Practical Phonetic Exercises

J.C. Catford and Peter Ladefoged

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Practical Phonetic Exercises

Nobody can hope to get very far in the study of linguistics without some knowledge of phonetics; and any such knowledge cannot be entirely theoretical, but must involve a practical component. A linguist should be able to produce the sounds he describes; and he should be able to reproduce sounds described by others. He should also have a familiar knowledge of all the terms used in taxonomic phonetics. It is hoped that this set of practical exercises will help him achieve all these aims.

The phonetic symbols used are those of the International Phonetic Association, except for the deficiencies of our typewriter (an IBM Selectric with a Camwil element, P/N 113-M), and except for the deficiencies of the IPA system, such as the lack of a diacritic for laryngealization. In presenting the main set of exercises the symbols have been introduced in a logical order; but in the illustrations of contrasts in actual languages we have sometimes had to use symbols which have not been previously presented. We suggest that these exercises, which are marked by a prefixed L, should be attempted in their correct sequence (provided there is an instructor who can be imitated) and then reviewed again later.

The exercises collected here are a development of a set originally prepared by us for use in the Phonetics Department of the University of Edinburgh. Undoubtedly the influence of David Abercrombie, the Head of that Department, and Elizabeth Uldall, who taught with us, is apparent throughout. We would also like to thank all the teaching assistants who have worked with us, especially Mona Lindau.
Pulmonic air-stream mechanism

1.1 Say a long [fff]. Observe the two components of this sound:
(i) pulmonic egressive initiation (or air-stream mechanism), and
(ii) contact between lower lip and upper teeth — articulation.

1.2 Practice a pulmonic ingressive air-stream (i.e. inhaling) a long
[fff].

1.3 Alternate pulmonic egressive and ingressive air-stream, with
various articulations, e.g. [ssaa, ssxx, ttt].

1.4 Try talking with a pulmonic ingressive air-stream, saying a wide
variety of different sentences. Can you count as far on one breath
in this way? What words are particularly difficult to say?

States of the glottis

2.1 Voiced - voiceless

Note that articulation and initiation remain the same. In passing
from [f] to [v] the state of the glottis alters in that the vocal
cords start vibrating.

2.2 Produce a sustained pulmonic egressive air-stream, plus a sustained
labio-dental articulation, i.e. the position for [f]. While doing
this, alternately add and subtract voice, i.e. say [ffvvffvvff].
Repeat with [s] and [z] articulations, e.g. [sszzsszzss] etc.

2.3 Tests for voice

(i) Place thumb and forefinger on the sides of the larynx, and
say [ffvvffvv]. Note that during [vv] the vibration of the vocal
cords can be slightly felt by the thumb and finger.

(ii) Close the ears. While keeping them closed say [ffvvffvv].
Note that during [ff] only a faint hiss can be heard. During [vv]
the head seems to be filled with a loud buzzing sound. Repeat
with [sszzsszz], [ţţţţţţţţ] and [ţţţţţţţţ].

(iii) Note that a voiced sound can be sung on different pitches.

(iv) There are also several instrumental tests for voice.

2.4 Practice subtracting voice from other sounds, keeping them other-
wise unchanged: (The sign [o] underneath a symbol indicates that
the corresponding sound is voiceless.)

Produce [nnn] then [ggg]; alternate [nnnnnnnnn]. Repeat this
exercise with [m] and [f], [l] and [ˈɛ] and [ɛ].
L.1 Note the following contrasts in Burmese: —

mâ healthy  nâ pain  qa fish
qâ order  qâ nostril  ñâ rent
lâ moon
jâ beautiful

Voiced, voiceless unaspirated and aspirated plosives

2.5 Say a sequence of the form [aba], which is voiced throughout. Now try to prolong the b closure, while making sure that you still maintain the voicing all through the sequence.

2.6 Produce an initial fully voiced [b] followed by a vowel.

2.7 Make a series of bilabial plosives followed by vowels, starting with a fully voiced [b], then gradually reducing the voicing during the closure till you make a voiceless unaspirated plosive followed by a vowel; continue the series gradually increasing the duration of the aspiration. (The terms voiced - voiceless are used to describe the state of the glottis during a closure; and the terms aspirated - unaspirated are used to describe the absence - presence of vocal cord vibration during the release of the closure.)

2.8 Repeat exercises 2.5 to 2.7 with alveolar and velar articulations.

2.9 Practice these exercises until you are sure that you can produce three clearly differentiated plosives (1) voiced, (2) voiceless unaspirated, (3) aspirated, at each point of articulation.

