Muslims' Contributions to the Modern Linguistics:
The Descriptive Framework of Tajweed of the Holy Qur'an and the Generative Phonology in Contrast

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Abstract

The purpose of the study was to uncover the unfortunately neglected contributions made by Muslims to the modern linguistics by comparing and contrasting the descriptive framework of Tajweed of the Holy Qur'an and that of the generative phonology. The results of the study indicated that Tajweed and generative phonology were for the most part similar in terms of features, sound classifications and phonological processes. As for the features, it was observed that for any single feature given in generative phonology there was also one or more equivalent features in Tajweed. As for the sound classifications, they showed an amount of 83% as similarities in the assignment of sounds to their due features. As with respect to the phonological processes, both of them have recognized two levels of representations; phonemic representation (i.e. ħaq)[1] is the underlying representation and phonetic representation (i.e. mustaħaq) is the surface representation after phonological rules have been applied to the phonemic representation. As the study demonstrated the high degree of similarities between the two frameworks is indicative of the fact that Muslim contributions to the study of linguistics is indeed eminent but efforts are need to introduce Islamic linguistics word-wide.
Key words: Tajweed of the Holy Qur'an, generative phonology, distinctive features, sound classifications, phonological processes

1. INTRODUCTION

One of the major contributions Muslims have made to the modern civilization is in the field of linguistics. The corpus of Islamic linguistics, undoubtedly, constitutes one of the major traditions along with Indian and Greek ones. Unfortunately, in the history of linguistics, this chapter has undeservedly been neglected. While there are bulks of materials available in different languages, uncovering the contributions other nations such as Indian and Greek have made to the field of linguistics, Moslem contributions have been unfairly neglected or given a very limited amount of space. This very terrible ignorance of Islamic linguistic texts has been outstandingly marked in the work of Pederson who says, "We have nothing to thank Mohammedanism for in this respect" (quoted by Semaan, 1968: 4). Regardless of intentional negligence of some scholars, one reason might be the fact that no full-fledged efforts have been made by Moslem linguists today to introduce Islamic linguistics world-wide. In other words, Islamic linguistic texts have not been introduced into the area of modern linguistics so as to be studied by professionals. Therefore, there seems to be great need to look for the contributions Muslims have made to the field by finding a suitable way through which we might penetrate into the area and thereby uncover our own linguistic tradition.

In order for our linguistic tradition to be introduced, it is necessary to approach our linguistic texts as technical treatises and therefore something intelligible in terms of modern linguistics. For us, modern linguistic theories serve as instruments with which we can investigate the Islamic linguistic texts in order to be able to make them understandable rather than to show that the methods they embody can be explained in terms of one or another of the modern theories. It seems obvious that there are various theories, ideas and rules in each one which can not exactly be accounted for by the other

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[1] Table 7. page 27 includes the transliteration of the Arabic Writing System

one. Therefore, in this study, modern linguistics is taken as an instrument through which our own linguistic heritage is cultivated, not as a criterion by which our linguistic tradition is judged.

2. REVIEW OF RELATED LITERATURE
2. 1. QUR'ANIC STUDIES
The first stage in Qur'anic recitation studies starts at 610 A. D. when the Holy Prophet received the first five verses of Al-ʔalaq (The Blood-Clot) Chapter from Allah through Gabriel. In these verses, the Holy Prophet was ordered through the imperative form اقرا /ʔiqraʔ/ 'recite' by Allah. The next stages include the periods the Holy Prophet started the teaching of the Holy Qur'an to his followers and later his companions continued teaching it to other Muslims. The trend of teaching the recitation of the Holy Book continued throughout the first two centuries AH so that it took the form of a discipline out of which Tajweed was developed. Most experts believe that phonetic studies were among the first issues associated with the early developments of Arabic grammar and philology.

2. 2. GENERATIVE PHONOLOGICAL STUDIES
Generative phonological studies start with the work of Chomsky and Halle (1968). Their book serves as a master work underlying generative phonology. This book has been used for the most part in this study. Some other works like Schane (1973) and Kenstowicz and Kisseberth (1979) have also been used which are taken from Chomsky and Halle (1968) as well.

2. 3. CONTRASTIVE STUDIES
Among the contrastive studies done are Semaan (1968), Yarmohammadi and Deghan (1370/1991) and Zandi (1992). These studies have dealt with the phonetic aspect of Tajweed. The researcher, however, has not found any work comparing and contrasting Tajweed and generative phonology.

3. THE OBJECTIVES AND SIGNIFICANCE OF THE STUDY
Considering the aforementioned essential need of cultivating the Islamic linguistic texts, the present study is an attempt to penetrate into the Islamic linguistic texts by comparing and contrasting the descriptive phonological framework of the Holy Qur'an (Tajweed) with that of the generative phonology.

The significance of the study lies in its unveiling of the contributions made by Muslim linguists to the modern linguistics. As this study cultivates the phonetic and phonological corpus data of Muslims, it may provide the reader with a good understanding of the role Muslims played in the development of linguistics as they did in that of physics, chemistry, mathematics, medicine, etc.

4. METHODOLOGY
To carry out the research two types of references have been employed in this study. For Tajweed, the corpus of the data has been collected from some master books dealing with Tajweed. Sibawayh (d. 177/798), Ibn al-Jazari: (d. 833/1429), Mousavi: (1369/1990) and some others have been mostly used in the study. The data have been categorized and tabulated in the form of tables to make the interpretation easier. As for generative phonology, The Sound Pattern of English (Chomsky and Halle, 1968) has been the major reference in this study. Of course, reference has been made to Schane (1973) and some other sources just to clarify the ideas in the former book.

4. 1. DATA FOR THE STUDY
To be more exact, let's have a look at the data available in Tajweed Framework. The available books on Tajweed, include information on the following topics;

(a) Makha:rij ul-ḥuru:f 'Points of articulation'
(b) Ṣifa:t ul-ḥuru:f 'Sound features'
(c) Aḥka:m ul-ḥuru:f 'Phonological processes'
(d) Ba:b ul-Madd wa al-Qaṣr 'Duration and Shortening'
(e) Ba:b ul-Waqf wa al-Ibtida:? 'Rules pertinent to where to pause and how to start again when one is reciting the Holy Qur'an'.

Among these, only the first four topics, (a), (b), (c), and (d) can be accounted for in generative phonology; therefore, the scope of the study is limited to the first four topics. The reason why the fifth, (e), was left out is that this topic is more semantically-oriented. It includes the statements explaining where to pause and where to start again when one is reciting the Holy Qur'an. It more or less looks like the instructions showing how to use punctuations so that the meaning of the verses would not be affected. Different types of haltings are also discussed under this topic. It also deals with the symbols suggested by ʔabdulla:h Saja:wandi:(d. 560/1165) a specialist in Qur'anic recitation, to show where the reciter has a must to pause or where s/he must not, etc. (The letters م and لا, for instance, stand for these two types of pauses respectively).

As for topic (a), the number of the places of articulation is said to be fourteen, sixteen or seventeen (Mousavi, 1369/1990). Sibawayh (d. 177/798), Ibn al-Jazari: (d. 833/1429) and some others, however, have described the place of articulation of the Arabic phonemes to be seventeen. The description by Sibawayh is taken to be the major source as "the first grammatical treatise of unquestionable authenticity is Sibawaiyhi's Kitab ... This work, whose author died in or about 177/798, is most probably the first attempt at a comprehensive and systematic description of the Arabic language at every level (phonetics, phonology, morphology, syntax, and semantics)" (Bohas, et. *al*, 1990: 1). He was a student of Khalil ibn Ahmad (d. 175/791) who is considered to be the founder of the Arabic grammar.

As for topic (b), manner of articulation, attempts have been made to collect features for which one can find somewhat equivalent areas in phonetics and thereof in generative phonology. Different grammarians and phoneticians claimed different features as related to this topic. For example, Makki: ibn Abi: Ṭalib al-Qaysi: (d. 437/1045) describes it as consisting of forty four features. Ibn al-Jazari: (d. 833/1429) considers it as consisting of thirty four and Sibawayh counts it to be twelve. The reason behind this variety among the features related to this topic as compared to a somewhat exact number of topic (a), place of articulation, may go with the subjectivity of the latter topic, (b). It is not so objective as the former topic which is more concrete and tangible. In other words, while the former topic, place of articulation, may concretely be, to a great extent, distinguishable even by common people, the latter topic, the manner of articulation, might not be distinguished even by the specialists and thus led them to come up with such a variety. Therefore, there were no criteria for the researcher other than to stick to the features in phonetics and phonology to choose among the very variety. That is, whatever features were found in Tajweed which could be somehow accounted for in phonetics and phonology, they were selected.

