"No analysis or mode of analysis is the only one accurate or sacrosanct, but any account of the language in any terms is an adequate statement and analysis, provided that, and to the extent to which, it comprehensively and economically explains what is heard (read) in the language and "renews" connections with further experience on it.

(Pirth's adaptation of a passage in James B. Conant's 'Science and Common Sense')
Introduction

0.1 It is the fact that one begins by introducing the work after one has completed it and this introduction is not an exception to this fact. This dissertation has intended to study some issues of Gujarati phonology. Gujarati language is one of the important western IA languages. Gujaratis are a commerce community. The history of their trade with the west goes back to more than one thousand years. Being the most mobile community Gujaratis were the earliest Indian settlers found all over the world even before the modernization or colonialization came. This naturally resulted into varieties of dialects. Moreover, the adjustable temperament of the people have always attracted outsiders to come and settle in Gujarat. The Iranian Zoroastrians have settled here for about a thousand years adapting the Gujarati language and making it their own - thus creating a new dialect. They have contributed considerably to Gujarati journalism and literature. Social groups and subgroups due to ethnic, caste, profession and economic differences provide with many highly enticing dialect phonologies.

Gujarati speaker has in general no language awareness. A kind of naivete about their language prevails even amongst the majority of educated speakers. Speakers having any academic interest in language are rare to come by (and rarer still are those who sustain such interest.) In this sense Gujarati is a neglected language.
0.2 This dissertation intends to study a few salient features of one of the standard dialects. The work began by collection of the phonic substance of the language. No predecided, prefixed theory or the methodological frame was considered as a model. It would be reckless as well as counter-productive to limit our research strategies in advance. The ideas and methods were allowed to be moulded and remoulded in the course of work. The only predecided part of this study was to stress the importance of phonetics in phonology and also to give enough weightage to perception of the language users, because the most changeable, flexible and adaptable yet the least noticeable part of the language is its sounds. From one person to the other, from one social group to the other and from one place to the other sounds vary; resulting into multifariously proliferated variations. These variations at the production end and the phonemes at the perception end are irresistibly challenging topics in the field of phonology. If people hear as well as speak then perceptual facts as well as articulatory ones have a place in phonology.

From more than fifty years the phonologists have tried to arrive at the methodology for describing the sound system but in the last few years it is realized that phonology would have to include much more than is commonly included. This 'much more' certainly means giving sufficient importance to the phonic substance (and the phonetics) of the language.
To study the phonic aspects of language and to describe the phonological systems from that is problematic and difficult. This problem is compared with the problem that cultural anthropology has overcome viz. the problem of the relationship between nature and culture. This relationship has to be determined and "it is a priori certain that any solution which attempts to deprive the problem of this relational character by excluding one of the two relata is doomed."¹ In the post-standard-theory period there have been many proposals which would want to take care of this 'relationship'. It is very well accepted that giving phonemic inventories and establishing relations between the underlying and surface phonemes is not enough.

0.3 Having no prior model for this dissertation, the study of the data has a kind of freedom which may to a certain extent appear methodologyless search. We have risked that accusation with the hope that we may make a fresh beginning in understanding of the Gujarati phonology. Little that has been done in this area provides us the background for the selection of the topics in this dissertation. We have tried to reject objectively some of the earlier observations and the study includes the evaluation of the past conclusions.

This dissertation has concentrated only on some aspects of the vowel phonology - the specific features of Gujarati vowel system compelled us to do so. In this sense the area covered is narrowed down but in the other sense it has been

¹ Mol and Uhlenbeck, 1959
expanded because we have tried to explore into greater depth. To give a complete phonemic inventory was never the aim of this work. From the beginning the intention was to study some of the peculiarities of the vowels. "Unlike consonants which consist essentially of interruptions in the speech stream vowels are the continuing or sustaining or sounding elements of speech." 

This feature of vowels makes them vulnerable to prosodies. Speech has its own musical score ranging from definite articules to laryngeal prosodies; and it is vowels which have the capacity to carry these prosodies because they have 'voice'. They display 'optimal manifestation' of voice. This quality creates the vocalic continuum and makes the speech audible. The murmur prosody in Gujarati is the most interesting peculiarity of such continuum. This study begins with the chapter on murmur.

It was noted that almost 50% of the Gujarati speakers speak with a kind of phonation which automatically inhibits murmuredness.

It becomes obligatory to provide some evidence showing the difference between the two phonation types. We have provided a few tomograms for this. However, we regret that in absence of all the sophisticated techniques we cannot

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3. Ewan, 1976. Studied small movements with the help of photocell-computer tracking technique. He could measure vertical movement of larynx in 2 mm steps and anterior posterior movement in fractions of mm.
extend any further investigation. The tomograms show the
difference in the laryngeal muscle adjustments for different
phonations. The old belief that differences of 'voice quality'
or phonation type are matters of 'emotional expression' or
'individual peculiarity' no longer is valid. In the first
chapter as well as in the subsequent chapters it is shown that
'phonation types' of Gujarati speech cannot be ignored.
Nonetheless a question can be posed as to how such phonation
difference can be crucial to phonological description.
Phonetically (and theoretically) linguists have accepted
Ladefoged's glottal stricture scale.⁴ But Henderson fears
that it is too early to consider all phonation types as
'phonological features' because by using them as 'cover
features'⁵ our ignorance regarding physical parameters may be
marked.⁶ (Gregerson also warns us against setting up of new
phonological features because 'from a phonemic point of view
any set of terms may serve to designate that A ≠ B'.⁷ We
must investigate throughly into what is actually happening
in the language.

Murmur and tight phonation may appear linguistically non-
relevant or non-functional. But we are able to give some
evidence which can show that both the phonations play a
significant role in moulding the phonology. These phonations

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⁴· Ladefoged, 1971
⁵· Vennemann and Ladefoged, 1973
⁶· Henderson, 1968
⁷· Gregerson, 1973
affect the mid-vowel lowering differently and also cause various manifestations of the nasality element. Phonation differences act as controlling and moulding forces for the phonology. An interesting observation should be noted at this point: murmurs spirantize voiced stops in intervocalic position. Tight phonation which has inherent tensing does not allow such weakening process. In the third chapter we have noted that fortisness-tensing - associated with the tight phonation-develops strong nasality in vowels. As a result there is no trace of denasalization process anywhere (which has already begun in the murmurs). These two phonations represent two processes: murmurs $\rightarrow$ lenition tight $\rightarrow$ fortition.

The tenseness of tight phonation acts as a preserving and balancing factor by retaining the stopness of the voiced stops i.e. by not allowing the contrast to develop between spirantized sounds and other stops and by retaining the nasal vowels. The laxness of murmurs on the other hand acts like a fluid process, ready to substitute, change and adapt itself in the contexts. Thus both the phonation types work hand in hand in the most wonderful manner retaining - substituting, preserving - effacing and yet balancing the phonemic inventory of the language.

In this sense we have to accept that these phonation types are the relevant linguistic features as if 'purpose-built'. Murmur dialect speakers who are the victims of
laxness - lenition process - deoralize 'h', spirantize stops and denasalize nasal vowels. Tight dialect speakers are as if holding and pulling the reins of phonological frame. These phonations throw light on different streams of diachronic developments too.

0.5 The issue of Gujarati having six vowels or eight vowels is discussed in chapter II. The variations in mid-vowels pose a theoretical question such as when does a phonetic feature serve as a contrastive feature phonemically. If the lowering of the mid vowels 'e-o' in Gujarati shows various degrees of lowering then can we consider such 'lowness' as binary? Lindau does not see any justification for regarding any single parameter as a composite of binary features. In describing phonological processes the use of binary features to express movements along a single parameter amounts to a wrong claim about relationships between vowels. Lindau demonstrated how feature of height is multivalued and that the points for each value of height need not be contrastive. The different manifestations of Gujarati mid-vowels have been shown as the results of the 'one-step-lower' movements in each defined context. We have shown that even the diachronically developed lower-mid vowels follow this 'one-step-lower' criterion. The contextual lowering is a natural process found in many languages.

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8. Lindau, 1978
9. Ladefoged, 1971
The degree of lowering varies sociolinguistically (giving vulgarized lowering) and dialectally too. All this 'amorphous mass' of lowered variety of mid vowels perceptually give us only two mid-vowel phonemes i.e. /e/, /o/.\textsuperscript{10}

0.6 Another pertinent feature of Gujarati vowels is nasalization. It is an asegmental process and has various manifestations. Nasalization is a complex process comprising nasal assimilation, (homorganic nasal + consonant), glidal insertion with nasalized vowel, nasal effacement and vowel tensing — strengthening. Nasalized vowel after tensing may get lowered and/or diphthongized dialectally. The sonority of vowels create a nasal spread syllabically calling for an asegmental treatment. Homorganic nasal + consonant sequences create one interesting theoretical issue of clusters. We have asserted that 'nasal + consonant' sequence is a homogenous cluster, if both the components are homorganic. The various nasality manifestations show that the sound change is in progress.

0.7 The dynamicity of processes (in the moving) such as murmur, lowering of the vowels and nasalization would mean that we have to ask two questions. (These are pertinent

\textsuperscript{10} We have also noted the fact that there is no nasalized ['ɛ] to be found in any of the dialects because when nasalized it is lowered. Gujarati and Bengali nasalized mid-vowel is [ɛ] in onomatopoetic words. Yoruba supports this observation. Doke has called it "extra-grammatical phonetics of onomatopoeia". (Doke, 1936).
1) what happens to the sounds?
2) why it happens?

As Lass says the questions of type (1) are more matters of fact but questions of type (2) involve matters of theoretical interest and are extremely complex. Answers to them depend on how well we know the answers to type (1) questions. We have at least made a small beginning in this direction by trying to show that these answers to question (1) type can be well answered by properly collecting the phonic substance of language. We have also shown how the features of murmur and nasalization are a segmental calling for the syllabication of the language. It is considered uncontroversial that the segments are to be assigned to syllables and the input to phonetically motivated processes must include syllabication. It is more or less accepted that syllabicity of segments must be specified as by the feature syllabic. We have worked out a few rules of syllabication in chapter IV. Ambisyllabicity has been accepted. In closed heavy syllables vowels take stress and length. The rhythmic pattern of the language is directly related to the syllabic pattern.

In the concluding chapter we have given some rules (for the prosodies and processes) following dependency phonology and autosegmental phonology.

11. Lass, 1980
A table of Gujarati consonants and vowels is given here.

**Table of Consonants**

<table>
<thead>
<tr>
<th></th>
<th>Bilabial</th>
<th>Dental</th>
<th>Retro-Palatal</th>
<th>Velar</th>
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<td>unaspirated vl</td>
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<td>aspirated vl</td>
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<td><strong>Affricates</strong></td>
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<td><strong>Semivowels</strong></td>
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Vowels

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CHAPTER I
MURMUR

sosmanām ghosinām 'vasanādau.

(RP. XIII.6)
1.0 Introduction

In this chapter the most salient issue of Gujarati Phonology is studied. This is the issue of murmured vowels which has been much discussed, and has attracted attention of many linguists from abroad. In the very beginning it should be made clear that 'murmur' is not a uniform feature of all the major dialects of Gujarati and that some dialects of Saurashtra Gujarati (which is commonly referred to as a Kathiawadi dialect) show clear absence of this feature, (i.e., the speakers who have not moved out of their respective non-murmured -- dialect areas, have not acquired 'murmur' as a borrowed feature). No doubt there has been always a great deal of mobility amongst Gujaratis and due to this Saurashtrians moving to Ahmedabad or Bombay have picked up 'murmur'.

In the areas spreading over from North of Ahmedabad to South of Surat 'murmur' is predominantly present. Ahmedabad being the capital city of Gujarat, much of the literary activity flourished here. Hence the dialect of this area took the status of 'standard educated dialect'.

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1. One very interesting development may be noted here. More than two hundred years ago a large number of upper class and/or caste Gujaratis from Saurashtra as well as Kaira District (see the map) went and settled in Africa. Over the generations they (being already partially uprooted from their own land) formed a new dialect and ended up by losing the murmur (a feature in Kaira District dialect) and losing open
The literary figures of the first half of this century (quite a few of them coming from Nagar community) naturally had a role to play in shaping the educated dialect. The conspicuous features of this Ahmedabad Nagar dialect are:

1. strong 'murmur',
2. presence of open-mid vowels 'ɛ' and 'ɔ',
3. clear nasalization in vowels,
4. a sharp distinction between 'ʃ' and 'ʒ',

(i.e. palatal and dental fricatives).

I don't belong to this dialect area. I was born and brought up in Bombay. My father hailed from Surat and my mother's family belonged to Bombay for more than seven generations. My schooling was partly through the medium of Gujarati and partly through English. For my graduation and post-graduation I studied Gujarati and Sanskrit literature. Though Bombay is not geographically in Gujarat, there is a considerably large population of Gujaratis coming from various dialect speaking areas. Until late fifties the Gujarati population of Bombay

1. (Contd.)

'ʃ' and 'ʒ' (a feature in Kaira district dialect as well as in South-coast Saurashtra dialect). This dialect are tempted to brand as 'Africa Gujarati'.

2. Pandit (1957) and Dave (1967) (both from Saurashtra) have referred to the fact that 'murmur' being a late acquisition in their speech, there is free variation between the murmured and non-murmured variants of vowels.

2a. I am one of my informants.
consisted mainly of upper class and caste. The strength of Gujarati schools came mainly from these groups. This influenced the standard of Gujarati language studies in Bombay. One was exposed to all the dialects and yet there was a conscious trend towards following a standard Bombay dialect. There is a clear imprint of South Gujarati dialect in my speech. I have 'murmur' in my vowels but I don't have open mid 'ɘ' and 'ɔ'.

