

# Are the Mandarin Retroflex Initial Consonants Really Retroflex? Are the Palatals Really Palatal?... Notes on Terminology

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The purpose of my paper is to offer a detailed view on the terminology used for classifying the initial consonants of Mandarin and suggest particular solutions.

When I was a student I made a great discovery: when I pronounced the palatals **j, q, x**, I realized that the body of my tongue should not be raised straight up, but instead pushed a little more forward. It was a puzzle for me: why are these sounds called palatals then? I made a similar “discovery” with the retroflexes – I was astonished to learn I should not bend the tip of my tongue backwards – eventhough these sounds are called retroflexes... These early student experiences and frustrations served as a motivation of my present paper.

## Introduction

The terms such as **palatal, velar, retroflex** etc. are used both in phonetic description – to describe the actual articulation of the consonants, and in phonology – to classify the consonants within the system of a particular language (音位系统). If these terms are employed as **phonological “labels”**, only rough contrasting features are taken into account, while the phonetic details can be neglected.

According to Haynu Pinyin fang'an, there are 21 initial consonant phonemes (*shēngmǔ* 声母) in Mandarin, that is in *putonghua*:

**b, p, m, f, d, t, n, l, z, c, zh, ch, sh, r, j, q, x, g, k, h**

They can be arranged into several rows according to the place of their articulation. Most phonologists accept six rows:

<b>labial</b>	唇音	<b>b,</b>	<b>p,</b>	<b>f,</b>	<b>m</b>
<b>alveolar</b>	齿龈音	<b>d,</b>	<b>t,</b>	<b>n,</b>	<b>l</b>
<b>dental</b>	齿音	<b>z,</b>	<b>c,</b>	<b>s</b>	
<b>retroflex</b>	卷舌音	<b>zh,</b>	<b>ch,</b>	<b>sh,</b>	<b>r</b>
<b>palatal</b>	腭音	<b>j,</b>	<b>q,</b>	<b>x</b>	
<b>velar</b>	软腭音	<b>g,</b>	<b>k,</b>	<b>h</b>	

The row “palatal” may be missing, as some authors consider these consonants as allophones of either **g, k, h** (e.g. Chao 1934, Howie 1976, Hsüeh 1986), or **z, c, s** (e.g. Hartman 1944, Hockett 1947, Dragunov & Dragunova 1955, Duanmu 2002, Lin 2007).

Each of the rows has a name which in most cases is based on the place of articulation. Some names can be different with different authors, as I will show later. These “labels” are not always phonetically accurate. In my paper I will first explore the **articulatory properties** of these rows in speech production. Then I will look at the **labeling terms**, as given by different authors, and try to find how accurately they express the articulation. Finally I will try to decide **what terms are the most appropriate**.

Let us look at the system of Mandarin consonants. The initial consonants can be arranged in **a table** which specifies the place of articulation and the manner of articulation. The active articulator – the tongue is given in italics. The affricates are in yellow. The table I am giving here is just a point of departure, as there may be different analyses in the literature.

### Initial consonants of Mandarin

<b>MANNER OF ARTICULATION</b> → <b>PLACE OF ARTICULATION ↓</b>	plosives and affricates		fricatives	nasals	laterals
	non-aspirated	aspirated			
<b>labials</b> ---	<b>b</b> [p]	<b>p</b> [p <sup>h</sup> ]	<b>f</b> [f]	<b>m</b> [m]	
<b>alveolars</b> <i>apical</i>	<b>d</b> [t]	<b>t</b> [t <sup>h</sup> ]		<b>n</b> [n]	<b>l</b> [l]
<b>dentals</b> <i>apical</i>	<b>z</b> [ts]	<b>c</b> [ts <sup>h</sup> ]	<b>s</b> [s]		
postalveolars <i>apical retroflex</i>	<b>zh</b> [tʂ]	<b>ch</b> [tʂ <sup>h</sup> ]	<b>sh</b> [ʂ] <b>r</b> [ʐ], [ʐ̥]		
<b>palatals</b> <i>dorsal</i>	<b>j</b> [tɕ]	<b>q</b> [tɕ <sup>h</sup> ]	<b>x</b> [ç]		
<b>velars</b> <i>dorsal</i>	<b>g</b> [k]	<b>k</b> [k <sup>h</sup> ]	<b>h</b> [x], [χ]		

The names of the rows are given in bold. As you can see, four rows are named according to the place of articulation, one according to the shape of the tongue, and one according to the shape of the lips.

If we explore these consonants more closely, we find out the following problems:

1. Various authors do not always agree on the **phonetic description** (and consequently also transcription) of particular rows. Let us take for instance, the row **d, t, n, l** and the row **z, c, s**. Some phoneticians think that the place of articulation of these two rows is slightly different, some think it is the same. Another example: the row **zh, ch, sh, r** is sometimes considered as postalveolar, sometimes prepalatal, sometimes alveopalatal.

Of course, this is partly caused by **the objective problems** the phoneticians have to deal with. E.g.: how to specify the regions of articulation and where to draw a borderline between them? We know the reality is a continuum – there are no discrete places of articulation. This problem is discussed in Ladefoged & Wu 1984:277.

Further, there might be a problem with transcribing the sounds. The categories of the International Phonetic Transcription (IPA) do not represent any particular sound system – IPA should be usable for any language, so the tables cannot be overly detailed. Consequently, some categories have to be interpreted slightly differently for different languages (for instance the category “retroflex”, as I will show later).

Also, some categories we might need may be missing. For instance there is no column “alveopalatal” in the IPA consonant chart. The only two alveopalatal fricatives **ç, ʒ** can be found among *Other symbols*. Further, the phoneticians have to cope with the **variability among the speakers**. These may be quite noticeable, yet still acceptable within the norm.