As for topic (c), it includes the phonological processes which have been stated for the recitation of the Holy Qur'an. Topic (d), duration and shortening, can also be included in topic (c), phonological processes, as it concerns the processes of shortening and lengthening of vowels in certain contexts, hence phonological processes. For the most part, reference has been made to Mousavi (1369/1990) for topics (c) and (d). Because of the limited scope of this article these two parts have been pointed out in passing. Attempts have been made to see how Moslem phoneticians have dealt with the phonological processes available in the Holy Qur'an.

4. 2. *PROCEDURE FOR COMPARISON AND CONTRAST*

After the descriptive statements concerning each topic were collected, it would be the right time to come up with the notions discussed in generative phonology. The procedure is that the concepts discussed in both frameworks be compared and contrasted one by one.

In order to start, the definition for each distinctive feature (i.e. Place of articulation & Manner of articulation features) specified by Chomsky and Halle (1968, pp. 298-329) were given. Second, in order for the features to be applied to the sound system specified in Tajweed, the description available in Tables 1., 2., 3. and 4. were compared with the definitions given. Consequently, the statements of comparison and contrast between the two frameworks would follow each definition. Finally, as the result of the above application of the features, the Arabic sounds were specified in terms of the distinctive feature matrix (Table 5.).

5. FINDINGS AND RESULTS
5.1. CONSONANT FEATURES

5. 1. 1. PLACE OF ARTICULATION OF ARABIC CONSONANTS

Table 1. below demonstrates the place of articulation for the Arabic consonants. It includes the place of articulation of all the 28 Arabic consonants as indicated by Moslem phoneticians and grammarians and the relevant equivalents in traditional phonetics.

Table 1. Place of Articulation Features of Arabic Consonants

No	Sounds	Place Of Articulation Given By Moslem Phoneticians	Equivalents
1	/ʔ/, /h/	"In the back of the throat" (Sibawayh as quoted by Semaan, 1968: 41)	Glottal
2	[a:][2]	"In the back of the throat" (Sibawayh as quoted by Semaan, 1968: 41)	Low, front, unrounded vowel
3	/ʕ/, /ḥ/	"In the middle of the throat" (Sibawayh as quoted by Semaan, 1968: 41)	Pharyngeal
4	/x/, /gh/	"In the front of the throat" (Sibawayh as quoted by Semaan, 1968: 41)	Uvular
5	/q/	"At the back part of the tongue and the part of the palate above it" (Sibawayh as quoted by Semaan, 1968: 41).	Post-velar
6	/k/	"At the back part of the tongue just below the point of articulation of /q/ and the part of the palate directly above it" (Sibawayh as quoted by Semaan, 1968: 41).	Post-palatal
7	/sh/	"At the mid-tongue[3] half way between it and the center of the palate" (Sibawayh as quoted by Semaan, 1968: 41).	Alveolar
8	/j/, /y/	"At the mid-tongue half way between it and the center of the palate" (Sibawayh as quoted by Semaan, 1968: 34).	Palatal
9	/ḍ/	"Between the beginning of the tongue's edge and the molars which are by the tongue"(Sibawayh as quoted by Semaan, 1968: 41).	Palato-alveolar

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[2] Following the notational system of Traditional Phonetics, we have enclosed this vowel within brackets as it is an allophone of the phoneme /a/.

[3] Anis (1965: 238) has taken wasaṭ al lisa:n to mean the blade of the tongue.

10	/l/	"At a point by the lower edge of the tongue towards the end of it between this and the part of the palate that faces it, above the bicuspid, the canine, the lateral incisor, and the front incisor" (Sibawayh as quoted by Semaan, 1968: 41).	Alveolar
11	/n/	"At a point of the tongue between it and a little above the incisors" (Sibawayh as quoted by Semaan, 1968: 41-42).	Alveolar
12	/r/	"The /r/ is produced at the point of articulation of /n/, except that the /r/'s point of articulation is effected further towards the point of articulation of /l/" (Sibawayh as quoted by Semaan, 1968: 42).	Alveolar
13	/ŧ/, /d/, /t/	"Between the point of the tongue and the bases of the incisors" (Sibawayh as quoted by Semaan, 1968: 42).	Dental-alveolar
14	/z/, /s/, /ṣ/	"At the point of the tongue a little above the incisors" (Sibawayh as quoted by Semaan, 1968: 42).	Dental-alveolar
15	/ẓ/, /th/, /dh/	"At the point of the tongue and the edges of the (higher and lower) front incisors" (Sibawayh as quoted by Semaan, 1968: 42).	Interdental
16	/f/	"At the back part of the lower lip and the edge of the higher front incisors" (Sibawayh as quoted by Semaan, 1968: 42).	Labio-dental
17	/b/ /m/ /w/	"Between the two lips" (Sibawayh as quoted by Semaan, 1968: 42).	Bilabial

With respect to the definitions and equivalents given in Table 1. attempts have been made to give more details below.

Moslem phoneticians have considered /ʔ/, /h/, /ʕ/, /ħ/, /x/ and /gh/ as pharyngeals. They have further described pharynx as consisting of three parts; aqṣa al-ḥalq 'back of the pharynx', ausaṭ al-ḥalq 'middle of the pharynx' and adna al-ḥalq 'front of the pharynx' each of which recognized as glottis, pharynx and uvula by modern phoneticians respectively. Accordingly, the glottal /ʔ/ and /h/, the pharyngeal /ʕ/ and /ħ/ and the uvular /x/ and /gh/ refer to the description specified by them.

Sibawayh has also described [a:] as glottal which is not confirmed by modern phoneticians. Ibn al-Jazari: (d. 833/1429: 105) says that Khalil ibn Ahmad did not mention [a:] as glottal. He maintains that Khalil has considered [a:], [u:] and [i:] as jaufi:yyah 'sounds produced in oral or pharyngeal cavity' (*ibid.* 82). Considering Khalil's view one can see that this view concerning vowels well meets the definition given by modern phoneticians. Modern phoneticians describe vowels to be produced without any obstruction in the oral cavity as opposed to consonants in the production of which obstruction is present.

Moslem phoneticians have described /k/ and /q/ as lahawi 'uvular'. They have further stated that /k/ is produced much forward to the front of the mouth i.e. palatal region but /q/ much backward to the back region of the mouth where the throat lies. They believe that the place of articulation for /q/ is uvular and for /k/ velar. Dealing with the problem of finding the exact place of articulation for /k/, the researcher came to the conclusion that the original Arabic /k/ must have been produced in the palatal region or, to be more exact, somewhere in the post-palatal region. To clarify the point, the following explanation may prove useful.

In Tajweed, it has been mentioned that the long alif '[a:]', specified as [+low, -back], takes the features of the consonants preceding it. If those consonants are velarized, velar or [-low, +back] (i.e. mustaʔliyah), [a:], which is [+low, -back], also becomes [+low, +back] (i.e. mufakhkhamah); otherwise, it remains nonvelarized, nonvelar, or [+low, -back] (i.e. muraqqaqahah). Thus, had /k/ been

produced in the velar region (i.e. -low, +back), it would have made [a:] <u>mufakhkhamah</u> '[+low, +back]' as /q/,/gh/, /x/, etc., which have the feature [-low, +back], would. As /k/ would not make [a:] <u>mufakhkhamah</u>, [+low, +back]; it seems preferable to specify /k/ as neither velar nor velarized. Rather, it must be said that the original Arabic /k/ must have been produced in the post-palatal region (i.e.-low, -back).

/sh/, /j/, and /y/ have been referred to by the feature <u>shajri:yyah</u> 'sounds produced close to the opening of the mouth'. <u>shajr</u> refers to the opening of the mouth. These sounds are produced by the middle (blade) of the tongue touching the part of the palate above it (Pourfarzib, 1374/1996: 46-7).

Comparing Sibawayh's classification of Arabic sounds with that of Gairdner-Jones's, Semaan (1968: 56) concludes that both of them have recognized /sh/ and /j/ as alveolar and palatal respectively.

Refusing the view that /j/ and /sh/ have the same point of articulation Anis (1965: 78) also maintains that research shows that in Arabic if there were two consonants to have the same point of articulation they would never occur successively in a word. That is, if /j/ and /sh/ (ignoring the presence of vowels in the same word) were produced in the same point of articulation, they would not appear successively in a word. But as there are words such as <u>shajar</u> 'tree' and many others in which /sh/ and /j/ occur successively, it becomes evident that they must have been produced in two different places of articulation.

Taking this view for granted, Anis further adds that there is a relationship between /j/ and /k/ concerning their places of articulation as there are not found any Arabic words in which /k/ follows /j/ except in one or two words like <u>jakira</u> 'to obstinate' which is not originally Arabic. But with respect to the reverse order (i.e. /j/ following /k/), there are not absolutely any words having this order. As evidence to his view, he further says that Ibn Jinni has also considered /q/, /k/, and /j/ as sounds produced in the back part of the tongue.