To give the rough picture of the dialect situation in Gujarat we have classified them here giving their major feature specifications:

(1) the dialect with murmur and open-mid vowels
   i.e. eight vowels plus murmur
(2) the dialect with murmur but without open-mid vowels i.e. six vowels plus murmur
(3) the dialect without murmur but with open-mid vowels i.e. eight vowels minus murmur
(4) the dialect without murmur and open-mid vowels i.e. six vowels minus murmur.

By 'six/eight' vowels we don't imply six/eight vowel phonemes. We simply refer to presence or absence of open-mid vowels besides 'e, o'. As our main concern is 'murmur' other features are not included in this classification. With other features included the classification will have to be redone.

Murmur has been considered as a distinctive feature of the language by all the modern linguists who have
studied murmur. We want to propose that it is a non-oral phonation feature and though a characteristic feature of dialects it is not used distinctively i.e. it does not cause contrasts in segmental phonemes. The ancient Indian phonetic observations and the modern experimental phonetic observations support the proposal. Hence here we have included the summary of previous studies along with the counter-arguments and all the phonetically supporting statements.

First of all we have tried to study 'murmur' as a feature. 'Murmur' has been defined by Ladefoged as "another name for breathy voice, a type of phonation in which the vocal cords are only slightly apart so that they vibrate while allowing a high rate of airflow through the glottis". The air-stream mechanism required for producing murmur is pulmonic but at the same time the position assumed by glottis for it is very conspicuously different from that for voiceless/voiced sounds. Murmured sounds can be made by keeping glottis fairly open at the end or by 'narrower' opening extending over the whole length of vocal cords. See figure 1. As Pike says "a voiced vocoid with added audible friction at the glottis... is traditionally called 'voiced' [h]. If one pronounces a voiced stop and adds to it a "vocoid to which friction is added at the vocal cords as was described earlier for voiced [h]" one gets aspirated voiced stops'. Pike has very carefully observed the

Figure 1 Four states of the glottis.
behaviour of 'voiced [ɨ] ' when he says that "one can arrive at a significant statement concerning the phonetic patterning of [ɨ], in relation to voiceless vowels and whispered and "voiced [ɨ]". Both voiceless and voiced vowels have cavity friction... If to each type one adds local glottal friction the first gives whispered vowels and the second vocalic timbers of 'voiced [ɨ]", creating the proportion, voiceless vowel (i.e.[ɨ]): whispered vowel: voiced vowel: 'voiced [ɨ]".\(^5\)

Murmur: as interpreted by ancient Indian scholars.

Our interest is in timbers of [ɨ]. Pike has also noted that these timbers of "voiced [ɨ]" are frictionals but also are resonant orals. Not many writers on phonetics discuss 'murmur'. It is an important type of phonation, though not found commonly in many languages. The ancient Indian treatises provide several very crucial observations. Hence, it would be certainly worthwhile to stretch the study to antiquity in order to know the full phonetic process involved in this type of phonation. The ancient scholars have shown unparallel soundness and accuracy in phonetic studies. Any issue in I A languages requiring phonetic explanation should not neglect these studies. It would be out of sheer callousness if one does not look into these treatises.

According to them 'h' is the result of 'bahya prayatna' --- external articulatory process. They have divided articulatory process into two main types: internal and

\(^5\) Pike, 1943, p. 71-72.
external. The external process can be divided into two types as shown below:

\[
\text{bāhyaprayatna}
\]

\[
\begin{array}{ll}
\text{vivār} & \text{samvār} \\
\text{śvāsa} & \text{nāda} \\
\text{aghosa} & \text{ghosa}
\end{array}
\]

The external processes in turn are classified according to three different mechanisms:

1. glottalic: voice/voiceless
2. pulmonic: aspiration/non-aspiration
3. velic: nasality/non-nasality.

Mahulkar has very well shown this diagrammatically. See figure 2.

Allen has rightly said that "in their recognition of the voicing process the Indian phoneticians make one of their greatest single contribution". As Mahulkar has pointed out ancient phoneticians used two matrices, one to indicate the internal activity (with two sub-matrices) and the other to indicate the external activity (with three sub-matrices).

\[
\begin{bmatrix}
\text{constriction} \\
\text{articulation}
\end{bmatrix}
\begin{bmatrix}
\text{velic} \\
\text{glottalic} \\
\text{pulmonic}
\end{bmatrix}
\]

FIGURE 2 - Areas of External and Internal processes
They have very clearly pointed out at the two positions of glottis: "when there is effort on the part of the speaker the air in the form of breathing (prāṇa), which is the emission from the lungs (kosthyya) becomes breath or voice according to aperture (khe) of the throat, (glottis) is open or closed or it becomes both breath and voice when glottis is neither closed nor open". In this connection Taittirīya prātisākhya also has similar remarks, "when glottis is closed voice is produced when it is open breath". "and in between samvrta and vivrata hakara is produced". This shows neat connection between voice and closed glottis and breath and open glottis. This also points at the production of 'h' in the in between condition of glottis. Breath then is the feature of voiceless sounds and voice is the feature of voiced sounds, but for 'h' and voiced aspirates breath as well as voice are the feature.

9. RK prātisākhya (RP) 1931, XIII. 1,2.

vāyuḥ prāṇah kosthyyam anupradānam

kanthasya khe vivrte samvrte vā

āpadyate svaṭṭama nāṭaṁ vā vaktrihamubhyam ।

10,11. Taittirīya prātisākhya (TP) 1906 II. 4-6.

samvrte kanthe nādah kriyate | vivrte

svāsah | madhye hakaraha|

12. RP XIII. 4-6.

svāsoghosanam | itaresam tu nādah
It is possible to make such accurate observations only if one has concentrated on 'living language' as observed by great western scholars like Benfey and Whitney. The language dealt with by ancient phoneticians was not "merely a religious or imperial language 'super-posed' upon the people" but rather a secondary language used by educated classes and therefore prātisākhyas..."manifest a thrilling interest in, the living phenomena of the language". These observations are apt for the behaviour of 'ḥ' (murmur) in Gujarati. The behaviour shows that it is a feature, a phenomenon of a language in action. It is a feature of live speech. prātisākhyas attach 'strong voicedness' with 'ḥ' and voiced aspirates. Allen has correctly explained that 'ḥ' and the voiced aspirates are considered as more fully voiced than the non-aspirates, and the voiceless aspirates more fully breathed than the non-aspirates.

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14. Here it would be interesting to note that RP XIX, 28 while pointing at the faults (dosāh) of pronunciation of 'ḥ' says: 'svāso' ghosa-nibhata vā hakāre.

The commentator says:
'svāso vādhiko' ghosa sadṛśatvāvā
hakārasya doso laksayet.
As we proceed through these numerous remarks about 'h', a totally new 'h' required for 'murmur' emerges out. The ancient treatises have also tried to know 'from where one utters 'h'?' RP has been rather uncertain when it says "either 'h' is considered guttural or it is considered as a chest sound". But then the freedom left for both the possibilities goes to prove that 'h' as a pulmonic sound was observed by them. Paniniyaṣikā is more observant and specific about the occurrence of 'h' and gives a distributional explanation: 'h' when followed by nasals and semi-vowels is pulmonic, otherwise it is glottal. This very interesting remark is crucial for us as it shows that the voicedness of 'h' and the following sounds can have 'inter-dependency'. The possibility of such dependency involves or implies a requirement of studying more than a 'segment' at a time. With this they enter into the real field of speech. They understood that adjustability of articulatory organs and modifications of sounds is the part of the speech-game. Some of them said that 'h' becomes homorganic with the beginning of the following vowel and becomes homorganic with the end of the preceding vowel.

---


kanthyo' karaḥ | prathamapancamau ca dvā
ūsmanam | ketideta urasyau.
RP has listed this possibility of homorganicity of 'h' as one of its faults by saying that "it is faulty to make 'h' (visarjanīya) homorganic with the preceding long vowel". But Uvata in the commentary quotes another commentator who said that 'Even for Gods it would be impossible to pronounce 'h' in any other way.' The gist of all this can be given as follows:

1. 'h' is produced when glottis is neither completely closed nor completely open.
2. 'h' can be glottal and/or pulmonic.
3. This alternative perhaps implies environmental dependency.
4. 'h' is characterized by 'pure breath' and 'strong voicedness'.

---

17. pāṇiniya śiksā 16.
   ḫakāram pāncamair yuktam antasthabhiśca
   samyutam | aurasyam tam vijānīyat kāntyam āhur
   asamyutam

18. TP II, 47-48.
   ūdaya -svārādi -sasthano hakāra ekeśām|
   pūrvanta -sasthāno visarjanīyaḥ|

19. RVXIV. 30.
   anya-sthāne dīrghāt-svarāt | paro visarjanīyo
devair api na 'sakya uccārayitum.
(5) 'h' has no specific point of articulation and has a tendency of becoming homorganic with the preceding and the following vowels.

(6) 'h' is vulnerable to modifications and also is capable of influencing environmental sounds by its 'voicedness' and 'breath'.

Allen has felt that "the aspiration of the voiced aspirates is voiced and there are strong historical phonological reasons for believing the Sanskrit 'h' to have been 'voiced h' [h]". This can be proved from the examples like this:

\[ h < ^* g^h \] in hima

within Sanskrit we get

ghnanti hanti
tat + hi taddhi etc.,

This leads to a point from where we propose the hypothesis regarding murmur (i.e. [h]). 'h' of I:A, with no definite point of articulation, with strong voicedness and with flexible, adjustable homorganicity does not remain merely a phonetic segment but a speech phenomenon. It is a process which can extend influence on or can be influenced by nearby sounds. It has a power of 'over-blowing' the following vowel. Allen has noted that Indian scholars regarded 'h' as a feature of a non-linear nature i.e. non-segmental.

---

They had perceived the 'breathy' effect that 'h' could bring over on the segmental phonematic units which are linear. Allen agrees with this view and believes that "except for transcriptional purposes the representation of a complex structure by category labels based on a mono-systemic analysis is an unacceptable procedure".\(^{21}\)

As it is known the attitude of Indian linguists was towards 'synthesis'. Bhartrhari prescribed that

"within the sound unit the component features have no independent existence. They realized, in studying language as a whole it would be necessary to synthesize the 'divided material of sentences' by using some technique."\(^{22}\) They have given number of 'Sandhi' rules for Sanskrit. These efforts of Indian phoneticians to synthesize the units of language were what Allen named as 'prosodies'. In giving the sandhi rules for juxtaposed sounds the phoneticians have given the natural phonetic processes. They gave three processes:

- **voicing**: \(\text{aasit} + \text{raajaa} = \text{aasidraaja}\)
- **aspiration**: \(\text{labh} + -\text{ta} = \text{labdha}\)
- **nasalization**: \(\text{vaak} + \text{mama} = \text{vaah mama}\)


\(^{22}\) Allen, 1963, p. 9.
Some examples from Sanskrit where in a sequence like 'h' + nasal/semi-vowel, 'h' is phonematically not significant. Here the process of breath and nasality overlap e.g. Kinhpute. This overlap may be due to 'nonlinear' quality of 'h'. This outflow of voiced breathiness of 'h', spreading over the surrounding sounds makes it inevitable to understand the requirement of synthesizing language material by studying sounds in context.

The phenomenon of 'h' which has 'karanaDhava' (having no mode of articulation) and which is 'parāsraya' (Pāṇiya sikhā) (dependent sound) can behave like a prosodic feature. This feature has interaction with sonorant sounds, such as:

\[
\begin{align*}
(1) & \quad h + v \\
(2) & \quad v + h
\end{align*}
\]

homorganicity.

RP says that the aspiration of sonant aspirates shows a strong sonant breathing. Such breathing crosses over and reaches the following vowel. It is like a 'spread' phenomenon which covers its surroundings.

\[\text{ghosinām ghosinaiva} \mid \text{The commentator says, ghosinām sosmanām ghosinaivosmanā} \mid \text{hakāren ityarthah : sosmatām ahuh} \mid \text{gha, jha, dha, dha, bha iti.}\]
The interaction of 'h' with voiced consonants can be as follows:

\[(3) \, c + h + v = \hat{c} + v^h \text{ voice and breath}\]

and with voiceless consonants the interaction will appear in the form of 'emission of more breath'

\[(4) \, c + h + v = c^h + v^l \text{ breath V.L}\]

This character of 'h' allows us to make a fairly obvious departure from the usual mode of phonological description. 'h' if and when does not behave as a segment will force us to view it from two different directions: horizontal and vertical.

Horizontally in a continuum of speech showing the capacity to spread on the surroundings. This prosodicity is the actual speech event.
vile- have shown that this proposal of has lot of support from ancient phonetics. There is an implicational suggestion in proposition that only if we accept the horizontal prosodicity we can propose the vertical direction in the description. There is one more aspect to 'h'. Lass has very aptly described the digestural characteristic of the sound segments because there are two relevant articulatory configurations: laryngeal and supralaryngeal. The first one is a categorial gesture and the second is a locational gesture. Mahulkar's diagrammatic representation of the internal and external processes can help to understand even Lass' proposal. Lass has considered 'h' as showing 'shifted (locational) gesture' — i.e., both the categorial and distinctive subcomponents are realized only laryngeally. Pratisakhyas have indicated that 'h' can be pulmonic and the external process in case of 'h' which has no specific point of articulation can become predominant. Lass holds similar view in considering 'h' as a defective unit in terms of system of opposition because 'it's matrice lacks defining specification for features that are purely intra-oral'. In fact: Lass goes one step further and says

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27. Ibid, p.154.
that any 'phonological' segment is represented as a two-part matrix, consisting of sub-matrices labelled [oral] and [laryngeal]. Lass insists on keeping these two parameters independent to show that each is a possible proper domain for a phonological rule in addition to the whole segment being such a domain. For Gujarati 'murmur' we want to show that it is the result of the laryngeal realization of categorical and distinctive gesture. \([h]\) which is a voiced fricative gets de-oralized in few of the Gujarati dialects as Lass has shown:

\[
\begin{bmatrix}
[\text{oral}] \\
[\text{laryngeal}]
\end{bmatrix}
\]

i.e. (a) gesture shift: [+ conti] 

(b) de-oralization \([\text{oral}] \rightarrow \emptyset\)

Putting it in Lass' formula we can give a general representation of \([h]\) - weakening:

\[
\begin{bmatrix}
[\text{oral}] \\
[\text{laryngeal}]
\end{bmatrix} \rightarrow \begin{bmatrix}
\emptyset \\
[\text{laryngeal}]
\end{bmatrix} \rightarrow \begin{bmatrix}
\emptyset \\
\emptyset
\end{bmatrix}
\]

Gujarati possibility of murmur is 'h' getting deleted. at this stage.