2. While choosing a **phonological label**, different authors can take different routes of abstractions. This also holds true for the analyses of Mandarin consonants. For instance, the row **j, q, x** is sometimes termed **palatal row** according to the passive articulator, sometimes **dorsal row** (舌面音 *shémiàn yīn*) according to the active articulator.

The result of these disagreements is **a terminological diversity**. For instance, the consonants **zh, ch, sh, r** may be called “retroflexes” (Chao 1968), “alveopalatals” (Kratochvíl 1968), “back apicals” (Wu 1992) or “postalveolars” (Lin 2007).

Now I will go through all six consonantal rows, discuss their articulation and the terms used for naming the rows. For the sake of simplification I will use the expression “the Chinese authors” to refer to the authors writing in Chinese who base their analysis on *Hanyu Pinyin*. All diagrams I will present here are of course based on the articulations of the native Beijing speakers.

I will start from two rows which are least problematical:

## **The row b, p, m, f**

We can skip this row, as it is generally termed as **labial row** (there are three bilabial sounds and one labiodental sound). Transcriptions [p], [p<sup>h</sup>], [m], [f] are commonly accepted. Just one remark: some authors (Kratochvíl 1968, Lin 2007) prefer to establish two separate groups: bilabial and labiodental.

## **The row g, k, h**

This row is articulated in the velar area.

### Position of the tongue

Let us look at the diagrams of sagittal sections of three native speakers articulating the consonant **h**:

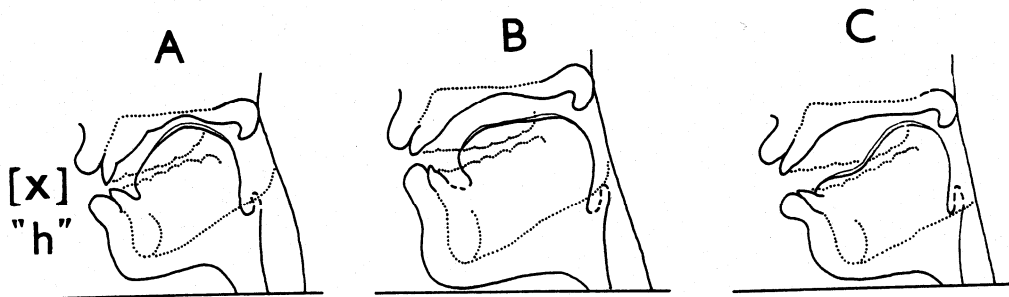


Fig. 1: **h** [x] (Ladefoged & Wu 1984, three native Beijing speakers)

We can see the back part of the dorsum is raised. Thus this row is mostly described as **dorsal back**. However, there are only few Chinese authors who use the term *shémiàn hòu yīn* 舌面后音, “dorsal back” (e.g. Cao 2002). Most often they consider this row as *shégēn yīn* 舌根音, that is **radical** (Wu 1992, Xu 1999).

### Place of articulation

The first two members of the row (**g**, **k**) are definitely velar. Now the third member, **h**. Let us look again at the diagrams to find out where exactly this sound is articulated. We can see the place of the stricture is not the same for all speakers. Ladefoged & Wu 1984 point out that this consonant displays a considerable variability among the speakers. Furthermore, there are another factors which may influence the position of the tongue: e.g. we can observe the influence of the following vowel: *hē* 喝 – *hǎo* 好.

So, the answer for **h** is not so straightforward. Most often **h** is considered a **velar fricative** [x] (Wu 1992, Lee & Zee 1999, Ladefoged & Wu 1984, Lin 2007). Some authors hold that it is an **uvular fricative** [χ] (Chao 1968, Pulleyblank 1984). Duanmu 2002 even admits a possibility of **glottal fricative** [h], such as in English *hard* (where it sometimes can be a voiced [ɦ], though). However, this is not considered a standard pronunciation.

### Phonological term

Most often **g**, **k**, **h** is termed a “**velar row**”. There are some exceptions, though, which result from the phonetic analysis: Chao names the row “**guttural row**” (adding a zero initial here as the fourth member), while Pulleyblank has “**velar / uvular row**”. The Chinese authors mostly call it *shégēn yīn* 舌根音.

### Discussion

For **h** we can count with the pronunciation [x]. Besides we can consider other allophones: uvular [χ], and possibly with some divergency from the norm also glottal [h] (thus **h**: [x], [χ], [h]). In phonology, we can stick to the traditional term “**velar**”.

## Consonants articulated in a broader region of the upper alveolar ridge

Now let us proceed to a more difficult area. That is the **upper gum ridge, upper teeth and the front part of the palate** (coronal consonants) Here the discrepancies in terminology are much more common.

### General remarks

Many consonants are articulated in this area. There are four categories covering this region in the IPA: dental, alveolar, postalveolar, retroflex. The name of the fourth category is not motivated by the place of articulation, but by the shape of the tongue. The columns are densely occupied:

Dental	Alveolar	Postalveolar	Retroflex
t d			ɖ ɗ
n			ɳ
r			
ɾ			ɻ
θ ð	s z	ʃ ʒ	ʂ ʐ
t̪ t̝			
ɹ			ɻ
l			ɭ

**Fig. 2:** The IPA - part of the consonant chart

We can see that the first three categories merge into one column – except for the fricatives. This leaves space for some modifications which might be needed for a particular language. The fourth category, retroflex, needs a different interpretation in different languages.

Now let us look at the involvement of the **tongue**. For this area, the front part of the tongue comes into play. The tongue is a very flexible organ and can take different positions. Various articulations may be used, according to what part of the tongue is involved in articulation:

- **anterodorsal** articulation 舌面前
- **laminal** articulation 舌叶 lamina (= small region right behind the tip)
- **apical** articulation 舌尖 tip of the tongue
- **sub-apical** articulation 舌尖下 the underside of the tip

I did not add a **retroflex articulation** (卷舌) as an independent item. That is because it is split: the markedly retroflex articulation are identified with sub-apical articulation, the “less retroflex” ones may be placed among apical articulations (see below).