Moslem and modern phoneticians do not agree as to the exact point of articulation of /d/. The former have described it as palato-alveolar as indicated by Sibawayh whereas the latter have described it as dental-alveolar. Of course, the reason is that the original /d/ has undergone change in terms of its point of articulation. That is, /d/ produced by Arabs today is not like that produced in the first few centuries (Anis, 1965).

Moslem phoneticians have called /n/, /l/ and /r/ <u>dhaulaqi:yyah</u>, 'sounds produced with the <u>dhalq</u> 'the edge of the tongue'. Modern phoneticians have characterized them as alveolar.

/t/, /d/ and /t/ have been called <u>nit?i:yyah</u> 'sounds produced at the palate'. /z/, /s/ and /s/ have been called <u>Asli:yyah</u> 'sounds produced with the tip of the tongue'. On further considerations, it becomes obvious that both of them describe the same thing. The difference, more or less, lies in the attribution of them just to two different types of features. In other words, the former have been attributed to the place of articulation, the palate, whereas the latter to the articulator, the tip of the tongue. Accordingly, both of them have been considered to be dental alveolar as both groups are produced with the front of the tongue touching the alveolar ridge.

/th/, /dh/ and /z/ have been called <u>Lathawi:yyah</u> 'sounds produced at the alveolar ridge' in Tajweed which is not in agreement with the definition given by Sibawayh. Rather they could have been said to be interdentals.

/f/, /b/, /m/ and /w/ have been called '<u>Shafahi:yyah</u> or <u>Shafawi:yyah</u> 'labial'. By the definition given /f/ is, thus, labio-dental and /b/, /m/ and /w/ are bilabials.

5. 1. 2. *MANNER OF ARTICULATION OF ARABIC CONSONANTS*
Table 2. includes the features, definitions, their equivalents, if any, in phonetics and also sounds categorized as related to each feature by Moslem phoneticians and grammarians.

Table 2. Manner of Articulation Features of Arabic Consonants

No	Feature	Definition	Equivalent	Sound
1	majhu:rah.	"Is one the articulation of which requires a maximum obstruction of the air stream at its point of articulation where the breath is held aback during the period of obstruction until the sound comes forth. The two other majhu:rah, /n/ and /m/, require that the obstruction of the air stream be in both the mouth and the innermost part of the nose so that they become nasalized" (Sibawayh as quoted by Semaan, 1968: 42-3).	Voiced	/ʔ/, [a:], /ʕ/, /gh/, /q/, /j/, /y/, /ḍ/, /l/, /r/, /ṭ/, /d/, /z/, /ẓ/, /dh/, /b/, /w/ /n/, /m/
2	mahmu:sah	"The process by which a harf is articulated with but feeble obstruction of the air stream at its point of articulation, the breath being allowed to flow along with the sound" (Sibawayh as quoted by Semaan, 1968: 43).	Voiceless	/h/, /ḥ/, /x/, /k/, /sh/, /s/, /t/, /ṣ/, /th/, /f/
3	shadi:dah	"Those letters which, in a state of quiescence, prevent the current of the sound in their utterance" (Sibawayh as quoted by Semaan, 1968: 43).	Stops	/ʔ/, /q/, /k/, /j/, /ṭ/, /t/, /d/, /b/
4	rikha:wah	"The letters in which the sounds run on. (Sibawayh as quoted by Semaan, 1968: 44).	Fricatives	/h/, /ḥ/, /gh/, /x/, /sh/, /ṣ/, /ḍ/, /z/, /s/, /ẓ/, /th/, /dh/ /f/,
5	bayni:yyah	"They are ḥuru:f between shadi:dah and rikha:wah" (Sibawayh, II, 490).	Sonorant	[a:], /ʕ/, /m/, /n/, /l/, /r/, /w/, /y/
6	munḥarif	"Is a ḥarf shad:d in [the pronunciation of] which the sound flows along [because] the tongue has altered its way with the sound not interrupting the flow as is the case with the ḥuru:f al-shadidah" (Sibawayh as quoted by Semaan, 1968: 44).Sibawayh further adds that in the utterance of /l/, the sound flows not from the point of articulation of this speech sound, but "from the two edges of the narrow part of the tongue, little higher than that" (Sibawayh as quoted by Semaan, 1968: 44).	Lateral	/l/
7	ghunnah	"A sort of nasal sound or twang coming from the nose. You bring it (i.e. this gunnah sound) forth from your nose [while] the tongue is still in the harf's emplacement; for, if you were to hold your nose (i.e. keep it closed during the production of /m/ and /n/) the sound could not flow forth" (Sibawayh as quoted by Semaan, 1968: 45).	Nasals	/n/, /m/
8	munṭabiqah	"The letters produced by " the part of the tongue which is the place of their utterance bring [closely] covered [in their utterance] by what is opposite to it of the palate" (Sibawayh as quoted by Semaan,	Velarized	/ṣ/, /ṭ/, /ḍ/, /ẓ/

No	Feature	Definition	Equivalent	Sound
		1968: 44).		
9	munfatiħah	The opposite of munṭabiqah		Sounds other than munṭabi-qah
10	mukarrar	"As a ħarf shadi:d in [the production of] which the sound flows because of the repetition" and the "obliquity" of this ħarf towards the /l/... "and were it not for this repetition the sound could not flow" (Sibawayh as quoted by Semaan, 1968: 44).	Vibrant	/r/
11	mustaʔliyah	"The rising of the tongue towards the palate whether velarization is being effected or not" (Al-Zamakhshari: as quoted by Semaan, 1968: 48).	Velarized	/d/, /t/, /s/, /z/, /x/, /gh/, /q/
12	mustafilah	The opposite of mustaʔliyah		Sounds other than mustaʔliyh
13	layyinah	"Because the points of articulation for both of them are wider than the others and thus allow for more breath. For /w/ the lips are rounded. As for /y/, [in producing the] /y/ you raise your toungue towards the palate" (Sibawayh as quoted by Semaan, 1968: 46). "The phoneme /a:/ [i.e. the allophone [a:]] is called by Sibawayh ha:wi: (derived from the Arabic root HWI, meaning "to fall"); he says that the mouth-opening at the point of articulation for /a:/ is larger than that for /w/ or that for /y/" (Semaan, 1968:46).	Glides	/w/, /y/, [a:]
14	tafishi: safi:ri: makhru:rah manfu:thah mabħu:hah	Shibilant (Pourfarzib, 1374/1996: 54) Sibilant (Al-Zamakhshari:, as quoted by Semaan, 1968: 48) Snoring (Asra:r, 1375/1996: 53-4) Blowing (Asra:r, 1375/1996: 81) Hoarse (Asra:r, 1375/1996: 30)	Strident	/sh/ /s/, /s/, /z/ /x/ /th/ /h/

5. 1. 3. CONCLUSION

In order to make a clear comparison between the classification of sounds in generative phonology and in Tajweed framework, we had better summarize Tables 1. and 2. in terms of the traditional phonetics and thereby come to a distinctive feature matrix in terms of the features in generative phonology. Table 3., then, presents the results of the consonant classification in terms of their place and manner of articulation.

Table. 3. Arabic Consonants in Traditional Phonetics Framework

Place or articulation	ial	s	a	s	a	s	ar	s	ar	s	ar	s	a	s	a	s	lar	s	ar	s	a	s	a	s

Manner of articulation														
Stops	Simple	VL				t				k				?
		VD	b			d					q			
	Velarized	VL												
		VD				ṭ								
Fricatives	Simple	VL		f	th	s	sh					x	ḥ	h
		VD			dh	z						gh	ʕ	
	Velarized	VL				ṣ								
		VD			ẓ		ḍ							
Affricates								j						
Nasals			m				n							
Liquids	Laterals						l							
	Vibrants						r							
Glides			w					y						

5. 2. *VOWEL FEATURES*

In this part, vowels are described in accordance with (a) tongue height; low vs. high, (b) the shapes of lips; rounded vs. unrounded and (c) the position of the highest part of the tongue on the front-back axis; front vs. back.

5. 2. 1. *TONGUE HEIGHT*

On the surface, it seems that vowels have totally been ignored by Moslem phoneticians. But the following story transmitted about the invention of the vowel signs, Ashka:l, by Abul Aswad al Du?ali: indicates that vowels have been paid attention to and described earlier than consonants in a way much similar to the description given by modern phoneticians[4].

It is said that to make the Holy Qur'an immune of misreading and thereby misunderstanding Abul Aswad (d. 69/688-9) had a ascribe from the tribe of ?abd Qays sit before a large Codex of the Holy Qur'an and asked him to look at his mouth carefully as he recited it. He said to the ascribe;

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[4] Chronologically, the invention of vowel signs has been worked on by ?abu ?al ?aswad who is considered to be the first Arabic grammarian.