This way of looking at 'h' clearly indicates at its potential 'laryngeality'. The question is how do we describe such 'de-oralization' of murmur? As noted in the introduction any description having only segmental
approach is insufficient for murmur. This provokes a little digression here. The phonological descriptions uptill 1950 depended only on the contrasts based on the 'garden variety of minimal pairs'. Their activity depended on an inventory of phonemes and listing of conditions for the occurrence of their 'variants.' Their motto 'one phoneme one symbol' obviously presupposes segmental phonology. To have adequate transcriptional symbols was so important a requirement that it becomes almost synonymous with the requirement of framing an adequate phonological theory. Such symbol finding activity created a methodological mirage.

Phonologists painfully faced the self-created problems such as phonemic overlapping, non-uniqueness of phonemic solutions etc. In Firth's words "one after another phonologists and phoneticians seem to have said to themselves: 'your phonemes are dead, long live my phonemes'. 28 Firth insisted on building up a generalized transcription and at the same time studying 'the relation of the symbolized element to the type of context in which it appears and to all other different symbolized elements that may also occur in the given type of context'. 29

29. ibid, p.47.
Firth was the first to note that the language has to be described in terms of two fundamentally different kinds of elements: phonematic units and prosodies. Firth had realized that symbol is artificially discovered static cover, but the speech is highly dynamic and complex 'continuum'. With keen phonetic skill and auditory perception we are able to break this continuum. Indian phoneticians showed how these parts analyzed from the continuum undergo various transformations until they are synthesized into actual speech acts. However, the modern phonologists never tried to put the segmented parts to where they belonged. Tatham has remarked that though the basis of all phonological theories should derive from the theory of speech production it seldom does, instead it derives from some kind of informal survey of the data of phonetics. Phonology would be the better off if it proceeded from phonetic theory rather than reorganized phonetic data. Chomskian and the post-Chomskian phonologies also have missed the dynamicity of spoken sounds. The standard generative theory (S.P.E. and Post S.P.E. generative developments) has a 'homogenous straightforward and appealing structure of phonological and phonetic representations'.

This theory divides its two dimensional array into elements of uniform size segments with no additional hierarchical structure. The theory is equally negligent to the fact that some features need not take as their domain precisely one segment. Hence it is not at all surprising that Allen commends the ancient Indian treatises for carefully studying the dynamicity of speech. They had realized the prosodies of voicing, aspiration and nasalization which can extend over a stretch of speech (may be a syllable, a word or even a sentence). Amongst the modern phonologists, Firth's prosodic approach is a radical break-through from the segmental phonology. Whereas the phonemicist maps the phonic data onto a unilinear sequence of phonological segments, the prosodist describes the data in terms of two fundamentally different kinds of elements. The first approach is uni-dimensional and monosystemic the second is two-dimensional and polysystemic. "The aim of prosodic analysis" according to Robins "is not that of transcription or unilinear representation of languages but rather a phonological analysis in terms which we take account not only of paradigmatic relations and functions which are operative in speech." These syntagmatic factors should be systematized and made explicit in phonology, no less than paradigmatic contrasts.

---

We are aware that most phonologists have made distinction between phonetics and phonology. However, some like Ohala consider phonetics as "an indispensable tool for the phonologists" and the natural generative phonologists have not long since realized the importance of phonetics. Halle insists that "the study of speech sounds must yield insights into articulatory aspect of the sounds, it must concern itself with the acoustic and psychoacoustic character of the sounds." While trying to understand 'murmur' realized that all the previous statements regarding 'murmur' in Gujarati are based on the prevailing trends amongst phonologists -
the trend to seek freedom from too much phonetic detail; the trend where linguistically relevant aspects were distilled from an infinitely variable speech behaviour. Modern experimental phonetics extends enough support to our views regarding 'murmur': Ondraváková affirms that the movements (of the vocal cords) are three dimensional and highly non-linear especially - in chest voice. Van den Berg holds similar opinion. That a chest sound should have highly complicated vocal cord movement should be considered as an interesting feature for 'h' too.

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36. Ondraváková (PSICPS) 1971, p.32.
Fig. 8 Volume velocity waveforms during a cycle glottal opening movement. From top to bottom:
- voiced — open — voiced
- voiced — open — voiced (minimum duration)
- voiced — breathy — voiced
- voiced — breathy — voiced (minimum duration)
- voiced — breathy — voiced (in vocal fry)

(From Rothenberg)
Figure 4: Typical vocal fold shapes at the time of oral release in Koreh stops:

I  unaspirated
II slightly aspirated
III heavily aspirated
Kim has explained that more the aspiration more open is the glottis. She also notes that the turbulence accompanying "/h/ articulation is not created at the glottis but at the point of constriction for the following vowel whose configuration is formed through co-articulation during /h/\(^1\). The strong voice and the turbulence of '/h/' are closely associated with the adjacent vowels in the murmured dialects of Gujarati. It is also noted that "the explosion burst of an aspirated stop like wise shows a considerable concentration of acoustic energy at the frequencies of neighbouring vocoid formants"\(^2\). Rothenberg obtained the waveform of airflow at the glottis and recorded volume velocity measurements. This was done while recording the airflow during English /h/. He notes that breathy voiced sound will have loose adjustment of vocal folds and that the glottal adjustment for this sound takes only 100 msec vis-a-vis 140 msec for closed adjustment sounds and that a larger peak air-flow is found for this sound.\(^3\) See the fig. 3.4. Lisker and Abramson in their study of 'Glottal modes in consonant distinctions' have noted that aspiration of voiced stops is voiced, unlike the more commonly found aspiration, simply because the glottal aperture does not become as large as to cease the

\(^1\) Kim, 1970, p.111.

\(^2\) Brosnaham and Malmberg, 1970, p. 129.

\(^3\) Rothenberg (PSICPS) 1971, p.380.
vibration of the vocal folds. They also assert that 'the theories of stop-voicing and aspiration that stress the importance of extra-laryngeal factors can claim less basis in observed fact than those one that stresses the paramount role of the larynx'.\(^1\) One quite convincing result comes from Kim's experiment. She observed from the Korean stops that there was maximum glottal opening for heavily aspirated stops and aspiration is a function of glottal opening at the time of the release of an oral closure of a stop, as shown in figure no. 4.

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2. In the discussion of the paper Rothenberg brought out an interesting issue regarding Hindi where the glottal airflow during the articulatory closure of a voiced stop can also be absorbed by a slight nasalization, that is, a small velo-pharyngeal opening. Here we extend a similar observation from a non-murmured dialect of Gujarati. In this dialect when a nasalized vowel is preceded by 'h' it gets slightly murmured. As 'murmur' is not the feature of this dialect the only logical reason for such murmur can be its nasalization. The examples are not many. e.g., (i) [hɛ] 'what!' (surprised by what you said) (ii) [hɔ ke] 'all right?'. In this connection Ohala has a point to suggest. His nasographic experiment displayed a vulnerability of low vowels to nasalization when in combination, with glottal consonants. In British R.P. 'half' is pronounced as [ˌhæf]. If this is proved true then \(h + \text{low} \sim h + \text{low} \) and this in turn may show the breathiness and voiced-ness getting over flown. e.g., \(h \sim h + \text{voice} \sim \text{low} \) murmur.
Figure 5  Index values of nerve impulse propagation time in axons.

- 0.77-posterior digastric
- 1.02-trigeminal
- 1.29-accessory
- 1.35-vagus
- 1.63-hypoglossal
- 2.55-superior labial
- 5.89-recurrent laryngeal

(adapted from Kim)
Kim refers to the valuable study conducted by Krmpotić where the length and the diameters of a dozen nerve fibers (axons) which supply neural impulses to muscles involved in speech production were measured. She tried to establish the order of degrees of latency in the propagation time by giving latency values in terms of Index i.e. the greater the index value the longer the time required for neural signals to reach muscles. The laryngeal nerves showed the greatest index value. See figure. Kim concludes that if the signals to laryngeal muscles reach later, vocal folds may assume open position longer and as a result the voicing for the following vowel may be delayed. This delay may also make voiced stop voiceless and unaspirated stop aspirated e.g., \[ b \rightarrow [p] \rightarrow [p_h]. \]

This observation is suggestive of the possibility that voice can be lost but aspiration is in fact acquired. RP has warned as to the possible faults in pronunciation of Sanskrit 'h': that there is a possibility of voice getting lost and the strong 'breath' being continued. Kim has similar opinion. She has summarized voicing and aspiration as closely related phenomena.

In murmured dialects voicing and aspiration form a single continuum. Voicing and aspiration here are 'implicational phenomena'. According to generative frame work one should be able to give 'redundancy rules' for such 'relations'. But as far as the 'spread' of 'murmur' on vowels in Gujarati goes the redundancy rules

---

may not be sufficient. We want to propose that in any segmental approach there is no provision for such 'non-linear' 'spread'. There are good reasons why these two phenomena are related. Kim extends very logical explanation as she confirms that there is continuous airflow through glottis from the lungs to the upper vocal tract during the vibration of vocal folds. "If the tract is wide open as in vowels the airflow can proceed with no difficulty. But when there is a constriction in the tract, as in obstruent consonants, there is a limit as to how much air can flow into the closed cavity. As more air flows into the oral cavity the pressure in the cavity becomes higher. If no adjustment is made this increasing pressure equalizes the pressure differential across the glottis and the voicing stops." In Gujarati the required adjustment must be taking place at the right moment; i.e., before the discontinuation of voicing. The adjustment here means increase in the cavity size to accommodate the airflow. e.g., in a pair of words such as

\[
[pot\ddott u] \quad \text{soft (neuter)}
\]
\[
[\ddott ph\ddott \dot t\ddott u] \quad (I) \text{reach}
\]

the pronunciation of the second word clearly will show the expansion of the cavity. Kim feels that 'though one can blow out one's cheeks to achieve this purpose, this is normally not done in speaking.' We agree partly with Kim

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that there is no conspicuously visible blowing of the cheeks. However, there is clear cavity expansion for Gujarati murmured pronunciations. As Kim suggests the simultaneous adjustment is done by lowering the glottis. On the other hand in tense voiceless consonants high sub-glottal pressure will often push up the glottis. Kim has succinctly summarized the relationship between glottal pressure and rate of vocal fold vibration (i.e., pitch). She asserts that "higher the sub-glottal pressure the higher the pitch. Thus in high-pressured voiceless obstruents the adjacent vowels tend to carry a higher tone than those adjacent to voiced segments which due to the constantly escaping air have a lower sub-glottal pressure". Kim gives Maran's classification like this:

(1) Raised (raised glottis can stop the voicing)
(2) Lowered (lowered glottis will retain the voicing)
(3) Spread (spread glottis yields aspiration as the air can continue to flow)
(4) Constricted (constricted glottis is used for glottalic sounds like ejectives, implosives, creaky sounds etc.)

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45. For the non-murmured i.e. tight phonation dialects of Gujarati the glottis does get pushed up. See the photograph on p. 103

We have put the relevant features for Gujarati in the table below:

```
  - Raised +
     /           \\       
   - Lowered +       - Lowered +
      /     \       /     \       \      
 Not in Gujarati -Spread+ -Spread+ not possible
     /\               /\               /\ 
  Voiced unaspirated Voiced aspirated Voiceless unaspirated Voiceless aspirated.
```

Kim's observations have certainly more insightful explanation.

Modern phonetic experiments - neurophysiological, physiological, acoustic, etc. - have directed many a way for attempting some explanation in phonology. We note to our benefit that many phoneticians have concentrated on 'h'. This 'h' being a laryngeal sound, no matter from where they begin they have to make some reference to it if their experiments are regarding vocal-cord activities. Here we summarize the ancient and modern phonetic observations together in order to get clear picture of 'h'.

1. 'h' is the result of bāhya prayatna - external process and that it is the pulmonic sound.

For 'h' glottis is neither closed nor very open.

2. For 'h' and voiced aspirates voice and breath are the features.

3. (i) 'h' can be either a guttural or a chest sound.

(ii) śāniniya sikṣā defines that 'h' is pulmonic when followed by nasals and glides, i.e. antasthas.

(iii) 'h' has a tendency to be homorganic with adjacent vowels.

4. 'h' has karanabhāva and it is paraśraya. Allen felt that it is due to these qualities that the ancient phoneticians never treated 'h' as a segment but considered it as a non-linear, non-segmental and transferable feature.

Breathy voiced sound will have loose adjustment of vocal folds (Rothenberg)

Aspiration of voiced stop is voiced.