### Mandarin

There are four rows of consonants articulated in this region in Mandarin:

<b>alveolar</b>	齿龈音	<b>d,</b>	<b>t,</b>	<b>n,</b>	<b>l</b>	} apical
<b>dental</b>	齿音	<b>z,</b>	<b>c,</b>	<b>s</b>		
<b>retroflex</b>	卷舌音	<b>zh,</b>	<b>ch,</b>	<b>sh,</b>	<b>r</b>	
<b>palatal</b>	腭音	<b>j,</b>	<b>q,</b>	<b>x</b>		

There is a **disagreement** in the literature both about their phonetic description and about the names of the rows. The authors agree, though, that the first three rows are pronounced with the tip of the tongue, that is they are **apical**.

Chinese authors usually use different labels motivated rather by the tongue, not by the place of articulation within the oral cavity (Wu 1992, Huang & Liao 1997).

<i>shéjiān zhōng yīn</i>	舌尖中音	(“apical central”)	<b>d, t, n, l</b>
<i>shéjiān qián yīn</i>	舌尖前音	(“apical front”)	<b>z, c, s</b>
<i>shéjiān hòu yīn</i>	舌尖后音	(“apical back”)	<b>zh, ch, sh, r</b>
<i>shémiàn yīn</i>	舌面音	(“dorsal”)	<b>j, q, x</b>

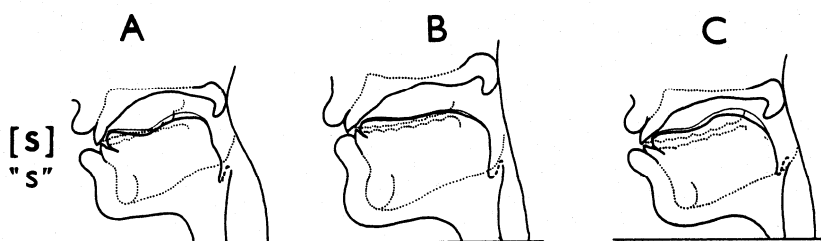
We can run into some minor differences: e.g. the row **d, t, n, l** is sometimes called only “apical” (Xu 1999, Cao 2002), or the row **zh, ch, sh, r** is sometimes called 卷舌音.

Now let us examine the particular rows.

## The rows **d, t, n, l,**      **z, c, s**

### Position of the tongue

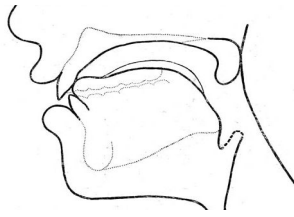
These are sagittal sections of s [s] pronounced by three speakers:



**Fig. 3:** Tongue position for s (Ladefoged & Wu 1984, three native Beijing speakers)

The tip of the tongue is slightly raised and touches the front alveolar and/or dental region. We can observe a concave dipping of the tongue for all three speakers.

Now let us check the sagittal section for **d**.



**Fig. 4:** Tongue position for **d** (Zhou & Wu 1963)

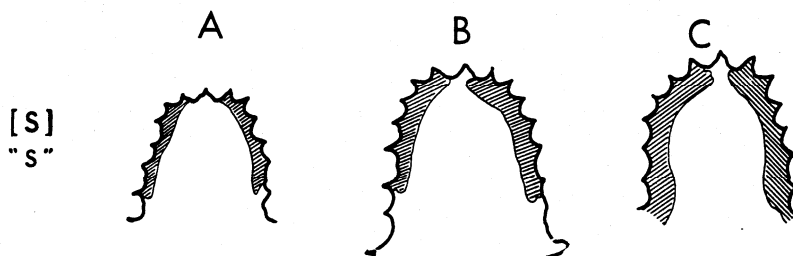
We can see that the tongue position is rather similar for both consonants, i.e. for both **s** and **d**. They are both articulated with the tip of the tongue. Most authors agree upon **apical** articulation for both rows. I found only one exception, suggesting partly **laminal** articulation: it is the phonetic study of Lee & Zee 1999. For **d, t, n** they give apico-laminal, for **z, c, s** apico-laminal or laminal. Only **l** is apical according to them.

Zhou & Wu 1963 found out that with **z, c, s**, the tip of the tongue is sometimes located next to the lower teeth. In that case the articulation is **dorsal**, NOT apical.

Ladefoged & Maddieson 1994 notice that for **z, c, s** the body of the tongue shows slight dipping, which does not hold for **d, t, n, l**. Yet we may observe the dipping on the sagittal section for **d** as presented at Fig. 4.

**Place of articulation:**

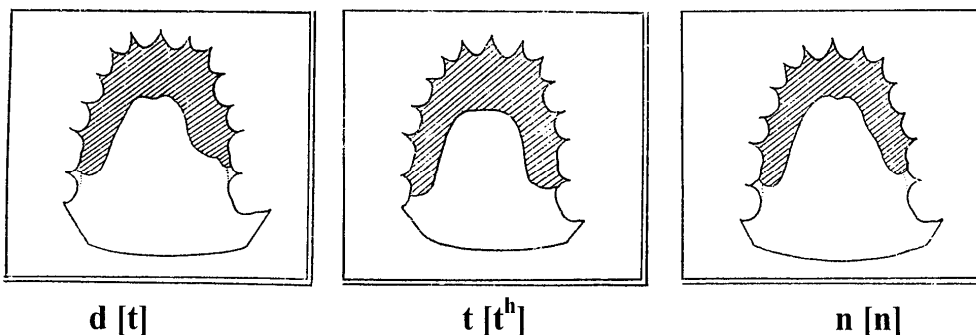
Is the place of articulation of these two rows the same? Let us look at the palatograms. They suggest there MIGHT BE a minor difference: First let us explore the row **z, c, s**, namely the fricative **s**:



**Fig. 5:** Palatograms of **s** (Ladefoged & Wu 1984, three native Beijing speakers)

We can see that the contact of the tongue with the alveolar ridge is quite narrow (although we observe certain variability). It follows that part of the tongue edges touches the upper teeth.