L.2 Note the following contrasts in Sindhi (an Indian language): —

beni curse  benu forest  penu leaf  phenu snake  benenu lamentation
daru door  teru bottom  theru district  daru trunk of body
sagi braid  bagl buggy  jokl suspic-  sakhl girl  sagl healthy
tail cious friend

2.10 Learn to produce a period of voicelessness during phase I of a voiceless stop (plosive) consonant, e.g. say [ahp, aht, ahk]. Stops of this kind are called preaspirated. The preaspiration may coincide with a consonant articulation as well as a vowel. (E.g. [aqt, aqt, aqt].) Sounds of this kind occur in Gaelic.

2.11 Whisper

Produce any vowel sound (represented in these exercises by capital [V]), then whisper this, and finally pass to the voiceless sound
Practice this sequence: [WVW - whisper - WVW] several times, and the reverse sequence [WVW - whisper - WVW].

2.12 Note that in phonetics 'whisper' is used as a technical term describing a particular state of the glottis. What is the state of the glottis during the first sound in the word "fin" when, in popular usage, this word is whispered?

2.13 **Glottal closure**

Practice closing the glottis. This state of the glottis is symbolized by [ʔ]. To get the sensation of closed glottis, simply 'hold the breath' — imagine you are exerting a sustained pressure on something with your arms (e.g. trying to lift a heavy weight).

2.14 To test whether the glottis is open or closed: open the mouth fairly wide, making sure that there is no contact between the tongue and the roof of the mouth (i.e. imagine you are saying a vowel). Flick a finger against the neck, a little below the angle of the jaw. If the glottis is open, the resultant sound is a rather dull thump. If the glottis is closed, a louder and clearer click is produced, the pitch of which can be varied by changing the shape of the mouth (e.g. by rounding the lips).

2.15 Alternate various states of the glottis. E.g. produce the sequence [WVW ? WVW] and the reverse sequence [WVW ? WVW].

L.3 Note the following contrasts in Tagalog (a Phillipine language): --

?a:naj termite ha:naj row
ka:o:n fetch kah:o:n box
ba:ta? child ba:ta? bathrobe
mag:alís to remove mag:alís full of sores

2.16 **Breathy voice or murmur**

Produce a vowel-like voiced sound letting a large quantity of breath escape at the same time: 'speaking while sighing' may help to suggest the desired effect. This state of the glottis often occurs during the release of some stop consonants in Indian languages.

2.17 Alternate ordinary vowels and murmured vowels (shown here by a subscript [..]). Say [aagagaag].

L.4 Note the following contrast in Gujerati (a language spoken in India): --

bar burden bar outside bar twelve

Note also the examples in L.2 on page 4.
2.18 **Creaky voice or laryngealization**

This involves a particular set of the vocal cords, but can be learned by singing the lowest note you can, then trying to go still lower, so that the relatively slow vibration of the vocal cords is heard as a set of discrete taps, like a stick being drawn along a railing.

2.19 **Alternate ordinary vowels and laryngealized vowels (shown here by a subscript [~]).** Say [aa~aaaaa~].

2.20 **Now try superimposing laryngealization on consonants: starting with sounds such as [w] and [m].** Practice sequences such as [aya], [ama], [aza], [aæ] etc.

L.5 **Note the following contrasts in Margi (a Nigerian language):**

<table>
<thead>
<tr>
<th>Bâbal</th>
<th>Open Place</th>
<th>Bâbal</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bâl</td>
<td>Ball</td>
<td>Bâlbâl</td>
<td>Cooked</td>
</tr>
<tr>
<td>Dâlmâ</td>
<td>Big Axe</td>
<td>Dâdâho</td>
<td>Bitter</td>
</tr>
<tr>
<td>Kâwâ</td>
<td>Sorry</td>
<td>Wâwî</td>
<td>Adornment</td>
</tr>
<tr>
<td>Já</td>
<td>Give Birth</td>
<td>Já</td>
<td>Thigh</td>
</tr>
</tbody>
</table>

**Glottalic airstream mechanism**

3.1 **Practice raising and lowering the larynx.** Place a finger on the larynx so that its movements can be felt. Say a vowel on the lowest note you can produce, then on the highest note you can produce. Produce these two notes again in very rapid succession. In passing from low to high you should notice a quick upward movement of the larynx. Now do the same thing in reverse — i.e. high — and observe the downward movement of the larynx. Alternate these rapid pitch changes — up, down, up, down — several times, noting the kinaesthetic sensations of larynx raising and lowering.