Ohała's observation about vulnerability to nasalization of low vowels in contact with 'h' can be reviewed in this connection. As 'h' is pronounced with loose vocal folds and air-flowing out, there is a possibility of soft palate getting into a lax position. No doubt this is a variable factor. We only note the susceptibility of 'h' as well as the adjacent vowels in forming a continuum. Rothenberg records the volume velocity measurement of glottal air-flow. For this purpose he studies breathy voice with its preceding and the following stages. He does not give any reason as to why he takes this particular sequence but it is obvious that 'h' being a breathy process it can be the best example.
By such a comparison we don’t imply any one-to-one parallel similarity. The idea is to show the significance of these studies for the study of murmur.

Having surveyed the phonetic behaviour of 'h' it would be worthwhile to see how the Sanskrit 'h' behaved through the historical stages. We are aware of the two facts that the description of the sounds in pratisākhya cannot be directly applicable to modern IA languages and that any IA language of today cannot make much out of Sanskrit. Yet it is true that the seemingly haphazard collection of observations are of great value to the phonological studies of IA languages. The period extending from Sanskrit to śrākṛt and from śrākṛt to Apabhraṃsā brings us up to the Middle Indian stage. Though we have the written material representing various stages it cannot serve as a direct evidence for the spoken material. So also śrākṛt and Apabhraṃsā both show the features suggesting a linguistic stage but they do not represent any specific language. They provide some idea about the varieties of different then existing dialects, however, none of them helps to localize the language area accurately.

Yet from the available material one can try to make some linguistic sense. Bloch has surmised that "if Apabhraṃsā could be written in the sixth century, it was because the stage of language to which it belongs, appeared in Gujarati to be sufficiently archaic to be put on a plane with śrākṛt". 47

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During the later part of the period known as Middle Indian (MI) a widely extensive language was prevalent all over Gujarat and Rajasthan. "It was much later that Gujarati, Marwadi and other kindred vernaculars got split." Tessitori has expressed a similar view. MI stage denotes the stage some time before 1300 A.D. Modern Indian stage can be said to have begun after that. Though the first Gujarati poet appears in the 15th century the scholarly and literary works of Jains provide enough evidence to date the language to an earlier period. With this as a background we have tried to see what peculiarities of 'h' sound give distinctive features to Gujarati in particular and Neo-Indian (NI) in general:

(1) Bloch notes that IA alone of all Indo-European languages possesses four series of occlusives: voiceless, voiced, voiceless aspirated, voiced aspirated. The aspiration is so substantial that when the aspirated consonants undergo changes it is the occlusion and not the aspiration which is lost. This means that even when occlusion gets lost the aspiration of that occlusive is transferred to some adjacent segment.

49. Tessitori, 1914.
(2) The voiced consonants from the Indo-Iranian period have transferred their voicing and aspiration to the following occlusive. Aspiration of aspirated voiced consonants is to some extent independent of their occlusion. Aspiration of aspirated consonants is tenacious and it is occlusion and not the aspiration which is the weak element of the voiced aspirated consonants in Sanskrit. 51

(3) The Sanskrit phoneme 'h' is a voiced aspiration similar in nature to the aspiration of the aspirated voiced consonants.

\[ \text{e.g. cid hi ciddhi} \]

The 'attack' of 'h' is still perceptible in this position.

(4) In \( \text{ṛākṛt MI} \) 's' opens in a group of consonants and new aspirated occlusives are formed when the group contains a nasal, which persists, the aspirate becomes voiced:

\[ \begin{align*}
\text{Pali } & \text{ niṅha (snā)} \\
& \text{unṅha (usna) etc.} 52
\end{align*} \]

It is a peculiar development: 'h' substitutes voiceless segment, but when attached to the voiced nasals it

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52. Ibid, p. 68.
acquires the quality of voicedness, which along with aspiration is bound to extend phonetically over the adjacent sounds. IA languages show many such examples where 'nasal + h' sequence appears and voiced aspiration from this sequence gets extended as a prosodic feature over the neighbouring sounds.

\[ \text{e.g. Marathi } [\text{mhn}]^\text{proverb'} \]
\[ [\text{matara}]^\text{'old man'} \]
\[ \text{Hindi } [\text{nahn}]^\text{'small'} \]
\[ [\text{nahlana}]^\text{'to bathe'} \]

This is just to say that 'voiced aspiration' does have predictable environments and shows up in IA languages in such environments.

(5) 'In certain circumstances an intervocalic 'h' of obscure origin becomes voiced'.\(^{53}\) This observation is in a way similar to the preceding one. In Bengali intervocalic 'h' is voiced:

\[ \text{e.g. } [\text{mohim}]^\text{'big'} \]
\[ [\text{gohon}]^\text{'deep'} \]

It can be seen from this that since the days of Sanskrit till now 'aspiration' has persistently remained in all the IA stages. Merging with stops it has produced the whole series of aspirated stops.

\(^{53}\) Bloch, 1868.
When merged with voiced stops it shows the potentiality to spill a strong voiced breath which no longer remains a segmental feature. This behaviour of 'h' is true even when it is in neighbourhood of nasals, liquids, and glides. Many examples of this nature can be given.

e.g. Marathi [l handwritten] / [l handwritten] 'small'

Hindi [t handwritten] 'shoes'

'small'

Hindi [t handwritten] 'to stay'

Hindi [t handwritten] 'here'

Hindi [t handwritten] 'there'

*(here the following nasalization also is pertinent)*.

No doubt in these languages (where 'h' acquires 'voicedness' environmentally) 'h' does appear as a voiceless variant.

e.g. Marathi [g handwritten] 'wheat'

Hindi [t handwritten] 'hand'

Sanskrit had a voiceless 'h' in the form of visarjaniya. "There is no longer any trace of it in MI". The question will be 'from where does the voiceless variant of 'h' of modern IA come from?'. It would be worthwhile investigating a comparative data from these languages.

Marathi, Hindi, Bengali, Kutchi, non-murmured dialects of Gujarati, all have voiceless 'h'. Gujarati murmured dialects also provide a highly complicated situation. There are dialects with very strong murmur and the dialects with comparatively weak murmur. The weak murmur dialects sometimes show strong breath in 'h' when not in weak environment (Here by weak we imply non-medial position and not in the neighbourhood of nasals, liquids, glides etc.) This 'h' with stronger breath may become voiceless in some individual's speech. The non-murmured dialects definitely have voiceless 'h' with strong breath. 55

In fact what Sanskrit so clearly had as a 'voiced aspiration' has come down up to Gujarati in its full-fledged expression - i.e., as a murmur prosody. It looks like that over the different developmental stages the voiced aspiration kept its strength and in some dialects of Gujarati perhaps it found appropriate medium for its manifestation. Why some dialects of Gujarati have no such voiced breathiness and why languages like Marathi, Hindi, Bengali, despite their voiced-breathy-intervocalic 'h' have voiceless 'h', are the questions which may not have any answer from synchronistic or diachronistic points. The questions may be answered by socio-linguistic approach.

All this detailed background was needed:

(1) to prove that 'h' is potentially prone to turn into the voiced breathiness;

55. RP XVIII, 28.
and to prove this 'h' can be de-oralized and simply show up as a laryngeal feature at times.

(II) to propose that in murmured dialects of Gujarati it is this 'h' element (either in the form of the voiced aspirated stops or in the form of the segment which voiced 'h') is the propagator of murmur in the adjacent vowels;

and to propose that the spill of voiced breath from these two situations is like a non-linear spread phenomenon and as such cannot be described at segmental level alone;

(III) to suggest that it is peculiar to the murmured dialects, where it finds its way in the form of a unique expression which is musical;

and to propose that as all the studies of Gujarati murmur up to now have seen it segmentally they have missed its crucial non-linearity feature. As Firth has said monosystemic analysis has reached, even overstepped its limits.56

1.2 Divetia's views

In this connection, we will summarize all the previous studies. However, none of them can be a point of reference from where the further research should begin. Although Gujarati is one of the most important IA languages no adequate description of any aspect of phonology of that language is available.

56. Firth, 1957, p.137.
Three earlier works belonged to pre-modern Gujarati days. These are:

(1) Divetia, Wilson philological lectures, 'Gujarati language and literature', 1915-1916;
(2) Turner, 'Gujarati phonology', J.O.R.A.S., 1921;

Divetia and Turner have studied the sounds over the period of development through the history. Divetia gives different dialect areas based on rough geographical divisions without giving any dialect specifications. Turner does not mention any dialect division except that he admits that "even in modern Gujarati we do not reach linguistic unity except in so far as the literary language, arisen out of a mixture of dialects". Turner is right when he says that this literary language "is generally used and understood by the educated over the Gujarati area."\(^{57}\) As Turner's study mainly was concerned with the developmental stages from MI to Neo-Indian (Gujarati), the dialect variations could be neglected. But Divetia talks about murmur and yet does not distinguish between the murmured and non-murmured dialects. However, it is Divetia who has for the first time given special attention to 'h' in Gujarati which he names as 'laghu prayatna hakār'. He says 'laghu prayatna hakār' is a sound not so named anywhere but it is largely noticeable in our

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\(^{57}\) Turner, 1975, p.91.
vernaculars and perhaps existed in Sanskrit; He feels that 'aurasya' and 'kanthya' hakar of Paninīya siksā may correspond to two 'hakar' of Gujarati: 'laghu prayatna' and 'guru prayatna' i.e. the weak 'h', the aspiration whereof is diffuse and the strong 'h' the aspiration whereof is concentrated. 

E.g. laghu prayatna: लढ़, लढ़, लढ़, लढ़. 
guru prayatna: गु, गु, गु, गु. etc.

He has meticulously described the origin of 'h'. He classifies his 'utsarga' on the basis of the features only specific to Gujarati and which are partially shared by other IA languages with Gujarati. 'laghu prayatna' hakar according to him is not specific to Gujarati alone. He noticed this feature in other IA languages and this is a very significant observation.

He further puts down three phonetic conditions for 'h' in Gujarati:

(1) Where 'h' is either samsrsta or samkirna and either has moved towards the beginning of the word or towards the final part of the word.

(2) An extra 'h' is added where in the original there was none.

(3) The original 'h' is dropped.

He defines the term 'samsrsta' as a 'mechanical mixture of sounds' and 'samkara' as 'chemical combination'.

i.e. it is a complete fusion of sounds. Samkara process of 'h' can occur with consonants as in,

<table>
<thead>
<tr>
<th>Sanskrit</th>
<th>Prakrit-Apabhramsa</th>
<th>Gujarati</th>
</tr>
</thead>
<tbody>
<tr>
<td>gabhirakam</td>
<td>gabhiraú</td>
<td>gherū 'dark'</td>
</tr>
</tbody>
</table>

and with vowels in,

| Adhuna | Aunā | Hauna | Hamna | 'now' |

This is rather a misleading statement. There was no need to show that 'gh' in 'gherū' is a samkara from 'g+h' because for him there are only two pertinent possibilities: 'laghu prayatna' and 'guru prayatna'. He is very critical of Dhruva for regarding 'h' in a different manner. Dhruva considers 'h' as "aspiration pervading adjacent vowel" and calls this aspiration as pranadhvani. Further he recommends the symbol of a mere dot below the aspirated syllable. Divetia was misguided and trapped in trivial matter such as symbols when he says "if one used a dot and wrote ḍ instead of ḍ, then one must write ḍ instead of ḍ. Divetia could not see that ḍ (gh) which is a 'samkara' form by his own definition cannot be compared with a 'samsrasta' form such as 'a'. Divetia has confused the issue of symbol with the phonetic value of 'h' and hence has missed the point which Dhruva made correctly that 'h' extends aspiration on adjacent vowels.

Divetia is also critical of Narmad who perceived the phenomenon rightly and felt that the word for 'we' should be written as 'ṛṛ' and not as 'ṛṛ'.

Divetia considers such 'half vowel', i.e., 'श' as an absurdity and phonetic impossibility. In fact Narmad like Dhruva had seen the element of 'h' going with the vowel. The significant drawback of Divetia's approach was that he did not perceive that the element of Dhruva's 'प्रानाद्भवनि' 'pervading the adjacent vowel' was present even after 'guru prayatna hakār'. The second drawback is that Divetia did not define all the specific environments for 'laghuprayatna or guru prayatna hakār'. Thirdly, Divetia generalizes his observations which are particularly based on his dialect (viz. nagar dialect of Ahmedabad).

1.2.1 Turner's views

The next important study of Gujarati phonology is by Turner. He felt that "the most notable feature throughout has been the progressive enfeeblement in the articulation of stops". This enfeeblement may mean either the loss of the final stop or voiceless stop becoming voiced (Fortis' changing to 'lenis'). Turner says that "Gujarati tends to neglect 'h' (intervocalic -h- gets disappeared largely in Gujarati)... In any case the aspiration of Gujarati aspirates in any position is much feeble than in Hindi". According to Turner then 'h' is feeble i.e. 'laghu prayatna' in all positions. About intervocalic '-h-' Turner says

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60 Turner, 1975, p.133.
that it "gets attached to preceding stops" but "in all other circumstances \(-h\)- becomes \(-h^--\) (i.e. an \(-h--\) pronounced with the larynx in an intermediate closure between that for a vowel and that for an 'h').\(^{61}\) This remark of Turner indicates that he rightly noticed the peculiarity of \(-h^-\) in Gujarati. However, he is more interested in the historical development.

The next study of Gujarati sounds by Dave gives only an articulatory study. In his table of consonants he mentions voiced and voiceless 'h' which may be correlated with weak and strong 'h' respectively.

Going through these three works one can say that none of them gives any cogent description of present day Gujarati 'h'.

1.2.2 Pandit's views

Among the later works only three major attempts to study phonology, having modern linguistics approach could be mentioned. Pandit's conclusions remain as the point of reference for Dave, Vyas and for the other studies.\(^{62}\) Pandit, of course, has done the pilot work, although all his conclusions cannot be accepted.

