

IBN SĪNĀ ON SPEECH ARTICULATION

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Ibn Sīnā (980-1037) appears to have been a very keen observer of speech phenomena ; and his treatment of phonological aspects is not only interesting and impressive but also enlightening and thought-provoking. How far he has drawn upon the earlier traditions or authorities, no doubt, deserves to be studied in depth. He, in fact, does occasionally refer to other's views (as in the case of *qar'* and *qal'*), or to the resemblance of the hyoid bone to the Λ in the Greek writing. Yet, without waiting for the outcome of such an investigation into the historical moorings of Ibn Sīnā's discourse on Speech Articulation, we certainly find that his *Risālah fī Asbāb Ḥudūth al-Hurūf*, presents more than a summing up of the earlier observations of the kind, if any, made by the Greek and Hebrew grammarians : its approach is positively empirical and its presentation quite non-pedantic and, therefore, revealingly functional.

Ibn Sīnā had, in fact, undertaken to write the *Risālah* at the instance of his benefactor, the Prince Abū Mansūr bin 'Alī bin 'Umar, most probably during the first decade of the eleventh century ; and he took due care to see that his discourse was neither casual nor merely derivative, but was based on what he himself characterizes as 'penetrative research into the causes of the formation of speech sounds and why they differ from one another when heard.' He also saw to it that he did not indulge in speculative theorizing, but approached the subject (*i.e.* articulation of speech sounds) with scientific openness of mind uninhibited by any metaphysical formulations like that of the *logos* in the West or that of the *sphota* in India.

On the other hand, Ibn Sīnā was well aware of the non-metaphysical grounds of sound, general as well as specific (including the human), as is clear from his formulation that it is the 'undulations reaching the still air in the ear-hole setting up vibrations therein' which the aural nerves spread over its upper surface.

Nor does he uncritically pass on to us just a paraphrase of any tract on the traditional *qira't* which also preoccupies itself with the articulation of Arabic speech sounds. His observations, by and large, are original and sound considerably modern even in the latest perspective of linguistic development.

But before we go into the implications of any such assessment, it would be necessary to cast a glance at the chapterwise coverage of the *Risālah*. The first of the six chapters deals with the generation of sound in general, while the second probes into the formation of specific sounds called speech sounds. The third chapter reveals the anatomy of the larynx and the tongue, and thus serves as a significant background to the fourth chapter that identifies the particular causes of the production of each of the Arabic speech sounds. The next chapter takes note of certain speech sounds similar to these *hurūf* and thus ventures into an area of linguistic studies now covered under Dialectology, while the final (*i.e.* the sixth) chapter throws up a new vista of investigation into the possibility of how 'these speech sounds can be heard (as a result) of activities other than speech articulation'.

Let us now consider a few observations of Ibn Sīnā, that reveal freshness of approach and analysis. Here is, for instance, his finding as to the immediate cause of sound. He puts it as 'the wavelike motion (*i.e.* vibration) (of the air) 'which may be due to *qar*' or *qal*' (*i.e.* 'a violent striking' or a 'violent separation'). On these causes he observes that both these involve 'a violent rapid vibration in the air'. In the case of both, again, 'it is necessary for the displaced air to follow the form and the type of undulation that happens to be there'; but, he points out that 'the *qar*' spreads more violently than the *qal*'. 'Although he concedes that the *qar*' is supposed to be 'a conditional factor in the production of sound', he expresses his suspicion that it (*i.e.* *qar*') 'may not be a general cause though it may be a very common one'.

One, however, wishes Ibn Sīnā had gone a little further into the implications of such a suspicion rather than summarily brush aside the divergent view by ridiculing it in the words: '... and should someone say that extraction produces knocking in the air, and considers this as being the cause of the sound, the weakness of such a statement is so evident that we need not undertake to demonstrate it'.

Anyway, another significant observation made by Ibn Sīnā pertains to the formation of speech sounds. According to him 'a speech sound is an *aridda* (*i.e.* an accidental form of sound) audibly distinguishable from another sound that has *hiddah* and *thiql* (*i.e.* intensity and density)'. Both these, according to Ibn Sīnā, are determined by 'the state in which the vibration is, by the continuity of its parts, its evenness or unevenness, and its branching'. Thus, evenness and continuity produce *hiddah*, while unevenness and its branching occasion *thiql*.