3.2 **Repeat exercise 3.1 silently, merely imagining the pitch changes, but actually producing only upward and downward larynx movements.**

3.3 **Produce glottalic egressive stops (ejectives, symbolized by p', t', k').**

(i) Close the glottis (i.e. 'hold your breath') for a few seconds.

(ii) While keeping the glottis closed, open and close the lips several times. If the lips are opened and closed smartly, a hollow sound should be produced.
(iii) Now, while holding the lips together, and while still keeping the glottis closed, try to raise the larynx so as to build up sufficient glottalic pressure to produce an explosive sound when the lip closure is released.

3.4 Repeat exercise 3.3 with other articulatory closures.

3.5 Produce an ejective followed by a vowel, e.g. [p*e] or [t*i]. Remember the sequence: close glottis - form stop articulation - build up glottalic pressure - release stop - release glottal closure into a vowel. Try to make the vowel follow immediately after the explosion.

4.1 Note the following contrasts in Amharic (an Ethiopian language): --

\[\begin{align*}
\text{t'íl} & \quad \text{quarrel} & \text{tíl} & \quad \text{warm} & \text{díl} & \quad \text{victory} \\
\text{k'ír} & \quad \text{stay away} & \text{kírr} & \quad \text{thread} & \text{gerr} & \quad \text{innocent} \\
\text{matʃ'} & \quad \text{one who comes} & \text{matʃ} & \quad \text{when} & \text{medʒ} & \quad \text{grinding stone} \\
\text{s'aggə} & \quad \text{grace} & \text{segga} & \quad \text{to worry} & \text{zegga} & \quad \text{to close}
\end{align*}\]

**Velaric airstream mechanism**

4.1 Say the clicking sound commonly written 'tut tut' or 'tck tck'. The phonetic symbol for this sound is [t]. Note that you can say a series of clicks while breathing in and out through the nose, or humming. This proves that the click is produced independently of the pulmonic (or glottalic) airstream.

4.2 How many clicks with different articulations can you produce?

4.3 Produce clicks before and after vowels; try not to have any pause between the click and the vowel.

4.4 Produce clicks with the velum up and with it down, i.e. non-nasally and nasally, with vowels before and after.

5.7 Note the following contrasts in Zulu (all these items are imperative forms of verbs, all with the tone pattern low - high): --

**(laminal) dental**

\[\begin{align*}
\text{voiceless} & \quad \text{aspirated} & \quad \text{voiceless} & \quad \text{aspirated} \\
\text{aspirated} & \text{4ha4ha} & \text{be evident} & \text{6ha6ha} & \text{rip open} & \text{4ho6ha} & \text{stab, jab} \\
\text{voiceless} & \text{a4a} & \text{climb} & \text{o4a} & \text{explain} & \text{b0a} & \text{narrate} \\
\text{voice} & \text{g4agg4a} & \text{dance at} & \text{g4oka} & \text{dress up} & \text{g4b0a} & \text{pound}
\end{align*}\]
Combinations of two airstream mechanisms

5.1 Voiced implosives (symbols [ɓ, d', ɡ'])

Alternate voiceless glottalic stops — egressive, ingressive, egressive, ingressive. Try to add voice on the ingressive ones — i.e. try to combine a fully-voiced stop with the glottalic ingressive airstream mechanism.

5.2 Say a fully-voiced [ɓ]. Try to produce the voicing for this, but not the explosion — i.e. try to pronounce an unreleased [ɓ] several times. Now try to do this while pulling the larynx down — i.e. combining it with a glottalic ingressive airstream mechanism.

5.3 Some people find it easiest to learn to make implosive sounds by trying to imitate a frog by using a velar articulation in combination with a rapid downward movement of the larynx.

5.4 When you can pronounce [ɓ, d', ɡ'] try to pronounce a vowel before and after them.

Note the examples in Sindhi in L.2 on page 1.

Fricatives and affricates

6.1 Say the word "eats" [iːts] slowly. Notice the relation between the last two sounds: pressure is built up behind the tongue during the [t]; then the tongue is withdrawn slightly so that the air is released through a narrow channel forming a fricative [s] at the same place of articulation. A combination of a stop plus a homorganic fricative is called an affricate.

6.2 Build up pressure behind a k—closure, and then withdraw the tongue slightly so that a fricative [x] is formed with the same place of articulation.