\(^{61}\) Turner, 1975, p.133.

\(^{62}\) These studies are:


Pandit's work has not been critically evaluated till now. Somehow his views were taken for granted and that attitude has led Gujarati phonology into a blind alley. It could very well be left there unless a fresh approach is made.

His views on 'murmur' attracted attention of many linguists. Since that time 'murmur' has come to be associated with Gujarati language as 'the inseparable' quality. Pandit's is the pioneer work as he is the first one to pronounce clearly the 'murmuredness' in vowels and to perceive a connection between aspiration and murmur. He starts his section on murmur as follows:

62. (contd.)


63. So much so that breathy voiced 'h' and its spread on the vowels in other IA languages has not been referred to.
"Aspiration in Gujarati is the breathy release which immediately follows the stop consonants and which is voiced when the preceding consonant is voiced, unvoiced when the preceding consonant is unvoiced. Murmur is voiced breath, low pitched and simultaneous with vowel," but he has also said that "Gujarati like many other IA languages has a set of aspirated stops in contrast with unaspirated stops and it has a set of murmured vowels in contrast with simple vowels."\textsuperscript{64} It is obvious from this statement that Pandit refers to contrast between murmured and non-murmured (clear) vowels. To justify and support his view he was required to produce a few contrasting pairs for which he mixes up words from different dialects. This tendency is seen to be continued upto Dave (1977).\textsuperscript{65} (He has taken words like /\textipa{\textexclam}d\textipa{i}/ 'run' /\textipa{\textasciitilde}d\textipa{d\textasciitilde}/ 'anger'.\textsuperscript{65}) He wants to consider element of murmur and element of aspiration in complementation.\textsuperscript{66} Hence his /\textipa{h}/ phoneme has two allophones [\textipa{\textasciitilde} aspiration and [\textipa{\textasciitilde}]] murmurm. This is a vague distribution because now the allophone of his phoneme /\textipa{h}/ is a component of all his murmured vowel phonemes. This is an odd and absurd distribution. According to him "murmured vowels do not occur after aspirated release of stops.

\textsuperscript{64} Pandit, 1957, p. 169.

\textsuperscript{65} These words are from non-murmured dialects of Saurashtra.

\textsuperscript{66} Pandit, 1957, p. 169.
Vowels after aspirated stops — voiced or voiceless — are always clear. It is rather being unobservant on his part not to notice 'the murmur' in the vowels after 'voiced breath' which can be either due to voiced aspirated stops or due to voiced 'h'. Further he says that 'Murmured vowel does not occur before pause' but he has not considered words like [tʃa] 'tea' [nha] 'bathe' (imperative) [ʃa] 'wound'. He has given only negative environments for the murmured vowels; (e.g., not after aspirated stops and not before pause). Does it means that all the rest of the occurrences of the vowels are murmured? This is anomalous because there are hundreds of words such as [bær] 'twelve' [bær] 'burn' [tæ] pull' (imperative) etc. without murmured vowels. This confusion is due to the fact that he does not say where murmur can occur. To these distributional problems he adds the problem of transcription when he says that "when an allophone of phoneme /h/ is simultaneous with the vowel it is murmur, when not simultaneous with the vowel it is the aspiration of the previous consonant. Murmur is transcribed after the vowel, aspiration is transcribed after the consonant". This statement is an example of


68, 69. Ibid.
Bloomfieldian reductionism and transcriptionism. Pandit applies the famous principle of economy (reducing all the aspirated stops) without realizing that he has created hundreds of sequences of the nature 'stop + h', as every occurrence of aspirated stop now is the sequence 'stop + h'. Just because some dialects of Gujarati have murmured vowels, the aspirated stops from all the dialects cannot be reduced. He has not felt any need of having the phonetic manifestation of /h/ as [h]. So his /h/ is either the phonetically synthesized component of aspirated stops or it is the murmur of the vowel. This murmur is a detachable component (in his own idiolect there is a free variation between the murmured and clear vowels.) but there can be no dialects without synthesized component of /h/.

He mentions an "important alteration"... that "a syllable final voiced aspirate release alternates with the murmur of the preceding vowel". His examples are:

"/labh/ ~ /lahb/ 'advantage'
/vagh/ ~ /vahg/ 'tiger' etc."

We disagree with this observation. The word final stops do obviously have zero release.
This no release/zero release variants of the sounds may sound fortis even though the stop is lenis and may lose some of its breathy release even when the stop is aspirated.

This process is in no way peculiar to Gujarati alone. It is a commonly observed phonetic result in the final position. Pandit did not see that the voiced breath of voiced aspirated stop in 'Pausa' was spilled in reverse direction thus making the preceding vowel murmured but this however never deaspirates the aspirated stop.

70. Allen, (1963, p.72) has quoted from Atharva prātisākhya (AP) i, 43-44, about the process of 'abhinidhāna' or 'āsthāpita':

Abhinidhāna is the checking of a consonant, making it obscure, weakened deprived of breath and voice; it takes place when a stop is followed by a stop: it is also called arrested (āsthāpita)

vyanjana vidhāranam abhinidhānāḥ pīditāḥ sannatāro:

hīna śvaśnādāḥ sparsasya sparse abhinidhānāḥ āsthāpitam ca.

RP says: apicāvsāne. 'it also occurs in 'pausa'. (vi.17-78)
Pandit maintains these views regarding 'murmur' even in his 1966 book. In the beginning of his section on murmur Pandit was almost nearer to the better explanation as he says that "'h' has a special position". He shows a very significant insight when he indicates that 'function' of 'h' is like an accent i.e. it spreads over more than one segment of pronunciation. 71

Unfortunately his 'proceduralism' does not leave him when he discusses free-variation between aspiration and murmur or between murmured and clear vowels. He slips down into implausible confusion due to his mixing of the phonologies of dialects; rather he uses his dialect for data, where Ahmedabad murmured dialect is imposed on his own original non-murmured dialect. In a murmured dialect 'murmur' as an element is so much a part of the vowels that we have never observed absence of it where it should be present nor have we ever heard such a free-variation. Certainly often there are cases where there is no environment for murmur and yet vowels are murmured e.g. in Baroda, Gujarat we often heard the word for 'staircase' [dadɔɾ] being spoken as [dadəɾ], 71a

In this book he is clear about there being no contrast between murmured and clear vowels. This is the point where he differs from his 1957 stand. We have summed up Pandit's arguments on murmur.

71a. For explanation see p.47
1. There are eight vowels in Gujarati:

\[ \text{i u e o \rightleftharpoons o} \]

(a) All these vowels can become murmured; (When? Environments not given).

(b) They can never be murmured if,

(i) they come before pause;

(ii) they come after aspirated stops.

(c) murmured and clear vowels don't contrast (1966).

2. There are ten stops: (including two affricates:)

\[ \text{p b t d \rightleftharpoons t\rightleftharpoons d} \]
\[ \text{tj dj tf d3} \]
\[ \text{k g} \]

(a) All these stops can be aspirated: (when? if followed by 'h'. When are they followed by 'h'? Not defined).

(b) All these stops can be unaspirated:

(when? if not followed by 'h')

i.e. stop + h = aspirated stops.

stop - h = unaspirated stops.

(c) Aspirated stops and unaspirated stops don't contrast. (?). In his table of phonemes only unaspirated stops are listed. 72

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3. /h/ is a phoneme with two allophones: one is the aspiration and the other is the murmur. Aspiration occurs after consonants and murmur occurs along with the vowels.

(a) The allophones of /h/ have unconditional, arbitrary occurrences:

- /stops/ (典型案例) 
- /vowel/ (典型案例)

It has been shown that both the efforts of Pandit fail to explain the issue. Yet Pandit's work remains as the starting point in two respects:

1. That 'h' functions as an accent and spreads on more than one segment of pronunciation,

2. That in Gujarati vowels are murmured due to 'h'.

Now, we turn to two other studies one is Dave's 'formant analysis of clear nasalized and murmured vowels in Gujarati' and the second is Jørgensen's 'phonetic analysis of breathy vowels in Gujarati'.

Dave has to his credit a full Ph.D. dissertation on 'studies in Gujarati phonology and phonetics' (Microfilm 1977). Between his first write up and his dissertation there is almost a period of ten years. The first paper was not intended to be a phonological study. But his dissertation has a full chapter on phonology. In his paper (1967) his views on murmured vowels, are very much similar to Pandit's except for the suggested 'free
alternation between the two pronunciations: [ho:i-oi] 'boat'. In 1977 also his phonological conclusions have much of 'Pandit taken for granted - it is more or less Pandit 'resaid'. Ten years after his paper and seventeen years after the appearance of generative phonology Dave has failed to say anything significantly from the phonological point. He still remains with the 'minimal pair' and 'contrast' procedures. One is certainly expected to do a little more probing into such complicated vowel system as Gujarati (Having e-η, o-ơ, murmur, nasalization etc.)

Actually his research is in the field of acoustic analysis. As early as 1965 he gave some acoustic study of vowels. His work has an advantage over others. He himself has quoted that "Even if phonemes cannot be found in curves, without the sound basis of phonetics no phonology can survive". 73

Despite his good phonetic work his attempts to study phonology are highly confused. Explaining the scope of his thesis he says "Gujarati has a unique vocalic system showing a three way contrast between the oral, nasalized and murmured vowels". See the figure as given by him.

73. Dave, 1977, p. 3.
The phonological interpretation of the murmured (breathy) vowels is a matter of interest to any linguist. Similarly, the phonetic analysis of the murmured vowels and retroflex consonants is of interest to phoneticians. This defines the scope of the present thesis. His phonological interest then, mainly will be to interpret murmured vowels. But one cannot interpret 'murmur' without examining the other aspects of Gujarati sounds. Hence, we will review his whole phonemic approach. This will mean a digression from the issue of murmur. But the digression provides with the core of the next issue in my work. His approach is based on contrasting pairs. The pairs given are not convincing. (some of the pairs are from Pandit). His pairs for [i], [e], [i] are:

- \[i\] 'brave'
- \[e\] 'one'
- \[i\] 'luxury'

He has noticed that the opposition between \[e\] and \[i\] is restricted to initial position or initial syllable only, while it has not been regularly maintained in other positions. This he notices for \[o\] and \[\v\] too. He does not want to know 'why it is so?'. Dave is a speaker of a dialect having six vowels. This is a

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74. Dave, 1977, p.3.

75. Pandit and Dave collect their data either from Sanskrit loans (formal literary language): e.g. \[iti:r\] 'others' \[ku:p\] 'well' or from typical Saurashtra dialect e.g.
pertinent point. A speaker with six-vowel dialect will have [e, o] in the words where the speakers of the eight-vowel dialect will have [ɛ, ɔ].

No doubt there are some words which are not common to both the dialects. Pandit and Dave obviously want to describe the dialect with murmur and eight vowels. If we compare the situations we will see that all the words with [e, o] from the six-vowel dialect are not spoken with [ɛ, ɔ] in the eight-vowel dialect. Hence, one should look for the exact phonetic reasons for the openness of [e] and [ɔ].

Dave's and Pandit's pairs to prove the contrasts between [e] and [ɛ], [o] and [ɔ] are given below:

Dave:

(1) /ver/ 'revenge'
    /vɛr/ 'saw dust'
    /vɛr/ is phonetically [vɛɾ]. The openness of the vowel is due to 'h' in the preceding position i.e. it is conditional.

(2) /mel/ 'put'
    /mɛl/ 'dirt'
    The word /mel/ is a dialect word. The speaker from Gohilwad having [ɛ, ɔ] uses the word [mɛl], for 'dirt' but never uses the word [mel] for 'put'. Another speaker from Ahmedabad having [ɛ, ɔ] also does not use the word [mel] 'put'.

75. (Contd.)
[tato] 'hot tempered' [kubo] 'hut' or from uneducated dialect e.g. [ela] 'hey'. All these put together are presented as having one phonology!
(1) /dʒe/ 'the one who'
/dʒt/ 'a greeting of respect'

The word /dʒt/ is a colloquial form for [dʒəj]. Hence, this is not a proper minimal pair. In the dialects having [t, ʃ] the 'ʃ' of [dʒəj] becomes [ʃ].

(2) /medʒ/ 'table'
/mətʃ/ 'match'

/meŋʃ/ is the word which is hardly used in any of the dialects and /mətʃ/ is borrowed from English. Moreover, both are non-Gujarati words.

(3) /pɛʃ/ 'to present'
/pɛts/ 'enter' (imperative)

/pɛʃ/ is a Persian word not ordinarily used in spoken Gujarati.

(4) /mer/ 'name of a tribe'
/mɛr/ 'may you die' (an abuse)

/mɛr/ is a dialectal word. In standard dialect it would be [mər] used only in an extremely informal situation.

Going through these pairs one wonders why they had to harp upon such implausible pairs. Even for [o] and [ɔ] some few far fetched pairs are given.
Dave:

(1) /go/ 'round
/g2/ 'molasses
This is the only one convincing pair which exists in the eight-vowel murmured dialect.

(2) /om/ 'a syllable for mantra
/η/ 'this year
/η/ is a dialectal word which can be used in the standard speech. The lowering of η is conditional i.e. before retroflex nasal. This we have discussed in the next chapter.

Pandit:

(1) /h0/ 'bad habit
/hɔ/ 'fear
/hɔ/ is again a highly restricted dialectal word.

(a) /mor/ 'peacock
/mɔr/ 'mango blossom
Phonetically /mɔr/ is [mɔr] where the opening - lowering is automatic.

(3) /tɔri/ 'theft
/tɔri/ 'dias for the marriage ceremony
This is one more convincing pair.