Now let us take a look at **d, t, n**:



**Fig. 6:** Palatograms of **d, t, n** (Zhou & Wu 1963)

The articulation is slightly more backwards here. It hits a larger part of the alveolar ridge, the contact area is quite broad. However, this does not have to be the rule. Look at another palatograms of **d, t** offered by another study (one speaker):

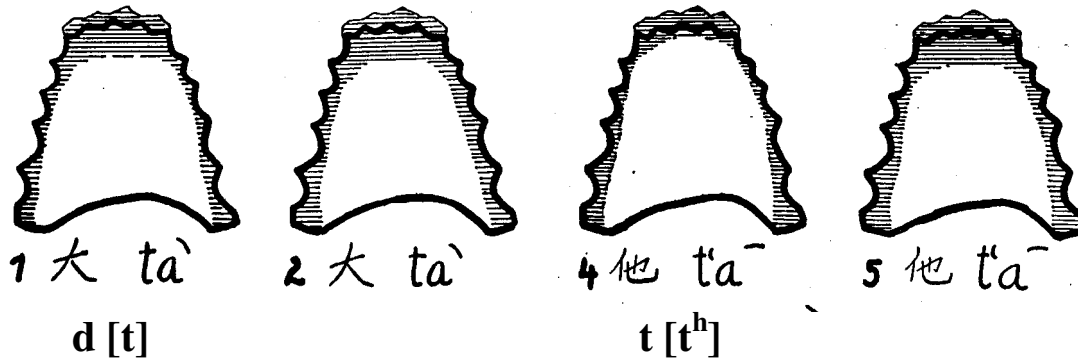


Fig. 7: Palatograms of **d, t** (Ohnesorg & Švarný 1955, one speaker)

The contact area is obviously not as broad here. We can conclude there is a considerable variability of pronunciation with different speakers.

What **localization** of the row **d, t, n, l** and the row **z, c, s** do we find in the literature?

- Some authors assume the place of articulation of both rows **is the same**.

However, they specify the place differently:

- **alveolar:** (i.e. the front part of the alveolar ridge) Ladefoged & Wu 1984, Pulleyblank 1984, Li 1999
- **dental:** Chao 1968, Howie 1976, Duanmu 2002, Lin 2007
- **denti-alveolar:** Lee & Zee 1999

- Some authors give two **different places**. Most of them assume that the row **z, c, s** is more front. However, Hsüeh assumes that **d, t, n, l** is more front.

- |                                      |                                       |                   |
|--------------------------------------|---------------------------------------|-------------------|
| - <b>z, c, s dental</b>              | <b>d, t, n, l alveolar:</b>           | Kratochvíl 1968   |
| - <b>z, c, s 上齿背 (= dental)</b>      | <b>d, t, n, l 上齿龈 (= alveolar):</b>   | Wu 1992, Cao 2002 |
| - <b>z, c, s 龈后 (= postalveolar)</b> | <b>d, t, n, l 龈前 (= prealveolar):</b> | Hsüeh 1986        |

### Transcription:

There is agreement in the literature on the following transcriptions:

[t], [t<sup>h</sup>], [n], [l]      [ts], [ts<sup>h</sup>], [s]

### Phonological terms

What are the names for these two rows used in the literature? They follow the phonetic analysis:

- Both rows are assigned the same place: “**dentals**” (Lin 2007), “**dentals**” **d, t, n, l**, and “**dental sibilants**” **z, c, s** (Chao 1968), “**alveolars**” (Pulleyblank 1984, Li 1999)



- Each row has a different label, e.g. “**alveolars**” **d, t, n, l**, “**dentals**” **z, c, s** (e.g. Kratochvíl 1968). The Chinese authors mostly use the terms *shéjiān zhōng yīn* 舌尖中音 (“apical central”) for **d, t, n, l**, *shéjiān qián yīn* 舌尖前音 (“apical front”) for **z, c, s**, as we already stated above.

Here is a small survey of the differences in labeling terms for **d, t, n, l** and **z, c, s**:

<b>d, t, n, l</b>	<i>dentals</i>	<i>denti-alveolars</i>	<i>alveolars</i>	<i>alveolars</i>	<i>prealveol.</i>	<i>apic. cent.</i>
<b>z, c, s</b>				<i>dentals</i>	<i>postalveol.</i>	<i>apic. front</i>
<b>authors</b>	Chao	Lee & Zee	Pulleyblank	Kratochvíl	Hsüeh	Wu

Which solution is the best? How to label these two rows after all? My opinion is that the difference in the place of articulation between **z, c, s** and **d, t, n, l**, if it exists at all, is very subtle. And even if minor differences exist, there is no need to reflect them in the classifying phonological terms. I suggest to label both rows as **denti-alveolar** (as Lee & Zee 1999 do).

Now: if we term both rows (**d, t, n, l** and **z, c, s**) as **dentialveolar** and **apical** (or apico-laminal), what is the difference between them? It is of course their manner of articulation:

the row **d, t, n, l** has two stops, one nasal and one lateral  
 the row **z, c, s** has two affricates and one fricative

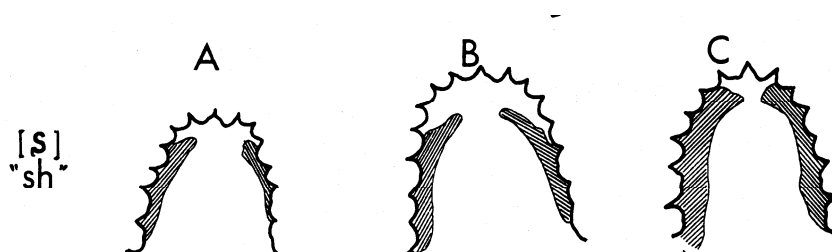
Last remark: the term dentialveolar is usually paired with the laminal, not apical articulation of the tongue; but Lee & Zee assume it is slightly laminal: *apico-laminal*.