> Wherever you see me opening my mouth [in the production] of a letter put a dot high up at its top and if I round my mouth put a dot in between the letter and if I narrow [my mouth] put a dot by the bottom of the letter[5] (Mansur, 1376/1998: 150).

There are three technical words describing the movements of mouth in the articulation of vowels in the above quotation. The first is the verb <u>fatiḥa</u> 'to open' describing the articulation of /a/. The second is the verb <u>ḍamma</u> 'to round' describing the articulation of /u/. And the third is the verb <u>kasira</u> 'to draw together' describing the articulation of /i/. These three verbs later came to be known as the features; <u>fatḥah</u>, <u>ḍammah</u> and <u>kasrah</u> referring to /a/, /u/ and /i/ respectively.

Among these, <u>fatḥah</u> and <u>kasrah</u> describe the height of the tongue in the articulation of /a/ and /i/ respectively and <u>ḍammah</u> describes the shapes of lips in the articulation of /u/. As we know, the mouth consists of two jaws and the respective organs of speech. The upper jaw, on which the places of articulation are located, is unmovable. The lower jaw, on which the articulators are located, is movable. Accordingly the opening, i.e. <u>fatḥah</u>, or closing, i.e. <u>kasrah</u>, of mouth is meant to refer to the disclosure or closure of the lower jaw but not the upper one. That is, the opening of the mouth in the above quotation can be taken as the lowering of the lower jaw and thereby the lowering of the tongue in the articulation of /a/, hence paralleling the feature [low]. And closing can be taken as the drawing-up of the lower jaw and thereby the tongue in the articulation of /i/, hence paralleling the feature [high]. In other words, the lowering of the tongue accompanies the lowering down of the lower jaw and results in a greater distance between the upper and the lower jaws; thus, in the articulation of the low vowels the mouth is more open (i.e. the distance between the two jaws is greater) and in the articulation of the high vowels the mouth is closer (i.e. the distance between the two jaws is less). This means that the feature high vs. low can be substituted by the features <u>kasrah</u> vs. <u>fatḥah</u> in Tajweed.

5. 2. 2. *THE SHAPES OF LIPS*

As it is evident, the feature <u>ḍammah</u> well parallels the feature [round] in phonetics.

5. 2. 3. *THE POSITIONS OF THE HIGHEST PART OF THE TONGUE*

To the researcher's knowledge there is no hint of the features front and back in Moslem phonetic literature attributed to the vowels /a/, /i/ and /u/. But, as will be mentioned in 6. 3. 3., with respect to the long vowel [a:] it is said that [a:] becomes <u>mufakhkhamah</u> 'velarized' (i.e. back) in certain contexts.

5. 2. 4. *CONCLUSION*

In sum, <u>fatḥah</u>, <u>kasrah</u> and <u>ḍammah</u> parallel the features low, high and round respectively. But one important point is that these features, though referring to the mouth configuration, are used as the proper names of the sounds they modify. That is, each of them refers to only one sound but not others even if they may share the same feature in common. For instance, <u>kasrah</u> 'high' is a name only for /i/ but not for /u/ which is also high.

Table 4. presents the positions of tongue, the tongue height and the shapes of lips in the articulation of the Arabic vowels.

Table 4. Articulatory Features Of Arabic Vowels

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[5] اذا رايتنى فتحتُ فَمى بالحرفِ فانقط نقطةً فَوقَه على اعلاه و ان ضممتُ فمى فانقط بين يدى الحرف و ان كسرتُ فاجعل النقطةً من تحتِ الحرفِ ...

Position of the tongue and shapes of the lips / Height of the tongue	Front Unrounded	Back Rounded
High	**i**	**u**
Low	**a**	

6. GENERATIVE PHONOLOGY

6. 1. MAJOR CLASS FEATURES

The vocal tract configuration provides the basis for the description of the major class features. It can be constricted or closed so that the air flows out in an obstructed way or it can be opened so that the air coming from the lungs flows out freely.

As Chomsky and Halle (1968: 301) put it , "the behavior of the vocal tract in speech can be described as an alternation of closing or opening." Therefore, there are two phases during which sounds are produced. During closing phase, the air stream is "either impeded or stopped and pressure is built up in the vocal tract" (*ibid.*). During the opening phase, the air stream flows out with a relatively free passage of air either through the oral cavity or the nasal cavity.

The very behavior of the vocal tract in speech production has led Chomsky and Halle to come up with the major class features, namely sonorant, vocalic and consonantal each of which "focuses on a different aspect of the open-versus-closed phase" (1968: 302).

Below, attempts are made to give the definition for each feature and specify the Arabic sounds provided in Tables 3. and 4. in terms of these features in generative phonology and finally find their equivalents, if any, as indicated by Moslem phoneticians.

6. 1. 1. SONORANT-NONSONORANT

"Sonorants are sounds produced with a vocal tract cavity configuration in which spontaneous voicing is possible; obstruents are produced with a cavity configuration that makes spontaneous voicing impossible" (Chomsky & Halle, 1968: 302).

Chomsky and Halle (1968) further maintain that sounds such as stops, fricatives and affricates that are formed with more radical constriction than glides are not sonorants, while vowels, glides, nasal consonants and liquids are. Applying this feature to Arabic sounds, we observe that sounds known as Yarmalu:n consist of the glides /y/ and /w/, the nasal consonants /m/ and /n/ and the liquids /l/ and /r/. Thus, they are all sonorants. As for vowels, Moslem phoneticians did not locate any particular point of articulation. This may indicate that they implicitly believed that such sounds were also sonorants; otherwise, they would have classified them as shadi:dah , 'hard' (i.e. stops) or rikha:wah , 'soft' (i.e. fricatives and affricates). Chomsky and Halle also describe /ʔ/ and /h/ as glides which are sonorant whereas Moslem phoneticians have considered the former as shadi:dah and the latter as rikha:wah. Another feature which may account for the feature sonorant is bayn bayn or bayni:yyah 'intermediate'. This refers to the sounds including; long alif '/a:/', /w/, /y/, /l/, /r/, /m/, /n/ and /ʕ/. Here, the difference between the two frameworks lies in the attribution of /ʕ/ to the feature sonorant by Moslem phoneticians. [a:] has been given the feature bayni:yyah 'sonorant' which can be taken to mean that they have implicitly considered all vowels as sonorant. But the fact that vowels had not been appeared in the Arabic orthography might have made them ignore their characteristics.

6. 1. 2. VOCALIC-NONVOCALIC

"Vocalic sounds are produced with an oral cavity in which the most radical constriction does not exceed that found in the high vowels [i] and [u] and with vocal cords that are positioned so as to allow

spontaneous voicing; in producing nonvocalic sounds one or both of these conditions are not satisfied" (Chomsky & Halle, 1968: 302).

In generative phonology, therefore, vowels and liquids are considered as vocalic, and glides, nasal consonants and obstruents nonvocalic. In Tajweed what is known as musawwat 'a sound produced with voice' is regarded as vocalic but liquids such as /r/ and /l/ are not specified to be vocalic.

As is implied in the literal meaning of the feature musawwat as sounds produced with voice, it may be said that this specification is in line with the definition of the vocalic sounds given above. Because, as it was given in Table 2., if voicing in vowels were meant to be the same as voicing in consonants such as /b/, /m/, etc., where there is a vocal cord vibration as well as a constriction in the oral cavity, Moslem phoneticians could have used only the feature majhu:rah 'voice' for consonantal as well as vocalic sounds. But the distinction between the feature majhu:rah, as specified for consonants as well as for vowels and the feature musawwat, as specified merely for vowels, may indicate that by musawwat they meant sounds allowing spontaneous voicing without any constriction in the oral cavity.

6. 1. 3. CONSONANTAL-NONCONSONANTAL

"Consonantal sounds are produced with a radical obstruction in the midsagittal region of the vocal tract; nonconsonantal sounds are produced without such an obstruction" (Chomsky & Halle, 1968: 302).

The feature consonantal is, thus, present whenever there is an obstruction to the air stream in the oral cavity. In many cases consonantal sounds are nonvocalic but since each feature identifies the activities of the vocal tract independently, there are also sounds in which both features can be present, [+vocalic, +consonantal] or absent, [-vocalic, -consonantal] (Falk, 1978).