6.3 Learn to produce [x] before and after vowels.

6.4 Produce [x] and add voice to it, so forming [ɣ]; alternate [xɣxɣxɣ].

6.5 Learn to produce [ɣ] before and after vowels.
L.8 Note the following contrasts in Spanish: --

'ixo sun 'axo garlic
'iyọ fig 'ọyọ do

6.6 Make the voiced and voiceless affricates [gy] and [kx].

6.7 Repeat exercises 6.1 - 6.5 using a p - closure and forming a voiceless bilabial fricative [χ] and its voiced equivalent [β].

6.8 Compare [g] and [f], and [β] and [v]. Say all these sounds in combination with various vowels. Practice sequences such as [faŋa, ɓava] etc.

L.9 Note the following contrasts in Ewe (a West African language): --

ɛβɛ the Ewe language ɛvɛ two
ɛdɛ he polished ɛfá he was cold
ɛβlọ mushroom ɛvlọ he is evil

Fricatives and approximants

7.1 Try making a fricative version of [j]. In this section we will use the diacritic [v] to mean a more close and therefore fricative articulation. Learn to contrast [aja] and [ajvă].

7.2 Practice voiced palatal fricatives before and between other vowels i.e. say sequences such as [eju, jʊ, etc.].

7.3 Now produce a labial velar fricative [wva]. Make sure you get friction at both places of articulation. Learn to contrast [awva] and [awvă].

7.4 Practice voiced and voiceless labial velar fricatives in other sequences. (Although both voiceless labial velar fricatives and approximants can be found in different languages, as far as we know no language uses the contrast between these two sounds.)

L.10 Note the following contrasts in Margi (a West African language): --

já give birth j-aj-ágọ picked up káwá sorry wá reach inside

Vellic control

8.1 Learn to control vellic movements. Say [bmbmbm] with no break between the [b] and the [m]. The lips should be closed, and the vocal cords should remain vibrating throughout this sequence. The only movement is the formation and release of the vellic closure.
8.2 Make the similar but entirely voiceless sequence [pgoŋgoŋ]. Try to become conscious of the velic movements.

8.3 Practice the sequences [dndndn], [tgtghtg], [ggoŋgoŋ] and [ŋŋŋŋ].

8.4 Try saying English words such as "open, hidden,itten, bacon" with and without nasal plosion.

8.5 Practice releasing nasal plosion, i.e. say sequences such as [bma, pga, dna, tga, nga, kga].

L11 Note the following contrasts in Russian: --

dno  bottom  no  but

dna  bottom (gen)  na  here, take it (interjection)

dnu  bottom (dative or  )  nu  well! (interjection)

instrumental

8.6 Say combinations of nasal and plosive initially without an intervening vowel; i.e. learn to say sequences such as [mba, mpa, nda, nda, nga, qka]. Try to make a compound consonant, not a syllabic nasal followed by a plosive in another syllable.

L12 Note the following contrasts in Tiv (a West African language): --

áa mbé  she suckled  á bëndé  he touched  á mândé  he swallowed

á ndèrà  he began  á dë  he left alone  á nëndé  he is backward in growth

á ndzùr  he muddled  á dzëndé  he prohibited  á nändé  he urinated

á ndʒỳl  he spoke quickly  á dzìngé  he searched

á ngëñhòr  he received  á gëmà  he turned round

á ñgëbëhom  he approached  á gëôr  he slashed

8.7 Compare all these sequences with [ma, nga, ýma] etc. The mark [,] underneath a symbol indicates that the sound is syllabic.

L13 Note the following phrase in Igbo (a West African language): --

Ị mà  I'm beautiful

Fricative laterals

9.1 Produce a voiceless alveolar lateral before and after vowels -- e.g. [iːi], [aːa], [uːu]. Now introduce local friction between the sides of the tongue and the teeth. This is a voiceless alveolar fricative lateral (symbol [ɾ]). Produce this also between vowels -- [iːi], [aːa], [uːu].
9.2 Produce the voiced counterpart of this sound (symbol [k]). Practice this also between vowels -- [iɡ], [aɡa], [uɡu].

L.14 Note the following contrasts in Welsh: --

ṭan  church  soṭṭ  shilling
'kɔtɛt  knife  ṭa'nesti  Llanelly
'kevai  friend

9.3 Note the following contrasts in Zulu: --

londá  preserve  bûká  roam loose
güá  prod  sc'ec'ra  tattoo

Trills, taps and flaps

10.1 Make a lingual alveolar trill [r]. Put the tongue loosely behind the alveolar ridge and try to set it vibrating with a pulmonic egressive airstream. Make voiced and voiceless trills.