Going deeper into the formation of speech sounds, Ibn Sīnā identifies two determinant factors that impose forms upon the vibration. These are various 'exits and distractions', and as he puts it, 'obstructions of the sound or of the air which produces the sound, followed by a release impulsion'. Complete obstruction pro-

duces what he calls 'simple entities that come into being and occur in the period between the time of obstruction and that of release', while incomplete obstruction causes what he calls 'complex entities in which obstruction and release occur simultaneously'. Under the category of simple entities he accordingly includes /b/, /t/, /j/, /d/, /ḍ/ and (from one point of view) /c/. The complex entities, obviously, comprise /a/, /th/, /h/, /kh/, /dh/, /r/, /z/, /s/, /sh/, /ḡ/, /z/, /'/, /gh/, /f/, /ḥ/, /w/, and /y/.

Both simple and complex entities are, thus, conditioned by 'a difference in the organs at and by which the obstruction and release are effected'. Elucidating this observation of his, Ibn Sīnā evinces a strikingly modern approach in terms of the placement of the point of articulation as well as the source of obstruction. According to him the organs may be 'soft or hard, yielding or unyielding'; while 'the point of articulation may be narrow or wide, rounded or unrounded'. The source of obstruction may similarly be strong or weak, small or large, determining thereby the strong or mild nature of the pressure after release, as also the greater or lesser extent of the obstructed body of air. It may be 'within a yielding area which easily pops apart, then opens out either with separation and extension, or remains in its place'.

Implications like these of the place and point of articulation involve a formative role of the muscles in the generation of speech sounds, and hence call for a close look at the anatomy of the larynx and the tongue. While describing three cartilages of the larynx, Ibn Sīnā highlights the muscles that separate the Arytenoid cartilage muscles that help in opening, enlarging or widening the larynx, muscles that 'pull the whole tongue forward, or cause a slanting of it, or flatten it'. As an instance of Ibn Sīnā's substantial pointedness in this regard I would like to share with the readers the following observations of his in full:

1. "As for the muscles whose function is to widen the larynx, it is well known that they need not be numerous, for the muscles of the chest together with the diaphragm force the air strongly outward, and this alone, where necessary, suffices to open the larynx. Among these is a pair, extending from the hyoid bone which resembles the Greek Λ , so as to join up the whole front of the thyroid cartilage (in all its extentions) and, when this pair contracts they pull it upwards and forward so that it prevents the thyroid cartilage from adhering to the nameless one." (*Eng. tr. by K. I. Semaan*)
2. "Also among them is a pair, shared by the larynx and the pharynx, which extends from the breastbone (*i.e.* the sternum) to the thyroid cartilage and continues to the back of the nameless cartilage and the frontal areas of the pharynx. When this pair contracts, it pulls the pharynx downwards and the nameless cartilage backwards, and thus separates between this latter area the thyroid cartilage."

Equally revealing are Ibn Sīnā's observations on the sight muscles that activate the tongue, causing it to contract, extend, broaden, flatten or protrude, to become longer, larger or aslant.

After this rewarding peep into the anatomy of human speech, Ibn Sīnā turns from the general to the specific speech sounds *i.e.* Arabic speech sounds, and goes into the particular causes of their production. His insight into the articulative process involved in generation of the speech sounds peculiar to Arabic is deep indeed, and the *description* attempted by him is as adequate and thorough as any attempted ever since.

Ibn Sīnā's treatment of each Arabic sound is not only complete in itself, but also comprehensive enough to present a comparative vista or two so as to broaden the area of understanding and deepen the insight into the dynamics of speech formation. The very order in which he takes up the sounds one by one is purposefully determined so as to facilitate an integrative study in affinity as well as divergence.

Starting thus with the /'/' he moves on to the /h/ followed by /'/' after which he takes up /h/ and so on through /k̄h/, /gh/, /q/, /k/, /j/, /sh/, /d/, /s/, /ʃ/, /z/, /t/, /t/, and /d/, /th/, /dh/, /z/, /l/, /r/, /f/, and /b/, /m/, /n/, /w/, /y/ to /a/, /u/ and /i/.

Here are a few telling instances of Ibn Sīnā's penetrative investigation and apt description :

- i) "'/' is deeper in the throat, in the place where the air involved in vomiting is located while /h/ is at the place where the air for clearing the throat is located."
- ii) "The process of formation of /k̄h/ is similar to that of /h/ save that /k̄h/ is produced further out, so that the place where it is articulated is harder, and the yielding membranes fewer and more resistant." (How accurate even in terms of modern description !)
- iii) "/gh/ is also formed in similar fashion, save that the air thereby does not exercise a forcible action on the yielding membrane but rather exerts itself on it so that it may come forth straight after its strength has been weakened because of its being drawn a little away from its point of articulation."
- iv) "/q/ is produced in the same (vocal area) as /k̄h/, but more inward and with complete obstruction (of the air stream)."
- v) "The relation of /q/ to /k̄h/ is of the same nature as that of /k/ to /gh/."
- vi) "... /j/ is, in fact, a /sh/ produced without the air being obstructed, while a /sh/ is a /j/ that began with the obstruction of the air stream which then was released."