Accordingly, the so-called musammat sounds 'sounds produced without voice' can be described as consonantal since in the articulation of them obstruction is present and Moslem phoneticians have, likewise, described them as having makhraj, 'place of articulation' in the oral or pharyngeal cavity. Moreover, the appellation of the feature musammat, as sounds produced without voice, may indicate that these sounds are produced without spontaneous voicing as there is always an obstruction in the oral cavity. The important point is that the feature musammat 'sounds produced without voice' should be taken to refer to sounds without spontaneous voicing rather than sounds with no vibration at all in the vocal cords i.e. [-voice] sounds. If the other way round had been the possibility Moslem phoneticians would have referred to consonants by the feature mahmusah which was defined as sounds without voice or [-voice] such as /t/, /k/, etc. Looking at the way they have specified sounds as musawwat and musammat, we observe that spontaneous voicing is the key element in their classification and the obstruction in the oral cavity is the secondary. That is, if the spontaneous voicing is present in the articulation of a sound then there is necessarily no obstruction in the oral cavity and hence musawwat production. And if the spontaneous voicing is absent then there is necessarily an obstruction in the oral cavity and hence musammat production. Bearing this view in their mind, they have not defined any sounds as belonging or not belonging to either of vocalic and consonantal classifications simultaneously because, as implied in their classification, it is not possible for sounds to have both spontaneous '[+vocalic]' and inspontaneous voicing '[+consonantal]' at the same time. In contrast, Chomsky and Halle have considered /l/ and /r/ as [+vocalic, +consonantal] and /w/, /y/, /h/ and /?/ as [-vocalic, -consonantal].

6. 2. PLACE OF ARTICULATION FEATURES

Sound segments can be described by means of either articulators or place of articulation features. The articulators may be said to lie along the lower jaw of the oral cavity, namely, the tip or apex of the tongue, the front or blade of the tongue, the back or dorsum of the tongue and the root of the tongue.

Along the upper jaw are the areas with which the articulators make contact or near-contact. It consists of the upper lip, upper front teeth, alveolar ridge, hard palate, velum or soft palate, uvula and the back of the pharynx. Looking at the definitions for each feature given by Chomsky and Halle (1968), one may observe that except for the feature anterior, characterizing sounds with an obstruction in the front of the oral cavity, these definitions are most likely based on the specification of sound segments in terms of the articulatory features of the tongue rather than their place of articulation.

In Tajweed, what has been described as makha:rij ul-ḥuruf 'places of articulation' parallels the definition for the place of articulation features. Moslem phoneticians have described sounds with respect to either articulators or places of articulation. Except for dhaulaqi:yyah and asli:yyah sounds which are classified on the basis of articulatory features of the blade and tip of the tongue the rest have been classified with respect to their places of articulation.

To find the place of articulation for a sound segment, Moslem phoneticians give the following rule. First you need to make the letter sakin 'unvowelled', then add /ʔ/ (Of course, there comes the vowel /a/ afterwards, hence /ʔa/) at the beginning of that unvowelled letter (i.e. consonant) and pronounce it, you will find the place of articulation for that sound (Pourfarzib, 1374/1996: 48). For instance, to locate the place of articulation for /b/, they put it in a sequence of /ʔab/ and pronounce it. Wherever there is a contact or near-contact, that would be the place of articulation for /b/. Whether or not this rule meets the definition given for the neutral position in generative phonology is an open question; an experimental study with X-ray motion pictures may lead to a better comparison. But practically using this criterion, Moslem phoneticians, to a large extent, were successfully able to characterize sound features. Along the same line, the following sections may give you a better picture.

To come to a good understanding of both frameworks concerning the place of articulation features, the definition for each feature given by Chomsky and Halle (1968) is given and compared with the corresponding feature of Tajweed in the following sections.

6. 2. 1. ANTERIOR-NONANTERIOR
"Anterior sounds are produced with an obstruction that is located in front of the palato-alveolar region of the mouth; nonanterior sounds are produced without such an obstruction. The palato-alveolar region is that where the ordinary English [Š] is produced" (Chomsky & Halle, 1968: 304).

In other words, sounds produced with an obstruction which is located in the front of the oral cavity are called anterior, whereas sounds produced without such an obstruction such as vowels, glides or produced in the back of the oral cavity are called nonanterior. The dividing line is the palate; thus, " the consonants that in traditional terminology are described as palatal, retroflex, velar, uvular or pharyngeal are nonanterior, whereas labials, dentals and alveolars are anterior" (Chomsky & Halle, 1968: 304).

As for Tajweed framework, there is no feature comparable to this feature. However, had the feature [anterior] been so defined that it would include the obstruction in the front, i.e. labial, dental, and alveolar region; in the middle, i.e. palatal; as well as in the back of the oral cavity, i.e. velar, uvular and pharyngeal region, then it would have been referred to by the feature Qamari: 'moony' specified by Tajweed.

6. 2. 2. CORONAL-NONCORONAL
"Coronal sounds are produced with the blade of the tongue raised from its neutral position; noncoronal sounds are produced with the blade of the tongue in the neutral position" (Chomsky & Halle, 1968: 304).

As the blade is raised from its neutral position, "it naturally approaches the area of the roof of the mouth that lies directly above it, that is, the region from the back of the upper teeth along the alveolar ridge to the front part of the palate" (Falk, 1978: 98). Thus, the segments specified as dental,

alveolar and palato-alveolar in the traditional terminology are described as coronal in generative phonology, and the segments produced at the periphery of the vocal tract, i. e. at the very front; labial, in the middle; palatal or at the very back; velar, uvular and pharyngeal are noncoronal.

In Tajweed, there is one feature which can be assumed to capture the definition for this feature. Sounds specified as <u>Shamsi:</u> 'sunny' are produced with the blade of the tongue raised against the upper teeth (i.e. inter-dentals; /th/, /dh/, /z̧/, dental-alveolars; /t/, /d/, /ţ/, /s/, /z/, /ş/), the alveolar ridge (i.e. alveolars; /sh/,/n/, /l/, /r/) and extending across the front part of the palate (i. e. palato-alveolar region; /ḑ/). Therefore, it seems to be right to regard <u>Shamsi:</u> sounds as coronal and <u>Qamari:</u> sounds as its opposition, noncoronal.

6. 3. BODY OF TONGUE FEATURES
The tongue body features identify the position of the body of the tongue in the production of sounds. Chomsky and Halle (1968) characterize the body of the tongue in the neutral position as raised and fronted, approximating the sound configuration for the sound [e] in the English word 'bed'. Therefore, it is logical to characterize these features as the various displacements of the tongue body from its neutral position. Below, the definitions for these features including high-nonhigh, low-nonlow, back-nonback are given. The word of comment including the specification of vowels and consonants in terms of these features along with the comparison and contrast with their equivalents in Tajweed will follow the definitions.

6. 3. 1. HIGH-NONHIGH
"High sounds are produced by raising the body of the tongue above the level that it occupies in the neutral position; nonhigh sounds are produced without such a raising of the tongue body" (Chomsky & Halle, 1968: 304).

6. 3. 2. LOW-NONLOW
"Low sounds are produced by lowering the body of the tongue below the level that it occupies in the neutral position; nonlow sounds are produced without such a lowering of the body of the tongue" (Chomsky & Halle, 1968: 305).

6. 3. 3. BACK-NONBACK
"Back sounds are produced by retracting the body of the tongue from the neutral position; nonback sounds are produced without such a retraction from the neutral position" (Chomsky & Halle, 1968: 305).

Chomsky and Halle (1968) emphasize that vowels as well as consonants can be readily captured by these features characterizing the body of the tongue.

Accordingly, the Arabic low front vowel, /a/, is described as [-high, +low, -back], high front vowel, /i/, as [+high, -low, -back] and high back vowel, /u/, as [+high, -low, +back]. Chomsky and Halle further notice that in the characterization of the vowels in terms of the above-mentioned features, we must observe that there are not [+high, +low] vowels in any languages, since it is physically impossible to simultaneously raise and lower the body of the tongue, while there can be [-high, -low, -back] vowels such as [e] and [ɛ] in English in the articulation of which the body of the tongue remains in neutral position.

Along with the definitions for the tongue body, we must also notice that [-anterior, -coronal] consonants of Arabic can be characterized with the help of the body of the tongue features, since their primary constriction is formed with the body of the tongue. Look at Table 5. to see how [-anterior, -coronal] sounds are characterized in terms of the tongue body features.

As for [+anterior, +coronal] consonants, we observe that these three features can be used to characterize the so-called secondary consonantal articulations such as palatalization, velaraization and pharyngealization; palatalized consonants are [+high] and [-back], velarized consonants are [+high] and [+back], pharyngealized consonants are [+low] and [+back]. Consonants neutral with respect to palatalization, velarization and pharyngealization are [-high] and [-back], since there is no constriction by the body of the tongue (Chomsky & Halle, 1968).