The realization of phoneme in a language is something which is highly natural to the speakers. Establishing such contrasts is an artificial exercise which linguists
have to indulge in. For any explanation of serious nature such exercises can have only marginal place.

Almost all except two of their pairs have, either conditional [ɛ, ɔ] or have words taken from different dialects or have words borrowed from foreign languages.

A dialect of Saurashtra has these broad vowels [ɛ] and [ɔ]. (phonetically speaking they are even lower than those in the eight-vowel murmured dialect). The speakers of six vowel dialect also have conditional lowering of their [ɛ] and [ɔ]. Of course, the degree varies to a great extent. Dave himself says, "varying degrees of openness of [ɛ] and [ɔ] which have been noticed by Pandit for the medial and final positions, have also been found in the initial syllables of our informants". In between the speakers of such different dialects there is never any difficulty of perceiving the words due to these differences because it comes natural to a Gujarati speaker to accept varying degrees of lowering of [ɛ] and [ɔ]. There can be some rare words where the lowering is unconditional. Such cases may be the result of hyperprocess of lowering. Here it would suffice to say that to put all the variants of mid-vowels [ɛ-ø-ɛ, ɔ-ø-ɔ] as contrasting sounds is unnatural and unconvincing.

76 Dave, 1967, p.11.
Dave has observed that [e] and [o] are not found to be nasalized (However, this too is a doubtful statement in itself. Dave is a speaker of six-vowel dialect. A little lowering of [e,o] when nasalized is expected in the speech of such speakers too.) He says that there are only six nasalized vowels. Should he not have searched for the reason why there is no contrast between nasalized [e,o] and nasalized [ɛ,ɔ] inspite of the fact that he has observed 'varying degrees of openness of [e] and [o] amongst his informants? Dave finds Pandit's solution of 'aspiration and murmur' 'incomplete' because "he does not set up the consonant 'h' either as a phoneme or as a variant". This sentence is highly ambiguous. Any sound segment in the language is automatically a variant of a phoneme. Dave wants to imply that Pandit does not show the manifestation of segment 'h' anywhere (which Divetia considers as 'guru prayatna hakar').

Dave feels that, "the problem is complicated by the fact that standard Gujarati is not a homogenous language". A little digression would not be out of place here. There can never be any homogeneity about

77 Dave, 1967, p. 11.
78 Dave, 1977, p. 29.
such standard dialect, in the sense that Dave implies. One must remember that 'standardization' is in itself an abstraction created theoretically by the linguists (and also by politicians). This process of abstraction is a challenge to the linguists, for the simple reason that educated dialect of Ahmedabad or educated dialect of Bombay may not be exactly identical and yet from both these one standard dialect has to be abstracted.

In doing so one should be careful enough not to mix up the idiolectal issues: like alternation between the murmur and the clear vowel. Such alternation of unsteadiness of the feature may disappear with time.

No doubt other unsteady features may enter the language. But while writing a phonology of the abstracted standard if we consider all these unsteady features there will be utter confusion. Murmur is not at all an unsteady feature in murmured dialects. It in fact serves as a demarcation between the two groups of dialects. One can accept Dave's statement about nonhomogeneity of the standard dialect; but how does one justify his bringing together the features of the 'western dialects' and of the 'eastern dialects' and thereafter writing the phonology of that mixed result?

Such an approach of Pandit and Dave is highly unscientific.
As William Labov has said "there are two distinct but overlapping concerns that motivate the study of research methods. One is the desire to find an approved and practical procedure for gathering, processing, and reporting data. The other is the need to discover if such results are right or wrong". If one is not particular about the data or if one is conniving at the differences that exist in the language there is absolutely no chance of giving any convincing result.

Pandit and Dave have slipped into a kind of 'Reductionism' - either by mixing up all the dialect features or by introducing their idiolectical features: such as alternation between the murmured and the clear vowels. As already noted Pandit has not given any specific positive environments for the murmured vowels. The examples of alternation between murmur and clear vowels is as in these words: /bahr/ ~ /bar/, /pahr/ ~ /pjr/.

How can such a theoretically incoherent situation creep up in the data? This is not to deny the variations in the language. This is to point out at the gross over simplification that is attempted by Pandit and Dave. Working on a standardization is something like a linguist working on the theoretical abstractions. Either we stick to this or go to modern sociolinguistic methods and provide data with variations in all the dialects. It certainly is difficult

to cope with these variations. If Pandit wants Ahmedabad area 'Eight-vowels murmured dialect' as a standard form then he should stick to it. Labov has correctly said "the distinct problem of... data producing activity is to control the effect of investigator's activity on the data so that the final result will not be an artifact of the investigation".\textsuperscript{80}

A very rough idea about the issues in the vowel system of Gujarati has been given in the text. (See p. 75)

One can easily see that the murmur and the clear have precise divisions; while as 'eight vowels' and 'six vowels' extend over both the areas.

Dave's /h/ is a consonant phoneme with four variants:

(1) [\textipa{h}] voiced glottal fricative in initial and intervocalic position.

(2) [\textipa{h}] voiceless glottal fricative occurring in final position

(3) [\textipa{h}] aspirated release of stops. It is voiced or voiceless according to the preceding stop

(4) [\textipa{h}] murmure, pronounced simultaneously with the vowel, occurring before a consonant e.g. [\textipa{bar}] and in free variation with [\textipa{h}], [\textipa{h}] and [\textipa{h}] (with the restriction that only aspiration in final position varies with murmur).

FIGURE: 6 - The dialect divisions and the differences in the vowel systems.
From this it is clear that Dave is mixing up dialects for his data. From his fourth allophone one gets a feeling that Dave is condescending to accommodate murmur only before consonants (the type of consonant is not defined); or this murmur is in free variation with all other variants. This is like an idiolectal study. Murmur is a very strong, steady and predictable feature of the standard educated dialect around Ahmedabad area and in this dialect murmur occurs because of voiced breathiness of voiced \( h \) with varying degrees of sonant breathiness (depending upon caste, profession etc. differences). In final position \( h \) is not a voiceless fricative but it is a murmured vowel.

The most complicated allophone of Dave is \([ h ]\) — an aspirated release—which is left unexplained by both Pandit and Dave. They call 'stop + aspiration' a sequence which is to be interpreted as a cluster'. All the aspirated stops are not phonemes; new clusters. No structural explanation is extended for hundreds of new clusters of the nature 'stop + h' and 'stop + h + liquid' (as in \([ bh r e ]\) ). Is it only 'the desire to reduce 'that justifies such conclusion? Dave says "we interpret the aspirated stops as clusters of two phonemes, one of which is /h/ and define tenseness as its distinctive feature. This is economical... (breathy or murmured vowels) are also clusters in our analysis". 

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the /h/ can be voiced or voiceless depending upon the preceding stop. But what is the phonetic feature of this /h/ which is aspiration? How is it economical to add hundreds of clusters? This is an incredibly casual statement.

This detailed discussion is given here to show that 'murmur' as studied up to now does not satisfactorily explain either its phonetic or its phonemic behaviour.

However, Eli Fischer Jørgensen's work is one of the finest phonetic study so far done on Gujarati. We have tried to go through almost all the investigations carried out up to now. But Jørgensen's is the only work where very precise and exhaustive phonetic investigations are conducted.

Unfortunately, Jørgensen did not realize that both Dave and Pandit don't have murmur in their original dialects. Collecting data is a tricky work. Taking linguistically refined informants like Pandit and Dave would mean a great help, but at the same time one risks the naturalness of the data collection procedure. Since 1957 she has tried to concentrate upon this breathiness of Gujarati language. The paper in I.L. 1967 is the result of her continued interest and research. Here she has given the analysis of the distribution of spectral energy, air flow, duration, fundamental frequency and overall intensity of murmured vowels. Also she gives a provisional analysis of the perceptual value of the acoustical cues.
Jōrgensen obviously had to depend on previous studies. She has also started from Pandit's conclusions when she says "It is well known that Gujarati has a contrast between clear and breathy vowels... It is obvious that phonemically the murmured vowels can be interpreted as vowel + /h/ as proposed by Pandit. But phonetically they form one segment"\(^{82}\) whether phonemically the murmured vowels are vowel + /h/ or not is not the direct concern to Jōrgensen. She is sure of their forming one segment phonetically.\(^{83}\)

\(^{82}\) Jōrgensen, 1967, p. 72.

\(^{83}\) This is a serious drawback of Pandit and his followers. They have considered murmured vowels and aspirated stops as clusters of 'v + h' and 'stops + h' respectively. But first of all, cluster has to be defined. Is cluster to be decided phonemically, or to be justified phonetically? Phonetically a cluster has to be a clear case of the bond between two or more consonants/vowels coming in a sequence i.e. getting juxtaposed. Phonemic interpretation of such clusters has to take the phonetic results into consideration. Hence if phonetically there is only one segment then how can one consider such a segment as a
She used minograph to which she attached Trans-pitch meter and Intensity meter. This helped her to measure (1) duration, (2) fundamental frequency and (3) intensity. She also used Aerometer for air flow measurements. With Fabre Glottograph she could measure the degree of opening of glottis. Her results are summarized here:

**Air Flow:** A stronger air flow was found in murmured vowels than in clear vowels (This is attributed to wider opening of glottis). Murmured vowels also have greater amplitude. Jørgensen feels that there is no proof that murmured vowels should have less intensity. It is highly probable that the loss of intensity which should be caused by the leaking glottis is compensated for by a stronger activity of the expiratory muscles.

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83. (continued)

sequence of different phonemes? It is also unexplainable why only particular phonetic segment is phonemically a cluster? Is this an arbitrary selection? Such parsimonious methodology shows that linguists totally ignore the perception of the speakers of the language. Uniformly, whole over Gujarat, irrespective of what dialect speaker speaks, aspirated and non-aspirated stops are perceived as distinct units (phonemes). Linguists can have their loyalty to methodological improvement, but not at the cost of the native speakers' perception. No short cut and reductions at the methodological level can improve the description and explanation.
Duration: Vowel duration is an acoustic quality because it has been measured on the basis of acoustic curves.

Intensity: She found no difference in overall intensity between clear and murmured vowels.

Formant Frequency: For formant frequencies she refers to Dave's findings. He did not find constant differences between the formant frequencies of clear and murmured vowels.

Distributional spectral energy: The characteristic of murmured vowels is the relatively high level of fundamental compared to the frequency region above the fundamental until around 2500-3000 CPS.

Jørgensen has proved a greater air flow, greater amplitude, same intensity as clear vowels and longer duration in murmured vowels. All these definitely amount to the particular conditions of the glottis. Jørgensen feels that the longer duration might be due to historical development of murmured vowels from a combination of phonemes. But there is a possibility of indirect correlation between the duration and the degree of opening. This was suggested by N.B. Thelin. Yet Jørgensen feels that the difference of duration can also be found in the cases where there is no difference in degree of opening (e.g. [a - a]). (We beg to differ from Jørgensen here. The murmured [a] and the clear [a] definitely have this difference. A slight lowering of jaw in order to increase the cavity is obligatory for greater air flow required for breathy voiced sound.
This has been proved by Kim; and we have already noted it. This is an inevitable physiological chain reaction. This is also relevant for our thesis about \( \epsilon, \delta \) which will be discussed later. Jørgensen is perhaps right in pointing out somewhat 'less precise' articulation of murmured vowels. (Divetia has connected murmur with the easy going nature and weak physique of the community. \([h + v]\) or \([v + h + v]\) or \([v + h]\) etc., in a relaxed pronunciation may get fused fully or partially.)

Jørgensen has compared murmured vowels with voiced \([h]\).

She feels that the murmured vowels have come into existence through a fusion of vowel and \([h]\). She says "voiced \([b]\) is found in Gujarati after voiced stops". We have shown that voiced aspiration is not a specific feature of Gujarati alone but is found in a majority of languages. Aspiration going with voiced stops is also voiced and this was known to ancient phoneticians.

We have already noted from RP, (XIII, \(\text{XIV}\)) that voice and breath are features of 'aspirated voiced sounds'.

She gives a mingogram and a spectrogram of \([b^h]\) of Gujarati. The spectrogram shows that the \([b^h]\) has a strong Fo (fundamental) and weak higher formants and some noise at higher frequencies. See her figure on p. no. 82.

84. XIII, \(\text{XIV}\), sosmanam ghosinam svasanadau.
Fig. 7.
Korow und 3. Ed band spektrogramm of M in Brf (80).
The strong air flow of [h] in [b'al] as compared to [bal] is seen in the mingogram. This figure also displays low intensity. See page no. 84. She proves a very strong similarity between the 'h' of voiced aspirated stops and intervocalic voiced [-n-]. The spectrogram of [polor] displays the same characteristic features as that of [ba't] i.e. strong intensity of Fo and weakness of higher formants; (See page no. 85) and the mingogram shows the similarity of increase in air flow and decrease of intensity. See page no. 86.

What Jørgensen wants to drive at is that the strong air flow, low frequency, and a strong Fo have all been found as characteristic of murmured vowels also. One very significant point she has made is about the speech of RD (Dave) where there is a drop of frequency and low intensity in the beginning of the curves of murmured vowels. These are signs of an incomplete fusion of [h] with vowel, so that the murmur element is stronger in the beginning only. That she has noticed this peculiarity of Dave's speech is crucial to our discussion. 'Murmur' is not a natural feature of Dave's speech; and hence there is this 'incomplete fusion of [hl with vowel'. To be more precise we would say that 'murmur' being an imposed feature in Dave's speech, the fusion does not arise naturally in his speech. See figure 11 on page no. 86. Somehow or other Dave's speech displayed some features different from the rest.
Figure C
Mingogram of b and bh (RD).
A. Oscillogram.
B. Intensity curve.
C. Airflow curve.
Fig. 19. Narrow band spectrogram of intervocalic h in por (RT).
Figure 10
Mingogram of intervocalic h in ko, paQ (RT).
A. Oscillogram.
B. Fundamental frequency curve.
C. Intensity curve.
D. Airflow curve.
Fig. 14: Mingsgrams of both, taro, par and both, taro, par (RO).
A. Oscillogram.
B. Fundamental frequency curve.
C. Logarithmic intensity curve, highpass filtered 315 cps.
D. Airflow curve.
Jørgensen has noted them as follows:

1. "RD has practically no difference'.. (between the intensity of murmured vowels and clear vowels). p, 102.