## The row **zh, ch, sh, r**

This row is traditionally called the **retroflex row** (in Chinese *juǎnshé yīn* 卷舌音). This seems to suggest the tongue should be bent backwards. We shall check whether it is true. But first, let us look at the place of articulation of these consonants.

### Place of articulation

Here are the palatograms of the fricative **sh**:



**Fig 8:** Palatograms of **sh** (Ladefoged & Wu 1984, three native Peking speakers)

We can see the tongue is not in contact with the front teeth (this is clear at least for the speakers A and B). That means the place of articulation is more back than for the rows **z, c, s** and **d, t, n, l**. The tip of the tongue is thus free and could be possibly bent backwards. Obviously, the distance between the teeth and the tongue can vary among the speakers (typically it is larger with the Beijing speakers). Also, the width of the stricture can vary.

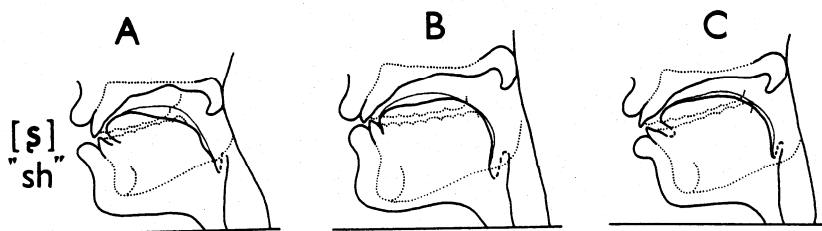
Different authors locate these sounds differently:

- **postalveolar** (Lee & Zee 1999, Lin 2007)
- **alveo(lo-)palatal**, i.e. slightly more back (Kratochvíl 1968)
- **prepalatal** (Ohnesorg & Švarný 1955)

The Chinese authors mostly give *qián yìng è* 前硬腭. i.e. **prepalatal** (Wu 1992, Xu 1999, Cao 2002).

### Position of the tongue

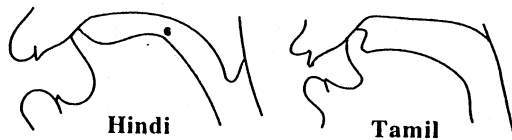
Most authors agree that this row is also pronounced with the tip of the tongue (as the previous two are). So in this sense the articulation is **apical**. However, the overall shape of the tongue is different from the previous two rows. Let us look at the sagittal sections for **sh** [ʃ]:



**Fig. 9:** Tongue position for **sh** (Ladefoged & Wu 1984, three native Peking speakers)

We can see the tip of the tongue is raised against the post-alveolar region. The concave dipping may or may not be present. The tongue is slightly retracted. Although the three speakers slightly differ, in any case it is clear **the tongue is not bent backwards**. It was proved by the instrumental studies a long time ago (i.e. Ohnesorg & Švarný 1955). The articulation is made with the surface of the tip (or, as Lee & Zee or Ladefoged & Maddieson 1994 assume, even laminaly), but definitely NOT with the underside of the tip! In spite of a considerable variability of pronunciation, no Chinese speaker articulates these sounds subapically (as Lee & Zee 1999 point out). That is why the phoneticians mostly prefer to avoid the term retroflex, or at most speak of “so called retroflexes” (e.g. Ladefoged & Wu 1984; of course they stress the need of the adequate interpretation of the term).

Now, it might be useful to explore the **retroflex consonants in other languages**. Let us take a look at two languages of India: Hindi (Indo-Aryan language) and Tamil (Dravidian language). The retroflex consonants in Indian languages are traditionally called **cerebrals**. The term is not homogenous, though, as the degree of retroflexion can be different in different languages (Švarný & Zvelebil 1955). We shall compare the retroflex postalveolar stops of Hindi and Tamil.



**Fig. 10:** Hindi [ɖ]                      Tamil [ɖ̠] (Ladefoged & Maddieson 1994:27)

- **in Hindi**, the tongue is raised against the post-alveolar region, but it is not curled backwards. The articulation is made with the edge of the tip
- **in Tamil**, the tongue is also raised against the postalveolar region, but the articulation is made with the underside of the tongue tip: it is sub-apical.

How come all these different sounds (such as in Mandarin, Hindi, Tamil) are called “retroflex”? The answer is that the term **retroflex** is somewhat vague. It is used for a rather broad group of articulations in the postalveolar region made with the tip of the tongue. The tip is lifted, and it can be more or less curled up and backwards. So the term is used both for markedly retroflex articulations, such as in Tamil, as well as for the less “retroflex” sounds such as in Hindi, and for even yet less “retroflex” sounds such as in Mandarin. It follows that the term “**retroflex**” must be interpreted differently in different languages.

### Transcription

IPA has only one set of retroflex symbols – those with a tail: [ɖ], [ʂ], [ʐ] etc. So how to express the difference between “more” and “less” retroflex sounds in various languages? Ladefoged and Maddieson offer the following solution: for the “less retroflex” sounds (which are not sub-apical) they suggest different symbols: the **alveolar symbols with a dot**, e.g. [ɖ̣, ɖ̣̣, ɖ̣̣̣]. In this way various degrees of retroflexion can be captured. However, this sort of transcription is not a commonplace. It was not accepted in the IPA. We can run into a “dotted” transcription of Mandarin retroflexes quite seldom.