Compared with the Tajweed framework, there are just two pairs of features referring to the height of the tongue in Arabic consonants. However, they are not exactly in agreement with the features 'high' and 'low' in generative phonology. One is muntabiqah 'covered' which refers to the velarized consonants, /s/, /t/, /d/ and /z/ produced by the blade of the tongue against the dental-alveolar region; munfatiḥah 'uncovered', as its opposite, refers to the sounds which do not belong to the muntabiqah category. The other feature is mustaʔliyah 'velarized' which refers to the same four velarized consonants, /s/, /t/, /d/ and /z/, characterized above as muntabiqah as well as post-velar, /q/ and uvulars, /x/ and /gh/, altogether marked as [-low, +back] by Chomsky and Halle (1968). mustafilah 'nonvelarized' as its opposite, refers to the rest of the sounds of Arabic not specified as mustaʔliyah.

In addition to these four features referring to the tongue height, there is another feature which is obtained as a result of a velarization process in Tajweed but indirectly refers to the tongue body features. That process is tafkhi:m 'velarization' the objective case of which mufakhkhamah 'velarized' describes the feature 'back'.

Moslem phoneticians have used the objective case (i.e. mufakhkhamah 'velarized') merely for two sounds, one for long vowel [a:] which is velarized when preceded by mustaʔliyah 'velarized' consonants and another for /r/. The former use is allophonic but the latter phonemic. It is said that "/r/ is inherently [phonemically] mufakhkhamah" (Pourfarzib, 1374/1996: 68) which becomes muraqqaqahah 'nonvelarized' in certain contexts.

As a conclusion, it can be said that the feature mufakhkhamah in Tajweed might be taken for the feature back in generative phonology.

As for vowels, it was made clear in section 5. 2. 1. that fatḥah refers to the lowering of the tongue and thus accounting for the feature [low] in generative phonology. kasrah refers to the drawing-up of the tongue and thus accounting for the feature [high] in generative phonology. Except for mufakhkhamah which has been used for the long back vowel [a:<], the feature [back], however, seems to be ignored in the description of vowels. This may be because of the fact that in Arabic the feature [round] is associated with the feature [back]; therefore, they might have thought that there seemed to be no need for vowels to be further specified by the feature [back] as [+back] vowel is also [+round] and vice versa. Another possibility might be that they might have had pedagogical purposes in mind. That is, pedagogically, the feature [round] is more observable than that of [back]. Therefore, it was more practical for them to show the learners the rounding of the lips in the articulation of /u/ than using the feature [back] which was not observable.

6. 4. ROUNDED-NONROUNDED

"Rounded sounds are produced with narrowing of the lip orifice; nonrounded sounds are produced without such a narrowing" (Chomsky & Halle, 1968: 309).

Chomsky and Halle further maintain that in glides and nonlow vowels rounding is usually accompanied by the feature back. That is , sounds that are [+back] are also [+round], those that are [-back] are [-round]. Of course, they assert that this association is not obligatory as there are many instances, for example in Turkish where the features round and back combine freely. However, as it

was mentioned, in Arabic the glide /w/ and vowel /u/ that are [+back] are also [+round]. The appellation of /u/ as ḍammah 'rounding' in Tajweed can be taken to refer to the feature [round] in generative phonology. As for /w/, Sibawayh, using the same feature, remarks that the lips are also rounded.**[6]**

6. 5. *MANNER OF ARTICULATION FEATURES*

Different manners of articulation are different ways of manipulating the air stream. The way the air stream flows out of the vocal tract ranges over complete closure and complete opening of the oral cavity. For instance, while stops are produced with complete closure, vowels are produced with complete opening. There are also some other ways along the very open-versus-close continuum such as half closure or half opening as in fricatives, affricates, liquids and glides.

In Tajweed, except for the three pairs of features such as musta?li:yah/mustafilah, muntabiqah/munfatihah and mufakhkhamah/muraqqaqahah which all characterize the raising/ lowering of the body of the tongue but have been mentioned as Sifa:t 'features', the rest of what have been described as Sifa:t ul-huru:f 'features of the letters' can be said to equate the definition for the manner of articulation features. Referring to the definitions given in Table 4. 2. one can see that Sifa:t are different ways of manipulating the air stream. For instance, majhu:rah/mahmusah'voiced/unvoiced' shadi:dah/rikha:wah 'noncontinuant/continuant etc. all describe the ways air stream flow out of the mouth. Therefore, it follows that, first, Moslem phoneticians have been aware of the significance of the manner of articulation features in the articulation of sound segments. And second, as will be indicated, they have come to a classification quite close to that of the generative phonologists' of the modern time. For instance, interestingly enough they have also defined main Sifa:t in pairs of binary features the same as those of the generative phonologists'. This will be better demonstrated in the following sections. Below, the definition for each feature given by Chomsky and Halle (1968) along with the word of comparison and contrast is discussed.

6. 5. 1. *CONTINUANT-NONCONTINUANT*

"In the production of continuant sounds, the primary constriction in the vowel tract is not narrowed to the point where the air flow past the constriction is blocked; in stops the air flow through the mouth is effectively blocked" (Chomsky & Halle, 1968: 317).

In other words, in the production of continuants the obstruction to the air stream in the oral cavity is only partial, with sufficient space left for the air stream to continue moving through the mouth. Noncontinuant sounds are, however, produced with the complete obstruction to the air stream through the mouth. Thus, the vowels, liquids, glides and fricatives are continuants as the air stream is able to move somehow freely with constriction in the oral cavity. The stops and nasal consonants are noncontinuant since the air flow is blocked with complete obstruction in the oral cavity.

In Tajweed, the feature rikha:wah 'soft', defined as "the flow of air or sound without obstruction" (Mousavi, 1362/1983: 52), seems to parallel the feature 'continuant' in generative phonology and the feature shadi:dah 'hard', the opposite of rixawah, as noncontinuant.

With these two features in hand, Moslem phoneticians could almost come to a unanimous agreement in practical terms. That is, they were in agreement as to the exact number of sounds marked as rikha:wah and shadi:dah. For instance, Sibawayh considered /h/, /ḥ/,/gh/, /x/, /sh/, /ṣ/, /ḍ/, /z/, /s/, /ẓ/, /th/, /dh/ and /f/ as rikha:wah and [a:], /?/, /m/, /n/, /l/, /r/, /w/, and /y/ as bayni:yyah. Mousavi (1362/1983) identifies /th/, /dh/, /z/, /ẓ/, /ḍ/, /s/, /ṣ/, /sh/, /f/, /gh/, /x/, /w/, /y/, /h/ and /ḥ/ as rixawah and /?/, /r/, /l/, /m/, /n/, as bayni:yyah, between rikha:wah and shadi:dah. It is worth mentioning that what

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[6] qad taḍumm shafatayk fi: al -wa:w You make your two lips rounded in [the production of] /w/.

Moslem phoneticians have described as <u>bayni:yyah</u> seems to meet the definition for the feature continuant because after all in their articulation the air stream is not blocked. Of course, among these sounds, nasals are noncontinuant as in their articulation the air stream is blocked in the oral cavity but escapes through the nasal cavity.

Comparing Sibawayh's sound specification of <u>rikha:wah</u> with that of Chomsky and Halle's of continuant, one can see that Sibawayh does not classify /y/, /w/, /l/ and /r/ as <u>rikha:wah</u> 'continuant', whereas Chomsky and Halle (1968) consider them as continuant.

6. 5. 2. NASAL-NONNASAL

"Nasal sounds are produced with a lowered velum which allows the air to escape through the nose; nonnasal sounds are produced with a raised velum so that the air from the lungs can escape only through the mouth" (Chomsky & Halle, 1968: 316).

With respect to this feature, it should be noted that what is recognized as <u>ghunnah</u> 'nasal' in Tajweed is in full agreement with the nasal feature in generative phonology. In other words, both frameworks specify that /m/ and /n/ in Arabic are nasal consonants.

6. 5. 3. STRIDENT-NONSTRIDENT

"Srident sounds are marked acoustically by greater noisiness than their nonstrident counterparts. When the air stream passes over a surface, certain amount of turbulence will be generated depending upon the nature of the surface, the rate of flow, and the angle of incidence. A rougher surface, a faster rate of flow, and an angle of incidence closer to ninety degrees will all contribute to greater stridency" (Chomsky & Halle, 1968: 329).

In generative phonology obstruant continuants (fricatives) and affricates are strident, whereas stops and sonorants are nonstrident. In Tajweed, there are certain features which seem to be more or less comparable to the feature stridency in generative phonology. <u>tafishi:</u> 'shibilant' /sh/, <u>s̟afi:ri:</u> 'sibilant' /s̟/, ,/s/, and /z/, <u>makhru:rah</u> 'snoring' /x/, <u>manfu:khah</u> 'whiffing' /f/, <u>manfu:thah</u> 'blowing' /th/ and <u>mabħu:hah</u> 'hoarse' /ħ/ altogether may account for stridency in generative phonology. Moslem phoneticians did not regard /dh/, /z̟/, /d̟/, /j/, /ʕ/ and /gh/ as belonging to any of the features mentioned. In generative phonology, however, all of these sounds including /f/, /th/, /dh/, /z̟ /, /d̟/, /s̟/, /z/, /s/, /sh/, /j/, /gh/, /x/, /ħ/ and /ʕ/ are considered as strident.