2. RD has not only a longer distance to the peak in murmured vowels but also a lower start and a greater rise of the intensity curve. p, 108. [see figure]

3. RD has a higher intensity in all murmured vowels; the others in most cases a slightly weaker intensity. p, 109.

4. PBP (Pandit) PB and RD often have some common features in their speech. Their oscillograms of murmured vowels show more asymmetry. p, 113.

5. RD's curves of murmured vowels are signs of an incomplete fusion of [h] and vowel p, 115.

These, and several other remarks which have not quoted here (because that would mean quoting the full explanation) at least indicate clear demarcation between different dialect speakers. To put it correctly it shows that if 'murmur' is a feature borrowed by the speaker at a later stage, it remains 'alien' in his speech to some extent.

Jørgensen has summarized her work and given her results on the physiological, acoustical and perceptual level. On the physiological level a strong air flow
characterizes murmured vowels. This is due to the opening in the rear part of the glottis. A stronger activity of expiratory muscles is assumed by Jørgensen (we have noted that Kim has not only mentioned the spreading of the glottis but also the lowering of the glottis. This means an additional activity after the opening of the glottis). On the acoustical level she has recorded many important observations out of which we have noted longer duration, lower intensity, strong level of fundamental and asymmetry of oscillogram etc. All these features are correlated to open glottis.

Lastly, one very important observation of hers will have to be noted. She says "the difference between murmured and clear vowels in Gujarati is neutralized after aspirated consonants. The vowel found in this position is 'considered clear', (By Pandit and his followers)... but curves of vowels preceded by aspirated consonants spoken by PBP, P.B. and RD show a certain assimilation of the beginning of the vowel to [h]: the fundamental is stronger, the air flow stronger and there may be some noise at higher frequencies". This stronger fundamental is clear in her figure. See figure no. 11. This observation indirectly extends proof to our thesis about murmur. It is an extremely crucial observation; unknowingly Jørgensen has refuted all earlier conclusions.

Jørgensen's research though not phonological turns out to be very important for phonological solution. Her phonetic results prove the inevitable importance of phonetics to phonology.

Vyas' views

Lastly, one recent study by Vyas has to be essentially noted as her dissertation is directly connected with this issue. She has correctly seen that the murmuredness in Gujarati is the result of the specific phonation type and that such a process should be described as a prosody. But she is unable to get away from the notion of 'contrast' when she says, 'the words show contrast between normal voiced and whispery voiced vowels in monosyllabic words.' From these words she feels that it is necessary to recognize six vowels [i], [u], [ɛ], [ɔ], and [a] as whispery voiced. The very fact that she was unable to get any contrast between [ɛ] and [œ] and [ɔ] and [ɔ] should have made her search for the reasons of this. Though her thesis is based on her own pronunciations she often confuses the conclusions with alternative pronunciations. Talking about 'whispery voiced plosives [f hunters] [b hunters] [t hunters] [d hunters] [h hunters] [b hunters] she says "they can be pronounced with

87. ibid, p.26.
88. ibid, p.36.
a clear vowel followed by the whispery release of the consonant or, more commonly in my speech the vowel is pronounced with whispery voice and final consonant has a weak release. Thus [vag^n] or [vag] ^89. 

Vyas has also not got away from the Pandit type of approach. She begins with Polysystemic approach but yet she does not leave the past studies. There is a grave slip in suggesting this type of alternative pronunciations. The total disappearance of the final aspiration as indicated here cannot be accepted. We have already discussed this in detail. Aspiration has lingering quality which is observed by linguists in diachronic as well as synchronic data.

The speakers of the non-murmured dialect have tight phonation and show conspicuous fortisness in their stops. Secondly, it is surprising that the earlier studies did not wonder as to how can the voiced aspiration of the stops get lost totally in the final position when that same voiced aspiration has expressed itself on a larger stretch of speech i.e. on the adjacent-preceding-vowel. This is a phonetic impossibility. This weird 'alternative pronunciation' is the root cause of the whole confusion. Vyas has noted the alternative pronunciation of /h/ giving the following examples:

89. Vyas, 1974/36.
This is an extension of the earlier mistake. She has confused the dialect differences. Because of this the significance of voiced breath due to [ⁿ] is not brought home to and hence the cause for murmured vowels is concealed. As a result she has allotted "various sounds of Gujarati to the different features characteristic of different kinds of phonation at the phonetic level". Later, she describes words depending upon the number of syllables and the nature of syllables. She also considers in detail, features which characterize syllable initial, syllable final and the syllable as a whole and shows how the clear phonation i.e. non-ⁿ prosody and breathy phonation i.e. ᵅ-ⁿ prosody spread in the word. But what is the relevance of such a classification when the main reason for the ᵅ-ⁿ prosody has been missed? Her allotment of the sounds to whispery voice is as follows:

vowels a, i, u, ᵏ, ᵖ
consonants ᵕ, ᵇᵢ, ᵇᵢ, ᵇᵢ, ᵇᵢ, ᵇᵢ, ᵇᵢ, ᵇᵢ, ᵇᵢ.

Why has she not allotted this feature to voiced [ⁿ] which ᵗᵃⁿ ᵗᵉ be present medially? Having missed this crucial point the whole classification of word/syllable prosody has become

91. ibid, p.61.
92. ibid, p.62.
misleading. She says "the sounds of section A 2-3 can be expected to be examples of breathy voice rather than merely examples of voice and whispery voice when they occur under conditions of heavy breathing or breathiness." See below:

A₂ : voiced stops : g, d, , , b.
    nasals : m, n, , ,
    liquids : l, r, l
    fricatives : s, h
    clear and nasalized vowels : ə, ɐ, i, u, o, ˈɛ, ˈɛ, ɔ

A₃ : murmur vowels : ə, ɐ, i, u, ɛ, ɔ
    consonants : ɡ, d, , ˀ, ˀ, b. ⁹⁴

But what happens in breathless condition or during heavy breathing in Gujarati can happen in any language. It has nothing to do with the issue of murmur. Vyas should have started afresh, then her prosodic approach would have certainly proved more explanatory.

I-3 Murmur: a prosodic process.
Finally, we state few of our observations, suggestions and the thesis about 'murmur'.

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⁹⁴ We have used the term voiced breathiness as a synonym for murmur. Vyas has used the term whispery voice for the same. Hence, her use of the term breathy voice should be considered distinct from my 'voiced breathiness'. 
To support the thesis we have extended a data of more than three thousand words. The data is given in Gujarati alphabetical order. All the possibilities of the environments for murmur have been noted. Out of 3257 words given here only 897 words have murmured vowels. The rest of the words don't have environments for 'murmur'. Nearly one fourth of the data show murmured vowels. The environments clearly indicate that murmur is due to voiced [h] which

(a) may be in a synthesized form as a component of the voiced aspirated stops

(b) or may be the manifestation of the phoneme /h/

(c) or may be the remnant of diachronic stage as the old Gujarati words here indicate:

[tumhe] 'you' (pl)
[əmhe] 'we' (pl)
[mahəru] 'mine'
[tumhəru] 'yours'.

Some number words have peculiarly developed murmured vowels.

e.g. [hətə] 'seventy two', [hətə] 'seventy three'

\( \ddot{u} \) = intrusive

It should be noted that Marathi words for these two words have [h]:

[bahattə]
[trahattə]
The fact is that murmured dialects are strongly characterized by murmuredness. There is no possibility of having any free variation mentioned by Pandit or Dave. Murmur becomes so much a part of speaker's phonology that it would be highly unnatural even to theoretically accept such a free variation. What is implied here is that though murmur appears to be a dialect specific phenomenon it is not an idiosyncratic phenomenon in the sense that the voiced-breathiness of [ʰ] has a recurrent universal nature and has to be considered as a 'natural' feature; and it has a logical phonetic explanation. (We have already noted the possibility of this feature in other languages). In this sense it is independent of any particular language structure. If [ʰ] occurs in a sequence in which a voiced segment precedes or follows it or both, then it may take voicedness of these segments. Such [ʰ] may in turn transfer its voiced breath to its adjacent sounds. It spreads regressively as well as progressively. Out of the two components of [ʰ] (i.e., breath and voice) it is voice that first becomes conspicuous due to the supporting voicedness of the preceding/following voiced sounds and as a result a continuum of 'voice' is created along with which the transferred breath gets merged. The result is a 'murmur'. An excellent unbreakable continuum gets formed when [ʰ] occurs initially. Perceptually speaking it is difficult to say whether it is voiced [ʰ + vowel] or it is a
murmured long vowel
e.g. \[\text{h}\text{\~o}j\] 'lips'
\[\text{h}\text{\~o}d\text{\~o}j\] 'yet'

But medially [\text{\~a}] is little more clear and more easily recognizable:
e.g. \[\text{d}\text{\~a}\text{\~n}\] 'burn' (n)
\[\text{m}\text{\~o}\text{\~n}\] 'great'

Murmuredness gives distinctness to some dialects of Gujarati. To put it differently these dialects have provided appropriate medium for the murmur-spread. Out of these dialects, some have very strong murmur (from Ahmedabad to Baroda area) and some have slightly weak murmur (from South Gujarat to Bombay area). Strong murmur dialects sometimes have murmur inspite of having no environments for it.

Here such data has not been worked out; hence we cannot conclude categorically. In my dialect (weak murmur dialect) there is no murmur in these words.\(^{95}\)

The reasons for the murmuredness in the large data in the appendix I, are same for both the varieties of murmur dialect.

\(^{95}\) The data has been checked with the other speakers who speak the same dialect as mine; one of these speakers was Dr. Suresh Joshi, the most noted creative writer.
But the words noted below show intrusive \( \text{\(\tilde{a}\)} \) in strong murmuring dialects:

**Set - I**

<table>
<thead>
<tr>
<th>Strong murmuring</th>
<th>Weak murmuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{(\tilde{h})})led( \text{(\tilde{a})} )</td>
<td>( \text{(\tilde{h})})led( \text{(\tilde{a})} )</td>
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<td>( \text{(\tilde{h})})ar( \text{(\tilde{u})})</td>
<td>( \text{(\tilde{h})})ar( \text{(\tilde{u})})</td>
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<tr>
<td>( \text{(\tilde{h})})e</td>
<td>( \text{(\tilde{h})})e</td>
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<tr>
<td>( \text{(\tilde{h})})as( \text{(\tilde{u})})</td>
<td>( \text{(\tilde{h})})as( \text{(\tilde{u})})</td>
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<tr>
<td>( \text{(\tilde{h})})asu</td>
<td>( \text{(\tilde{h})})asu</td>
</tr>
</tbody>
</table>

* Note that these words seem to be the result of a synchronic process.*

The other set of data shows murmuring in both the dialects despite having no environments for murmuring. But these words seem to have developed murmuring over the period of development in language i.e., the diachronic remnant of the aspirate element might have remained in the form of murmuring. Some of these words we have already listed. Some more are given below:

**Set - II**

<table>
<thead>
<tr>
<th>Strong murmuring</th>
<th>Weak murmuring</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{(\tilde{h})})a( \text{(\tilde{u})})</td>
<td>( \text{(\tilde{h})})a( \text{(\tilde{u})})</td>
</tr>
<tr>
<td>( \text{(\tilde{h})})o( \text{(\tilde{u})})</td>
<td>( \text{(\tilde{h})})o( \text{(\tilde{u})})</td>
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<tr>
<td>( \text{(\tilde{h})})as( \text{(\tilde{u})})h</td>
<td>( \text{(\tilde{h})})as( \text{(\tilde{u})})h</td>
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<td>( \text{(\tilde{h})})as( \text{(\tilde{u})})h</td>
<td>( \text{(\tilde{h})})as( \text{(\tilde{u})})h</td>
</tr>
</tbody>
</table>

In this connection the diachronic development should be noted. In Pali and prakrit 's' loses its proper articulation and only 'aspirate' remains behind. Pischel has noted the change of 's' to 'h' in prakrit and Hemchandra also refers to such change.95n.