- vii) "The production of /ǧ/ is similar to that of /s/ save that in /s/ the passage of the air requires the use of a larger surface of the tongue both in length and breadth. A sort of hollow is formed in the tongue surface to give the rolling of the air a certain resonance."

In between, Ibn Sīnā gives a practical tip or two for production of a group of sounds akin yet divergent. One instance would suffice to illustrate the telling simplicity of his experimentation as well as presentation: "Were someone to take water in his mouth, bring this water close to the throat, then drive some air into it, he would hear the sound /ǧh/; but if he pushes the water a little forward and does not allow the air to go through it in a straight forward fashion, but sideways, then gently presses it, he would hear the sound /h/; then that of /kh/, and then that of /'/. However, there is more yielding in /' than in /kh/. (More of this experimentation a little later).

Ibn Sīnā's treatment of the Vowel may, of course, appear to be rather inadequate; but he makes no secret of the fact that 'as for the Vowels, their conditions seemed to escape him'. Yet his observations, however brief, sound fairly substantial within their scope. Thus, according to him, /a/ and /a:/ are produced by 'a small emission of the air stream without any interference' whereas the /u/ and /u:/ are produced with 'a little interruption of the air stream at, and narrowing, of the lips, along with a slight gentle propulsion upwards on the way out.' The /i/ and /i:/, on the other hand, are produced with 'gentle propulsion' rather downwards. (This pinpointing, by the way, fairly corresponds to what modern linguistics term as *mid*, *high* and *low*.)

Ibn Sīnā, however, takes due note of length as a phonemic feature in the case of /a:/, /i:/ and /u:/; but he remains intriguingly silent on the nature of /ai/ and /au/. He is equally silent on the transformation of sounds by way of palatalization or velarization, or even fricativization, though he does refer to the production of speech sounds coming under these categories too. Surprisingly enough he does not care even to study the phenomenon of clusters and the distribution of sounds conditioning constraints.

Notwithstanding these limitations of his coverage of cross section, Ibn Sīnā has not only described each of the speech sounds peculiar to Arabic but also speech sounds 'similar to these *ḥurūf*'. This excursion of Ibn Sīnā into the area that is now studied under Dialectology is quite significant in terms of dialectal variation as well as linguistic affinity. Thus, for instance, while he detects that the 'zay type of /s/ ... is common to the *Khwārizm* dialect', he recognizes features peculiar to the Persian and the Turkish speech sounds. The relation of the Persian /c/ to the Arabic /j/ strikes him as similar to the relation of the Arabic /k/ to the non-Arabic /k/.

Another phonemic feature of the Persian language that he underlines is an /i/ which seems to him to be almost like /v/, as in the word /vizoni/, meaning 'increase', 'excess'. The /v/ in the word he finds different from both /b/ and /f/. It differs from /b/ in that the obstruction of air involved in it is incomplete; while it differs from /f/ in two respects: the narrowing for the exit of the sound from the lips is greater; and the stronger pressure of the air almost produces a vibration in the front part of the lips.

All these details about the distinctive features of the sounds described by Ibn Sīnā are amazingly sharp and substantial as if coming straight from some acoustic laboratory of today. Even such observations of his that *prima facie* sound rather ingenious, are revealing enough. He, for instance, finds a /t/ in the clapping of two hands so held that a hollow vault is formed by the palms; and he makes out a /t/ in the forcible stroke of a finger upon the hand, while a weaker stroke gives him a /c/.

At the end of the *Risālah* Ibn Sīnā makes a reference to the *hurūf* 'for which there are no written symbols'; but he does not deem it necessary to elucidate 'the causes both strong and slight' to which he ascribes these *hurūf*. He had, for the most part, 'heard these from birds' and 'in the speech of the nations whose languages resemble the singing of birds'. (Is he referring to tone languages? One does not know.)

What makes the *Risālah* a valuable contribution of Ibn Sīnā, thus, is not only its uninhibited approach but also its functional presentation of phonetic forms empirically explored.

ACKNOWLEDGEMENT

All quotations in this article are from the English translation of Semaan.

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