6. 5. 4. ABRUPT RELEASE-DELAYED RELEASE

"These features affect only sounds produced with closure in the vocal tract. There are basically two ways in which such a closure may be released, either instantaneously as in the plosives or with a delay as in the affricates. During the delayed release, turbulence is generated in the vocal tract so that the released phase of affricates is acoustically quite similar to the cognate fricative. The instantaneous release is normally accompanied by much less or no turbulence" (Chomsky & Halle, 1968: 318).

In generative phonology, therefore, stops are considered as abrupt release and affricates as delayed release. As a comparison, <u>shadi:dah</u> 'hard' in Tajweed seems to parallel the feature abrupt release in generative phonology. In fact, the only difference between the feature <u>shadi:dah</u> in Tajweed and the feature abrupt release in generative phonology lies in the exact number of sounds specified in each framework as <u>shadi:dah</u> or abrupt release. To be more exact, it should be mentioned that they do not agree as to the specification of the sounds /d̟/ and /j/ in their categorization. In Tajweed, /b/, /t/, /d/, /t̟/, /j/, /k/, /q/ and /ʔ/ are considered as <u>shadi:dah</u>. In generative phonology, /b/, /t/, /d/, /t̟/, /d̟/, /k/, /q/ and /ʔ/ are considered as abrupt release. Looking at the sounds specified by both frameworks, we observe that the generative phonologists mark /d̟/ as abrupt release and /j/ as delayed release. Moslem phoneticians, however, consider /d̟/ as <u>rikha:wah</u>, [+continuant] or [-abrupt release] and /j/ as

shadi:dah, [-continuant] or [+abrupt release]. As for the former, the reason for the disparity lies in the fact that /ʤ/ was originally pronounced in the palato-alveolar region and described as rikha:wah. But generative phonologists have described modern Arabic /ʤ/ which is different from the one produced in the first few centuries. In modern Arabic /ʤ/ is produced in the dental-alveolar region with the feature [+abrupt release]. Whereas in the earlier Islamic periods it was produced in the palato-alveolar region with the feature [+continuant]. In fact, this very palato-alveolar continuant /ʤ/ does no longer exist in modern Arabic. As for the latter, they do not mention any feature for delayed release. As Chomsky and Halle (1968) put it this may be because of the fact that the released phase of affricates is acoustically quite similar to the fricatives and this led them to describe /j/ as shadi:dah or [+abrupt release].

6. 5. 5. LATERAL-NONLATERAL

"Lateral sounds are produced by lowering the mid-section of the tongue at both sides or at only one side, thereby allowing the air to flow out of the mouth in the vicinity of molar teeth; whereas in nonlateral sounds no such side passage is open" (Chomsky & Halle, 1968: 317).

The feature munharif 'oblique, slanting, indirect' in Tajweed parallels the feature lateral in generative phonology. Sibawayh (as quoted by Semaan, 1968: 44) considers /l/ as munharif which is in accord with Chomsky and Halle's definition of the feature lateral given above.

6. 5. 6. VOICED-NONVOICED (VOICELESS)

"In order for the vocal cords to vibrate, it is necessary that air flow through them. If the air flow is of sufficient magnitude, voicing will set in, provided only that the vocal cords not be held as widely apart as they are in breathing or in whispering" (Chomsky & Halle, 1968: 326-7).

The feature majhu:rah 'pronounced with the voice, and not with the breath only' and mahmu:sah 'pronounced without the voice, and with the breath only' in Tajweed equal the features voice and unvoiced in generative phonology respectively except that /ʔ/ and /ṭ/, which are considered as majhu:rah 'voiced' in Tajweed, are marked as unvoiced in generative phonology. The rest of the majhu:rah sounds which are in accord with those of Chomsky and Halle's (1968) are as follows; /b/, /m/, /w/, /dh/, /ẓ/, /d/, /ḍ/, /z/, /n/, /l/, /r/, /j/, /y/, /q/, /gh/ and /ʕ/.

As for the vowels, on the surface, it seems that Moslem phoneticians ignored that they are also majhu:rah but since they marked long alif [a:] as majhu:rah, it can be implied that they did also regard other vowels as majhu:rah. The reason might be that the short vowels in Arabic were not written orthographically; therefore, this might have led Moslem phoneticians not to characterize them as having this feature. As was mentioned earlier in sections (6. 1. 2.) and (6. 1. 3.), the difference between musawwat and majhu:rah features is that the former refers to the sounds with spontaneous voicing but without any obstruction in the oral cavity which merely includes vowels while the latter refers to the sounds without spontaneous voicing but with vibration in the vocal cords (i.e. voiced consonants). Looking at the issue from this angle there seems not to be any difference between the two frameworks concerning these two features. Moslem phoneticians have considered spontaneous voicing as musawwat or [+vocalic] and the vibration in the vocal cords as majhu:rah or [+voice] as Chomsky and Halle have.

So far, we have discussed the place and manner of articulation of the Arabic sounds as were specified in generative phonology and Tajweed frameworks. Thus, it is necessary to provide a distinctive feature matrix on the basis of what has gone before. Along the same line, therefore, Table 5. summarizes the Arabic sounds discussed so far in terms of the distinctive feature matrix.

Table 4. 5. Distinctive Feature Matrix of Arabic Sounds

Segments / Features	b	m	w	f	th	dh	ẓ	t	d	ṭ	s	z	ṣ	n	l	r	sh	ḍ	j	y	k	q	x	gh	ḥ	ʕ	?	h	a	i	u
Vocalic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+
Consonantal	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	-	-	-	-	-
Sonorant	-	+	+	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	+	-	-	-	-	-	+	+	+	+	+	+
Anterior	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
Coronal	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
High	-	-	+	-	-	-	+	-	-	+	-	-	+	-	-	-	+	+	+	+	+	+	-	-	-	-	-	-	-	+	+
Low	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	-	+	-	-
Back	-	-	+	-	-	-	+	-	-	+	-	-	+	-	-	+	-	+	-	-	-	+	+	+	+	+	-	-	-	-	+
Round	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Continuant	-	-	+	+	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	-	-	+	+	+	+	-	+	+	+	+
Nasal	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strident	-	-	-	+	+	+	+	-	-	-	+	+	+	-	-	-	+	+	+	-	-	-	+	+	+	+	-	-	-	-	-
Abrupt release	+	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	-	-	-	-
Lateral	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Voice	+	+	+	-	-	+	+	-	+	-	-	+	-	+	+	+	-	+	+	+	-	+	-	+	-	+	-	-	+	+	+

6. 6. PHONOLOGICAL PROCESSES

Each morpheme in any language has two types of representations, a single phonemic representation which identifies only those phonetic features not predictable from generalization and one or more phonetic representations which specify in detail the phonetic features that occur when the morphemes are pronounced. By means of phonological rules, the abstract phonemic representation, the underlying phenomenon of a phonological system, changes into the concrete phonetic representation, the surface of a phonological system.

The same concept has been demonstrated in Tajweed framework. Moslem phoneticians have indicated that Tajweed is a discipline in which places of articulation of <u>letters</u> 'sounds' along with their <u>haq</u> 'sound features' and <u>mustahaq</u> 'rules of pronunciation of letters' are discussed (Mousavi, 1363/1983).

Mousavi further adds that <u>haq</u> includes the features which belong to the sounds when pronounced in isolation and out of context. <u>mustahaq</u> refers to the <u>ahka:m</u> 'rules of pronunciation' which should be observed in the actual pronunciation when different sounds come to interact with each other in combination. In other words, it can be claimed that <u>haq</u> along with the places of articulation forms the abstract phonemic representation of the morpheme and <u>mustahaq</u> includes the phonological processes involved in the actual pronunciation which leads to the concrete phonetic representation.

Moreover, by looking at the chapters discussed in any Tajweed books one can see the very fact that Moslem phoneticians have characterized the Arabic sounds in isolation and out of context as phonemes and have also been aware of the processes changing the abstract phonemic representation into the concrete phonetic representation. That is, there are chapters pertaining to <u>makha:rij ul-huru:f</u> 'places of articulation', <u>sifa:t ul-huru:f</u> 'sound features' in both of which phonemic representations of sounds are discussed and <u>ahka:m ul-huruf</u> 'rules of actual pronunciation' of morphemes, in which the phonological processes leading to phonetic representations are discussed.

7. RESULTS OF THE DISCUSSION

7. 1. CONTRASTIVE REMARKS REGARDING FEATURES

In this part, Tajweed and generative phonology are contrasted in terms of features irrespective of their discrepancies concerning the particular sounds which might be assigned different values. In other words, attempts are made to find only the corresponding features in both frameworks. As was previously elaborated, the following comparison indicates the features in generative phonology and their equivalents in Tajweed.