The position regarding murmuring can be summarized as follows:

96. Pischel, 1957, p. 219 (Hemchandra, 8:2: 74,75).
<table>
<thead>
<tr>
<th>Non-murmured dialects</th>
<th>Weaker murmur dialects</th>
<th>Strong murmur dialects</th>
</tr>
</thead>
<tbody>
<tr>
<td>All the vowels are non-murmured and spoken with varying degrees of tight phonation, 'h' sound is voiceless.</td>
<td>The whole data in appendix I is common to both the types of dialects showing precise and natural phonetic reasons for murmur. In these dialects 'h' is always voiced.</td>
<td>A speaker of weaker murmur dialect may lose 'voice' from 'h' in some situations. But this is entirely an idiolectal feature.</td>
</tr>
<tr>
<td>A speaker of weaker murmur dialect may lose 'voice' from 'h' in some situations. But this is entirely an idiolectal feature.</td>
<td>The speakers of strong murmur dialect may show a tendency to speak murmur even when there are no environments for murmur. This is like a continuation of phonetic actuation of the phonation which has become a habit in the community.</td>
<td></td>
</tr>
</tbody>
</table>

By giving two main dialect divisions having, (i) murmur phonation and (ii) tight phonation, it is implied that Gujarati speakers acquire (physiologically) two different phonation habits. The murmur phonation is the result of 'voiced [ʰ]' which has created 'h-prosody'. Drastically different from this is the tight phonation where 'h' remains voiceless. The glottis acquires very different position from that required for murmur phonation. Geographically speaking the tight phonation dialect area is nearer to Kutch; and Kutchi language has also tight phonation. This observation is based on the claim that I speak both Kutchi and one of the tight phonation dialects quite well. I have felt the tension of muscles near glottis while speaking these dialects. Some preliminary experiments were carried out by taking the tomograms for both the phonation types. The tomograms of an Ahmedabad speaker (strong murmur dialect) and of a Junagadh speaker (tight phonation dialect) display the distinct positions of glottis. The photograph 1 shows the position of glottis for the clear vowel where the glottis is neither raised nor lowered but the photograph 2 shows clearly the lowered glottis for murmured vowel as for the word [b̪ʰən]. The photograph 3 shows neutral position of glottis. The photograph 4 shows the raised position of glottis for the tight phonation of [ɶ] 'that' in Junagadh dialect. Here aryepiglottic folds have contracted medially and the sublottalic angle is at the
Photograph I - Position of glottis for the clear vowel, pronounced by the murmured dialect speaker.

Photograph II - Lowered position of glottis for murmured vowel.
Photograph III - Neutral Position of glottis.

Photograph IV - Raised position of glottis of the tight phonation dialect speaker.
right angle. Although this work is preliminary the photographs at least prove that the 'murmur' in Gujarat is a laryngeal process; and interestingly enough Gujarati has two distinct phonations.

The data in appendix I shows that there is an overall regularity of environments for 'murmur'. However, the data in set I and II show some exceptions. It would be non-empirical not to take notice of such data and it would be like underestimating the extent of exceptions to the regularity. To these exceptions, we propose an answer partly based on Chen and Wang's proposal. According to them the sound change works on the language in a gradual manner thus remaining as an ongoing process which spreads from morpheme to morpheme in the most plausible manner.

Such phonetic processes exhibit certain cross-linguistic validity and the phonetic actuation. These processes also imply some constraint on human apparatus physiologically and perceptually. Where 'murmur' process spreads as in sets I and II, the physiological adjustment by lowering the glottis takes place. As Chen and Wang indicate the phonological rule extends its scope of operation in all relevant environments but more often than linguists have thought a phonological rule may cross the boundaries of defined pattern of environments and may spread in different ways. Such innovative spread may get regularized. In Gujarati examples here the relevant

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97. Chen and Wang, 1975, p. 25.5.
lexical diffusion is complete but the phonation habit continues to spread in new environments which seemingly are exceptions. However, they are the phonetic actuations of phonation habit of lowering the glottis: the speakers tend to do that in new environments too. Moreover, such 'spread' provides the interesting data for noting the 'change-process' in action. The extension of murmur in such 'not-expected' environments has also socio-linguistic implications. The murmur is dynamically in action and often hyper-murmurization activity is seen.

Murmur being a laryngealization process it has a non-segmental behaviour. This non-segmental behaviour is a prosody which encompasses more than a single segment and in Gujarati it often covers more than a syllable. This prosodic element does not affect the segmental units, but it is not independent of the segmental sounds. It very much depends on 'h'. This 'h' has a vowel like quality. Moreover it has inseparable association with adjacent vocalicity. Fant has noted that "vowel like feature of 'h' will be 'zero-free' which on the speech production level "implies non-nasalized, non-lateral glottis source sounds, acoustically correlated to the predictability of formant levels from the F pattern..." This would lead to the classification of some whispered vowels and 'h' sounds as vowel like
and others as non vowel like. The vowel likeness creates prosody. We think we have been able to make our point clear enough to consider murmur as 'a prosody'.

The statement about segmental phonemes and prosodicity has to take a different shape. Listing variants of segmental phonemes in distributional terms can never take care of 'murmur'. Murmur spreading over a syllable (or even more than a syllable) cannot get confined to a single segment point. As Firth has said... "the syllabic prosodies of word is anima vocis, the soul, the breath, the life of the word". Firth also sees the scientific convenience in regarding 'h' as belonging to the prosodic system. 'h' of Gujarati can be the phonematic unit as well as can be the prosody. The phonation effect though simultaneous with the segmental units has not a segmental length. It lingers over a full syllable or even more than that: All this answers the doubtful issues of Divetia, Pandit and Dave. It would be justified if we say that,

(1) there is no reason to hunt for the contrasting pairs between the murmur and the clear vowels.
(2) voiced aspirated stops are as much a cause for the murmuredness of the vowels as the [h] fricative is. Hence, there is no logical

basis to consider them as sequences (clusters) of stop + h. In fact they are very much contrasting with their respective voiceless aspirated and voiced/voiceless unaspirated stops, in every sense of the term 'contrast'. They induce murmur prosody in the adjacent vowels but in their own right they have the unit status.

(3) Murmur means an adjustment of glottis and expansion of oral cavity. This in turn results in lowering of the jaw which may lower the mid vowels (dialectally.)

(4) The occurrence of the murmur causing environments (i.e., [ʔ]) or voiced aspiration of voiced aspirated stops depend on:

(a) With which consonant/vowel the syllable begins or ends.

(b) Which vowel precedes or follows them.

This delimits the freedom of occurrence of these murmur causing environments e.g. In a word beginning with [k] followed by [ʔ] only one voiced aspirated stop [d̪] can follow [ʔ]. We have listed the distributional possibilities below:
<table>
<thead>
<tr>
<th>First syllable</th>
<th>Murmured</th>
</tr>
</thead>
<tbody>
<tr>
<td>$k +$</td>
<td>$\delta +$</td>
</tr>
<tr>
<td>$e +$</td>
<td>$\hat{f}$</td>
</tr>
<tr>
<td>$a +$</td>
<td>$\hat{f}, \hat{h}.$</td>
</tr>
<tr>
<td>$o +$</td>
<td>$\hat{f} + \hat{h}.$</td>
</tr>
<tr>
<td>$u +$</td>
<td>$\hat{h}.$</td>
</tr>
<tr>
<td>$k^h +$</td>
<td>$\varepsilon +$</td>
</tr>
<tr>
<td>$d^h +$</td>
<td>$\hat{h}$</td>
</tr>
<tr>
<td>$a +$</td>
<td>$\hat{h}, \hat{b}.$</td>
</tr>
<tr>
<td>$o +$</td>
<td>$\hat{h}, \hat{b}.$</td>
</tr>
<tr>
<td>$e +$</td>
<td>$\hat{h}, \hat{b}.$</td>
</tr>
<tr>
<td>$g +$</td>
<td>$\alpha +$</td>
</tr>
<tr>
<td>$a +$</td>
<td>$\hat{d}^h, \hat{d}^h, \hat{b}^h$</td>
</tr>
<tr>
<td>$o +$</td>
<td>$\hat{d}^h, \hat{d}^h, \hat{h}$</td>
</tr>
<tr>
<td>$i: +$</td>
<td>$\hat{d}^h$</td>
</tr>
<tr>
<td>$u +$</td>
<td>$\hat{h}, \hat{q}^h$</td>
</tr>
<tr>
<td>$e +$</td>
<td>$\hat{h}$</td>
</tr>
</tbody>
</table>

* $g^h$ All the words irrespective of the following consonant/vowel will have murmured vowels because the words begin with $g^h$ (vd. Asp. stop).

| $t\{ +$ | $\varepsilon +$ | $\hat{d}^h, \hat{b}^h$ |
| $a +$ | $\hat{h}$   |
| $o +$ | $\hat{g}$   |
| $i: +$ | $\hat{d}^h, \hat{b}^h, \hat{h}$ |
| $e +$ | $\hat{h}$   |

| $t\{^h +$ | $o +$ | $\hat{b}^h, \hat{h}$ |
| $e +$ | $\hat{h}$   |

<p>| $d^3 +$ | $\varepsilon +$ | $\hat{g}^h, \hat{h}$ |
| $a +$ | $\hat{h}$   |
| $o +$ | $\hat{h}$   |</p>
<table>
<thead>
<tr>
<th>First syllable</th>
<th>Murmured</th>
</tr>
</thead>
<tbody>
<tr>
<td>%d₃ +</td>
<td>i: + b₃, h</td>
</tr>
<tr>
<td>u +</td>
<td>d₃, h</td>
</tr>
<tr>
<td>e +</td>
<td>h</td>
</tr>
<tr>
<td>*</td>
<td></td>
</tr>
<tr>
<td>*%d₃ h</td>
<td></td>
</tr>
<tr>
<td>*%t +</td>
<td>a + q₃, b₅, h</td>
</tr>
<tr>
<td>*%q₅ +</td>
<td>o + e₅, q₅</td>
</tr>
<tr>
<td>u +</td>
<td>e₅</td>
</tr>
<tr>
<td>*%q₅ h</td>
<td></td>
</tr>
<tr>
<td>*%t +</td>
<td>a + e₂, d₃, h</td>
</tr>
<tr>
<td>u +</td>
<td>h</td>
</tr>
<tr>
<td>*%t₂ h</td>
<td>a + e₃, b₃</td>
</tr>
<tr>
<td>o +</td>
<td>b₃</td>
</tr>
<tr>
<td>*%d +</td>
<td>e + d₃, d₃, h</td>
</tr>
<tr>
<td>a +</td>
<td>e₃, d₃, q₃, h</td>
</tr>
<tr>
<td>o +</td>
<td>q₃, h</td>
</tr>
<tr>
<td>i +</td>
<td>d₃</td>
</tr>
<tr>
<td>u, u: + d₃, d₃, b₅, h</td>
<td></td>
</tr>
<tr>
<td>e +</td>
<td>h</td>
</tr>
</tbody>
</table>

* applies to all voiced aspirated stops.
<table>
<thead>
<tr>
<th>First syllable</th>
<th>Murmured</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ p</td>
<td>ə +</td>
</tr>
<tr>
<td></td>
<td>a +</td>
</tr>
<tr>
<td></td>
<td>o +</td>
</tr>
<tr>
<td></td>
<td>i +</td>
</tr>
<tr>
<td></td>
<td>i: +</td>
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<tr>
<td></td>
<td>u +</td>
</tr>
<tr>
<td></td>
<td>e +</td>
</tr>
<tr>
<td>+ r</td>
<td>ŋ +</td>
</tr>
<tr>
<td>+ b</td>
<td>ɔ +</td>
</tr>
<tr>
<td></td>
<td>a +</td>
</tr>
<tr>
<td></td>
<td>o +</td>
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<tr>
<td></td>
<td>i +</td>
</tr>
<tr>
<td></td>
<td>u +</td>
</tr>
<tr>
<td></td>
<td>u: +</td>
</tr>
<tr>
<td></td>
<td>e +</td>
</tr>
<tr>
<td>* b</td>
<td>ʌ +</td>
</tr>
<tr>
<td>* m</td>
<td>ə +</td>
</tr>
<tr>
<td></td>
<td>a +</td>
</tr>
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<td></td>
<td>o +</td>
</tr>
<tr>
<td></td>
<td>i +</td>
</tr>
<tr>
<td></td>
<td>i: +</td>
</tr>
<tr>
<td></td>
<td>u +</td>
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<tr>
<td></td>
<td>u: +</td>
</tr>
<tr>
<td></td>
<td>e +</td>
</tr>
<tr>
<td>* j</td>
<td>ə +</td>
</tr>
<tr>
<td></td>
<td>a +</td>
</tr>
<tr>
<td></td>
<td>o +</td>
</tr>
<tr>
<td></td>
<td>u +</td>
</tr>
<tr>
<td>First syllable</td>
<td>Murmured</td>
</tr>
<tr>
<td>---------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>r</strong> +</td>
<td>e +</td>
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<tr>
<td></td>
<td>a +</td>
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<td></td>
<td>o +</td>
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<td>i +</td>
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<td>i: +</td>
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<tr>
<td></td>
<td>u +</td>
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<td>u: +</td>
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<td><strong>i</strong> +</td>
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<td>e +</td>
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<tr>
<td><strong>v</strong> +</td>
<td>e +</td>
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<td>i: +</td>
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<td><strong>f</strong> +</td>
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<td>i: +</td>
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<td>u +</td>
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</table>
The above list clearly indicates the limited distribution of 'breathy vowels'. When voiceless unaspirated stops are in the initial position ([k, tʃ, t, t, p]), the possibilities of murmur causing environments are less than when the voiced unaspirated stops [g, dʒ, ʤ, d, b] are in initial position. When voiceless aspirated stops are in the initial position the said possibilities are even less e.g., in case of [ ʃ h, (p h)] the possibility is zero. When [l, r, v, j, s, ʃ] and [m, n] the initial position, the possibilities are many more. We can roughly say that murmur is caused by 'voiced breath' and 'voiced breath' expresses itself more fully and freely. When voiced sounds (voiced stops, liquids, nasals, and sibilants) are around. This expression is indicative of a highly
natural phonetic phenomenon. First of all 'h' as a laryngeal production gets voiced 'h' in the 'voiced environments' and transfers 'voiced breath' to the same vowels which are responsible in making it 'voiced'! It thus is the cause for 'murmuredness of the vowels but at the same time the 'voice' prosody is implied: in the sense that 'voiced breath' is more easily transferred when the consonants too are voiced! We get convinced of the requirement of seeing beyond a sound segment. As Firth has again and again insisted we have to accept that "whatever units we may find in analysis must be closely related to the whole utterance, and that is achieved by systematic statement of the prosodies...In the perception of speech by the listener whatever units there may be are prosodically reintegrated".

Firth, 1957, p. 138.