We may find the following solutions for the Mandarin consonants **zh, ch, sh, r**:

- Absolute majority of authors use the IPA symbols for the retroflex fricatives [ʂ], [ʐ]. The row is thus transcribed as [tʂ], [tʂʰ], [ʂ], [ʐ] (Chao 1968, Kratochvíl 1968, Hsüeh 1986, Norman 1988, Ladefoged & Wu 1984, Wu 1992, Cao 2002, Lin 2007).
- Other, less frequent transcriptions employ the **alveolar symbols** with a dot: [ʂ̣], [ʐ̣], as suggested by Ladefoged & Maddieson 1996. Long before them other authors used this notation: Hartmann 1944, or Howie 1976: [tʂ̣], [tʂ̣ʰ], [ʂ̣], [ʐ̣]. Cheng 1974 writes [č̣], [č̣ʰ], [ʂ̣], [ṛ]. Lee & Zee 1999 have a different solution, which stays within IPA conventions: as they see these sounds as **apical postalveolars**, they use a symbol for postalveolar fricative [ʃ] and add a special diacritic (“staple”) to indicate the articulation is apical (not laminal or dorsal): they write [tʃ̣], [tʃ̣ʰ], [ʃ̣], [ṛ].
- Dragunov & Dragunova 1955 do not express the particular position of the tongue at all: they have [dž], [tšʹ], [ṣ̌], [ṛ̌] (perhaps because Russian has the retroflex sounds [ʂ], [ʐ])

Note that the consonant **r** is mostly treated as a voiced counterpart of the fricative **sh** (thus [ʂ] - [ʐ]) However, many authors prefer to view it as an approximant (Pulleyblank 1984, Lee &

Zee 1999, Duanmu 2002). It is transcribed either as a **retroflex approximant** [ɻ], or, less frequently, as a **postalveolar approximant** [ɻ̠]. Some authors view [ʐ], [ʐ̠] are free variants of the phoneme /r/ lately (we can observe a considerable variability of pronunciation).

### Phonological term

The absolute majority of authors labels this row as a **“retroflex row”** (Chao 1968, Wang 1963, Howie 1976, Pulleyblank 1984, Hsüeh 1986, Norman 1988, Duanmu 2002). Some of them point out that the real articulation is not really retroflex, but some don't. Lin 2007 is an exception: she prefers to avoid the term “retroflex row”. She labels these sounds as **“postalveolar row”** (and points out that the articulation is not retroflex). The Chinese authors mostly use the term *shéjiān hòu yīn* 舌尖后音 (“apical back”). Sometimes we can see *qiáoshé yīn* 翘舌音, i.e. “cacuminal” (lat. *cacumen* = “the tip”). The term *juǎnshé yīn* 卷舌音 i.e. “retroflex” is used occasionally.

### Discussion

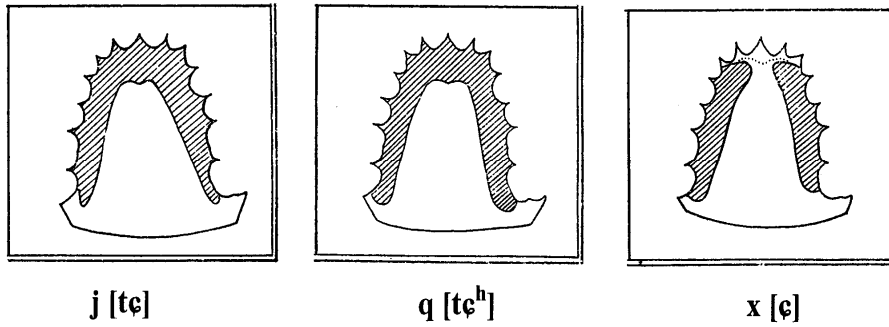
We may wonder whether it is appropriate to label **zh, ch, sh, r** as a **“retroflex row”** in a **phonological description**? As we showed above, a general term can have different interpretations in different languages. So it is for Mandarin. The term “retroflex” does not necessarily imply that the tongue is bent backwards. We do not need to be overly strict in phonological description, as the main issue is the contrast. As Ladefoged & Maddieson 1996 point out, no language is known which contrasts apical and sub-apical retroflexes. For this reason, I think we can keep the traditional term **“retroflexes”** (eventhough there is an alternative: to call the row **“postalveolars”**, as Lin 2007 does). A **phonetic description** is a different matter. We have to use the term “retroflex” more carefully. The main point that has to be made is that the articulation is apical, not sub-apical. I recommend to avoid the term „retroflex“ in the phonetic description at all. It is better to speak about **postalveolar apical sounds**. In **transcription** we can stick to the tradition and use the retroflex IPA symbols. i.e. [ʈʂ], [ʈʂʰ], [ʂ], [ʐ]. I believe that the more exact transcription, such are the “stapled” or “dotted” symbols, is not necessary. Yet, these symbols must be given a proper interpretation. (Ladefoged and Maddieson felt a need for fine differentiation as they were comparing various languages of the world, whereas we are describing just Mandarin).

## The row j, q, x

This row is traditionally called a **“palatal row”**. This seems to suggest the dorsum of the tongue must be raised straight up against the palate. Let us see whether it is the case.