It should be reminded that there are sometimes more than one feature in Tajweed corresponding to a single feature in generative phonology. This is because Moslem phoneticians have paid more attention to the detailed acoustic and articulatory distinctions in the sound classifications. As was stated earlier, Tajweed, for instance, has given some six different features for the single stridency in generative phonology. These features are, of course, a bit different acoustically in their stridency. For instance, <u>makhru:rah</u> for /x/ is different from <u>manfu:khah</u> for /f/. The researcher has tried to group such sounds under one category as they share the same characteristics with miner acoustic differences.

Generative Phonology Features	Tajweed Features

Vocalic	musawwat
Consonantal	musammat
Sonorant	bayniyyah or bayn bayn
Places of articulation	makha:rij ul-ħuru:f
Anterior	Qamari:[7]
Coronal	Shamsi:
High	Consonants: muntabiqah, musta?liyah Vowels: kasrah
Low	Consonants: munfatiħah, mustafilah Vowels: fatħah
Back	mufakhkhamah
Round	dammah
Manner of articulation	sifa:t ul-ħuru:f
Continuant	rikha:wah
Abrupt release	shadi:dah
Nasal	ghunnah
Strident	tafishi: /sh/ safiri: /s/, /s/, /z/ makhru:rah /x/ manfu:khah /f/ manfu:thah /th/ mabħu:ħah /h/
Lateral	munħarif
Voice	majhu:rah
Nonvoice	mahmu:sah
Phonological processes	aħka:m ul-ħuru:f

7. 2. *CONTRASTIVE REMARKS REGARDING SOUNDS*

The researcher has found that the discrepancy between the two frameworks lies more in the attribution of sounds to different features. For instance generative phonology has described /l/ and /r/ as [+vocalic, +consonantal], whereas Tajweed has specified them as consonantal. Or sometimes generative phonology has nothing to do with some particular sounds as there is no record of such sounds in its corpus of data. For instance, /d/ in old Arabic of the first century A H was labio-palatal which is both continuant and strident while modern /d/ is dental alveolar which is noncontinuant and nonstrident.

Table 6. demonstrates the contrast between the two frameworks. Four types of clues given below the table display the degree of similarities and differences between the two frameworks. **(1)** refers to the differences where Tajweed is marked plus and generative phonology minus, **(2)** includes

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[7] As was explained in 6. 2. 1. there is no feature comparable to this feature. However, had the feature [anterior] been so defined that it would include the obstruction in the front, i.e. labial, dental, and alveolar region; in the middle, i.e. palatal; as well as in the back of the oral cavity, i.e. velar, uvular and pharyngeal region, then it would have been referred to by the feature Qamari: 'moony' specified by Tajweed.

the differences where generative phonology is plus and Tajweed minus, **(3)** consists of sounds not comparable in Tajweed, and **(4)**, the last alternative, demonstrates the sounds with common features.

As a rule of thumb, it is evident that the degree of similarities (i.e. cells left intact) are more than those marked as differences. Statistically speaking, the comparison shows an amount of 8% for Tajweed +, generative phonology -; about 3% for generative phonology +, Tajweed -and about 7% for the one with no comparable correspondence in Tajweed. Thus, the degree of the differences altogether makes a total of about 18%. Whereas the last choice shows an amount of about 83% as similarities between the two frameworks which is significantly high.

Table 6. Distinctive Feature Matrix of Arabic Sounds

Segments / Features	b	m	w	f	th	dh	ẓ	t	d	ṭ	s	z	ṣ	n	l	r	sh	ḍ	j	y	k	q	x	gh	ḥ	ʕ	ʔ	h	a	i	u
Vocalic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+
Consonantal	+	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	-	-	-	-	-	-
Sonorant	-	+	+	-	-	-	-	-	-	-	-	-	-	+	+	+	-	-	-	+	-	-	-	-	-	-	+	+	+	+	+
Anterior	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coronal	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
High	-	-	+	-	-	-	+	-	-	+	-	-	+	-	-	-	+	+	+	+	+	+	+	+	-	-	-	-	-	+	+
Low	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	-	-
Back	-	-	+	-	-	-	+	-	-	+	-	-	+	-	-	+	-	+	-	-	-	+	+	+	+	+	+	-	-	-	+
Round	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+
Continuant	-	-	+	+	+	+	+	-	-	-	+	+	+	-	+	+	+	+	-	+	-	-	+	+	+	+	-	+	+	+	+
Nasal	-	+	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strident	-	-	-	+	+	+	+	-	-	-	+	+	+	-	-	-	+	-	+	+	-	-	+	+	+	-	-	-	-	-	-
Abrupt release	+	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	+	+	-	-	-	-	+	-	-	-	-
Lateral	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Voice	+	+	+	-	-	+	+	-	+	-	-	+	-	+	+	+	-	+	+	+	-	-	-	+	-	-	-	-	+	+	+

1	**Tajweed** + **Generative Phonology** -	*(yellow)*	**3 No comparable correspondence in Tajweed**
2	**Generative Phonology** + **Tajweed** -	*(orange)*	**4 Sounds which share common features**

(green box) *(white box)*

7. 3. CONTRASTIVE REMARKS REGARDIG THE PHONOLOGICAL PROCESSES

As was stated in 6. 6. Moslem phoneticians have recognized two types of representations in Tajweed of the Holy Qur'an. ḥaq is the phonemic representation which is considered as the pronunciation of sounds in isolation and out of context. mustaḥaq is the phonetic representation which is regarded as the pronunciation of sounds in actual context after aḥka:m 'rules' have been applied. With this in mind Moslem phoneticians have developed rules which are well fitted in the generative framework.

8. CONCLUSIONS

The results of the study indicate that Tajweed and generative phonology are for the most part similar in terms of both features and sound classifications. For the former, it has been observed that for any single feature given in generative phonology there is also one or more equivalent features in Tajweed. For the latter, they show an amount of 83% as similarities in the assignment of sound to their due features.

As it is evident, whether in the corresponding features summed up in 7. 1. or in their sound classifications shown in Table 6., both frameworks go neck by neck displaying a high degree of resemblance. Accordingly, based on the information obtained from the findings of the study, the following points can be concluded:

1. Both generative phonology and Tajweed have used similar ways of the data analysis. The former has analyzed the sounds in terms of place of articulation features, manner of articulation features and phonological processes. In a similar way, the latter also uses makha:rij ul ḥuru:f, sifa:t ul ḥuru:f and aḥka:m ul ḥuru:f which are respectively comparable to those of the generative phonology mentioned above.

2. Tajweed like generative phonology has also employed somewhat binary features (i.e. opposite features) in sifat assignments to the classification of sounds.

3. Looking at Tajweed from a generative perspective, one can observe that it can well fit the notions in the generative framework. That is, Tajweed can be put in the generative framework without losing any of its ideas. Therefore, generative phonology can well be used in teaching Tajweed without missing any of the ideas discussed in it.

4. As the study demonstrates, the high degree of similarities between the two frameworks is indicative of the fact that what modern phonologists have talked about in their new findings of the linguistics of the modern period, Moslem phoneticians have also come to as early as some fourteen centuries ago. Taking into consideration a time interval of some fourteen centuries between the two frameworks is a striking fact. Accordingly, the contrastive analysis of the findings of the present study indicates the fact that Moslem phoneticians and philologists played a significant role in the field of linguistics in the Middle Ages. As a conclusion, the result of the study can be claimed to be an evidence against Pederson, who said, "We have nothing to thank Mohammedanism for in this respect" (cited in Semaan, 1968: 4). Obviously, Moslem philologists have made major contributions to linguistics in the same way as they have to mathematics, astronomy, physics, chemistry and medicine, etc.

5. Moslem contributions to the study of linguistics is indeed eminent but efforts are needed to introduce Islamic linguistics world-wide. Through such a world-wide introduction of our linguistic heritage, on the one hand, we can help the modern linguistics and open up ways to those interested in the field. On the other hand, we can also benefit from the findings of the modern linguistics and help improve our linguistic theory.

Table 7. Transliteration of the Arabic Writing System

Arabic Letter	Transliteration	Arabic Letter	Transliteration
ء	?	ض	đ
ب	b	ط	ŧ
ت	t	ظ	ƶ
ث	th	ع	ʔ
ج	j	غ	gh
ح	ħ	ف	f
خ	x	ق	q
د	d	ک	k
ذ	dh	ل	l
ر	r	م	m
ز	z	ن	n
س	s	ه	h
ش	sh	و	w
ص	s	ى	y
ـَ	a	ـَا	a:
ـُ	u	أو	u:
ـِ	i	ِای	i:
اَى	ay	أو	au

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