two litters [phonemes]. Since each has only two consonants, then the possibilities are only two; roots with three letters have six; roots with four letters have 24; and roots with five letters have 120 possibilities. Then he would establish which of these possibilities actually exist in the language to list them in his dictionary and ignore the others.

9. Appendix

The Distinctive Features of Classical Arabic Consonants on the Basis of the General Consensus of the Ancient Arab Grammarians

	Majhur	Sahih	Shadid	Rikhw	Mutawassit	Anfi	Mufakham	Mutbaq	Mustacli	Halqi	Basit	Shajari	Nitci	Asli	Lithwi	Thawlaqi	Hawaːi	Jaːnibi	Mukarrar	Muqalqal	Safiːr	Khyshumy
f	-	+	-	+	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-	-	-	-
b	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-
θ	-	+	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-
ð	+	+	-	+	-	-	-	-	-	-	+	-	-	-	+	-	-	-	-	-	-	-
ḏ	+	+	-	+	-	-	+	+	+	-	+	-	-	-	+	-	-	-	-	-	-	-
t	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-
d	+	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	+	-	-
ṭ	+	+	+	-	-	-	+	+	+	-	-	-	+	-	-	-	-	-	-	+	-	-
s	-	+	-	+	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-
z	+	+	-	+	-	-	-	-	-	-	+	-	-	+	-	-	-	-	-	-	+	-
ṣ	-	+	-	+	-	-	+	+	+	-	+	-	-	+	-	-	-	-	-	-	+	-
ḍ	+	+	-	+	-	-	+	+	+	-	+	-	-	-	-	-	-	-	+	-	-	-
š	-	+	-	+	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-
j	+	+	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+	-	-
l	+	+	-	-	+	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-
ḷ	+	+	-	-	+	-	+	+	+	-	-	-	-	-	-	+	-	+	-	-	-	-
m	+	+	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
n	+	+	-	-	+	+	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	+
r	+	+	-	-	+	-	-	-	-	-	-	-	-	+	-	-	-	-	+	-	-	-
ṛ	+	+	-	-	+	-	+	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-
k	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-
q	+	+	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	+	-	-
x	-	+	-	+	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-

γ	+	+	-	+	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-
ħ	-	+	-	+	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-
ç	+	+	-	-	+	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-
h	-	+	-	+	-	-	-	-	-	+	+	-	-	-	-	-	+	-	-	-	-
?	-	+	+	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-
w	+	-	-	-	-	-	-	-	+	-	+	-	-	-	-	+	+	-	-	-	-
y	+	-	-	-	-	-	-	-	+	-	+	+	-	-	-	-	+	-	-	-	-

Hawai also includes vowels. ä Mutawassit and mu^çtal with (w, y + vowels)

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