### Place of articulation

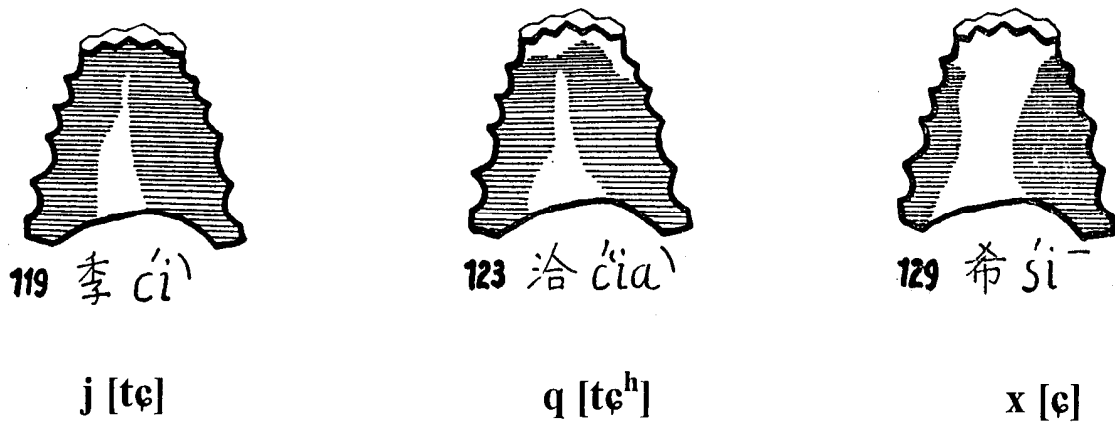
Which part of the palate comes into play? Let us look at the palatograms:



**Fig. 11:** Palatograms of **j, q, x** (Zhou & Wu 1963)

We can see the imprint of the tongue is rather narrow, that means the body of the tongue is obviously not lifted straight up, but presses to somewhat more front region. The roof of the mouth is not affected here. We can say the articulation is about **alveolo-palatal**.

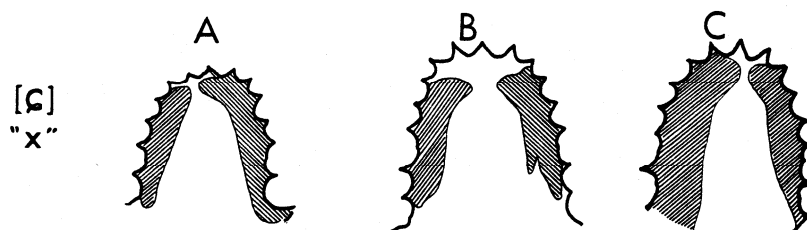
However, this does not have to be the truth with every speaker. Look at other palatograms:



**Fig. 12:** Palatograms of **j, q, x** (Ohnesorg & Švarný 1955)

Obviously, the contact of the tongue with the palate is much larger here. In case of **q, x** we can even observe a distance between the tongue and the front teeth. So in this case we can speak of **palatal articulation**.

Again, these consonants may be pronounced in different ways by different speakers. Here is another proof of the variability among the speakers. These are three speakers pronouncing the fricative **x**:



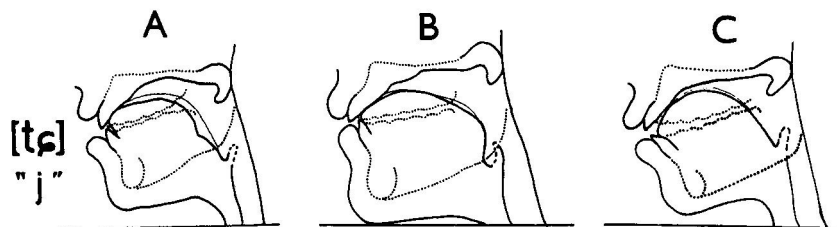
**Fig. 13:** Palatograms of **x** (Ladefoged & Wu 1984, three native Beijing speakers)

So after all: are these sounds true palatals, or are they articulated in slightly more front region? I did not find any phonetic description which speaks of a purely palatal articulation. Most often the articulation is described as **alveolo-palatal**. Ladefoged & Maddieson 1996 call them **alveolo-palatals**, or alternatively **palatalized post-alveolars** (they explicitly say they avoid the term palatal, which has to be reserved for the sounds articulated more back). Also Ladefoged & Wu 1984 and Lin 2007 regard them as **alveolo-palatals**. Ohnesorg & Švarný 1955 consider them as **palatalized postalveolars**. Lee & Zee 1999 are very detailed: **j, q = alveolo-palatal, x = postalveolar or prepalatal** (note that retroflexes are postalveolar for him).

The Chinese authors slightly differ. They locate the articulation at *qián yìng è* 前硬腭, i.e. front palate, i.e. the consonants are **prepalatal** (Zhou & Wu 1963, Wu 1992, Huang & Liao 1997, Xu 1999).

### Position of the tongue

Let us look at the sagittal section for the affricate **j**:



**Fig. 14:** Tongue position for **j** [dʒ] (Ladefoged & Wu 1984, there native Beijing speakers )

The body of the tongue is convexly bulged against the front part of the mouth roof and the back of the alveolar ridge. The convex shape is especially obvious with the third speaker. The tip of the tongue is lowered and rests behind the lower teeth. So we can see the tongue position is quite different from that of the retroflexes. That is why the beginners have troubles pronouncing the words like *xiānsheng, zhūiqiú, qìchē, zìxíngchē* etc.

Now which part of the tongue is involved in the articulation? It is not the whole dorsum, but the front part of it. Thus, most often we meet (**antero**)**dorsal** specification (Ohnesorg & Švarný 1955, Hsüeh 1986). Very detailed description is again offered by Lee & Zee 1999. For **x** they give **lamino-anterodorsal**, while **j, q** can be either **lamino-anterodorsal** or **apico(!)-anterodorsal**. Chinese authors also use *shémiàn qián bù* 舌面前部 (Zhou & Wu 1963, Wu 1992, Xu 1999, Huang & Liao 1997, Zhu 1997, Cao 2002). Norman 1988 speaks of **laminal articulation**, which is unusual.

### Transcription

Commonly accepted transcription is this: **j** [tʃ], **q** [tʃʰ], **x** [ç]. We can see the symbol for the **alveolo-palatal** fricative [ç] is employed. Very seldom we can see the use of the symbol for the **palatal fricative** [ç] (Duanmu 2002). He writes **j** [tʃ], **q** [tʃʰ], **x** [ç]. This is not correct, as it does not reflect the real place of articulation. The sound [ç] represents German *ich-Laut* which is really palatal and sounds quite different.

### Phonological term

- Most authors prefer the traditional term “**palatal row**”, such as Chao 1968, Kratochvíl 1968, Pulleyblank 1984 etc. Some of them point out that the articulation is not purely palatal (Norman 1988, Lee & Zee 1999). If someone uses the term “**alveolo-palatal**” (Ladefoged & Maddieson 1996:149, Ladefoged & Wu 1984), or “**postalveolar palatalized**” (Ohnesorg & Švarný 1955), it is a phonetician, not a phonologist.
- The Chinese authors prefer to use the term based on the active articulator: they speak about a “**dorsal row**” 舌面音 *shémiàn yīn* (Wu 1992, Xu 1999, Huang & Liao 2002, Cao 2002, also Hsüeh 1986).

### Discussion

The term “**palatal row**”, as we saw, does not reflect the place of articulation in detail. It can be even misleading, especially in second language teaching (as I found out with myself and my students). Unless the students are correctly instructed, they attempt to pronounce these sounds as pure palatals, e.g. they pronounce **x** as [ç].

So would it be better to rename the row and call it “**alveolo-palatal**” instead? I do not think so. As I pointed out already, it is not necessary to capture the phonetic detail while labeling the sounds phonologically. There is no contrast between palatal and alveopalatal sounds in Mandarin. We may thus stick to the traditional term “**palatal row**”.

## CONCLUSIONS

We discovered that some **classifying terms** for the rows of Mandarin consonants do not correspond in detail with the articulation. My conclusions follow:

(1) In **phonology**, that is in classification, I suggest to stick to the traditional terms “**palatal row**” and “**retroflex row**”, even though they are not phonetically accurate. They are quite sufficient as the labels. They have been commonly accepted in the literature for many years, they are short and easy to remember/pronounce. Introducing a new term (e.g. “postalveolar row” for **zh, ch, sh, r**) might have more disadvantages than advantages. There is no need to be overly meticulous when choosing the classifying terms.

(2) We must not expect the phonetic precision from the phonologic terms. Most often they pick up only one single feature (usually the place of articulation, which may be only approximate) and neglect other features. However, as Ladefoged & Wu 1984 point out in their study of Mandarin fricatives and affricates, the whole shape of the vocal tract is important. The location of the stricture even does not have to be particularly critical for some sounds. For instance, the difference between the place of articulation of **zh, ch, sh, r** and **j, q, x** is very subtle. The major difference is in the shape of the tongue (Ladefoged & Maddieson 1994). The teeth position may also be very important: the closeness of upper and lower teeth may create a secondary source of friction, such as for **s, sh, x**. It follows the informative value of the classifying terms must not be overrated.

(3) Because the labeling terms are not exact, nor comprehensive, they need a correct and sufficiently detailed **phonetic interpretation**, giving all relevant phonetic details. At the same time, the phonetic description should avoid being too narrow and dogmatic. It should leave some space and count with a certain degree of variability among the speakers (even for one speaker).

(4) We should always make clear when a particular term is used for **phonetic description**, and when it is used as a term in **phonological classification**. Otherwise we risk confusion, e.g. in second language teaching.

(5) The rows **d, t, n, l** and **z, c, s** are sometimes (though not always) labeled as articulated at slightly different places (alveolar x dental). Even if it was true, this level of detail in phonology is inconsistent with a more generous approach applied to the rows “palatal” and “retroflex”. Furthermore, it is even doubtful whether the places of articulation are really and noticeably different. Possibly these two rows are labeled differently for convenience: it is more practical to have two distinct labels for them. Nevertheless, I assume, together with Lee & Zee 1999, that these two rows generally have the same place of articulation, i.e. **denti-alveolar**. Consequently, I suggest to label all these consonants as „**denti-alveolars**“ in phonological classification. The two denti-alveolar rows are sufficiently distinguished by the manner of articulation feature: **z, c, s** may be called “**denti-alveolar sibilants**“, while **d, t, n, l** simply “**denti-alveolars**“. Or (if we wish to be more explicit) “**denti-alveolar non-sibilants**“.

(6) I tried to map out various solutions and analyses. I found out that there is **no canonical analysis** for the Mandarin initial consonants – both in phonetic description (including the transcriptions) and in phonological classification. Literally every row has more than one alternative labels in the literature. I arrived at the following version of classification (the articulatory phonetic features are based on Lee & Zee, even though mine are somewhat less detailed):

	<b>label</b>	<b>place of articulation</b>	<b>tongue</b>
<b>b, p, f, m</b>	labials	bilabial, labiodental ( <b>f</b> )	- - -
<b>d, t, n, l</b>	denti-alveolars	denti-alveolar	apico-laminal
<b>z, c, s</b>	denti-alveolar sibilants	denti-alveolar	apico-laminal
<b>zh, ch, sh, r</b>	retroflexes	postalveolar	apical
<b>j, q, x</b>	palatals	alveolo-palatal	anterodorsal
<b>g, k, h</b>	velars	velar, uvular ( <b>h</b> )	dorsal back

**Fig. 15:** A table of Mandarin initial consonants

The IPA consonant chart may be found in the Appendix below



## Appendix:

### THE INTERNATIONAL PHONETIC ALPHABET (revised to 2005)

CONSONANTS (PULMONIC)

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	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b			t d		ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ		n		ɳ	ɲ	ŋ	ɴ		
Trill	ʙ			r					ʀ		
Tap or Flap		ⱱ		ɾ		ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative				ɬ ɮ							
Approximant		ʋ		ɹ		ɻ	j	ɰ			
Lateral approximant				l		ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

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