10.2 Make dental trills, voiced and voiceless, before and after vowels.

10.3 Learn to control a trill so that there is only a single touch of the tongue. This is an alveolar tap [r].

L.17 Note the distinction between a tap and a trill in Spanish: --

pero  but  pero  dog
por'ke  why?  buro  donkey
se'nor  Senor  rei  king

10.4 In making a flap [ɾ] the body of the tongue is drawn back, the tip is extended up towards the hard palate and then brought down so that it flaps, usually against the post-alveolar ridge, on the way. Practice this sound before and after vowels.

L.18 Note the difference between a tap (which may be a trill) and a flap in Hausa:

báŋá:  servant  bárá:  begging

10.5 Consider the extent to which it is possible to make labial and uvular trills, taps and flaps.
Secondary articulation

11.1 Practice palatalized sounds. Form a frictionless palatal articulation simultaneously with the primary articulation. Say, e.g. [v], [z], [m], [n], [l], producing a vowel of i-type at the same time. Add an open vowel, e.g. [a], and note the j-like off-glide. Practice other palatalized sounds: e.g. palatalized [p], [b], [t], [d], [k], [g], [f], [θ], [θ], [s], [x], [v], [r].

11.2 Practice velarized sounds. Form a frictionless velar articulation simultaneously with the primary articulation -- i.e. produce a vowel of [w]-type at the same time as the primary articulation.

Say velarized [v], [z], [m], [n], [l], [p], [b], [t], [d], [f], [θ], [θ], [s] before and after vowels.

11.3 Moderately palatalized and moderately velarized sounds are sometimes called clear and dark respectively. Practice clear and dark [l]s, and discover which type you normally use in each of these words: leaf, late, lock, look, feel, tail, call, cool, little.

Say all these words first with a very clear [l], then with a very dark [l].

L.19 Note the following contrasts in Russian: --

<table>
<thead>
<tr>
<th>English</th>
<th>Russian</th>
<th>Russian</th>
</tr>
</thead>
<tbody>
<tr>
<td>brat</td>
<td>brother</td>
<td>bratl</td>
</tr>
<tr>
<td>krofl</td>
<td>roof</td>
<td>krofl</td>
</tr>
<tr>
<td>stal</td>
<td>he has become</td>
<td>stal</td>
</tr>
<tr>
<td>zar</td>
<td>beat</td>
<td>zarl</td>
</tr>
</tbody>
</table>

11.4 Practice labialized sounds. Round the lips, without producing labial friction, simultaneously with the primary articulation. Note that labialized consonants are often accompanied by velarizations and hence may be indicated by a superscript [w].

Say [sw], [sw], [xw], [yw] etc. before and after vowels.

L.20 Note the following contrasts in Twi (a West African language): --

- caca straw mattress cawá he cuts
- sač he wears sač he looks at

11.5 In some languages labialization is accompanied by palatalization, and may be marked by a superscript [4].

Say [s4], [f4] before and after [a].
L.21 Note the following contrasts in Gĩ (a West African language): --

éʃə it is ablaze ñtʃə he struck
dʒə it is right édʒə it is broken

Nasalization

12.1 Remember that nasalization is not, in our terminology, a secondary articulation but a separate process; but it is convenient to practice it at this point. Alternate non-nasalized and nasalized vowels saying [aəə, oəə, oʊʊ, iɪɪ, uʊʊ].

12.2 Learn to produce nasalized approximants such as [ɻ, w] and fricatives such as [ʃ, v].

L.22 Note the following contrasts in Yoruba (a West African language): --

fː use ɔ́bo monkey su scatter seed
iʃaf wife ɪbɔ gun sʊ push
iʃɛ that wɛ they mɛʃ four

Vowels

13.1 Vertical axis. Say a series of four different front vowel qualities from close to open. These will be approximately close, half close, half open and open (symbols [i, e, ɛ, a]). Try to feel the degree of raising of the tongue. Say these sounds with the mouth as wide open as possible, watching the tongue in a mirror. Now repeat silently, paying attention to the kinesthetic and any tactile sensations you notice.

13.2 Horizontal axis. Say [i] again and then say a close back rounded vowel [u]. Alternate [i - u - i - u]. Try to note the movement of the tongue from front to back in the mouth. Repeat silently again, noting the kinesthetic and tactile sensations.

13.3 Lip position. Say [i - u - i - u] again. This time note the fact that the lip position changes as you go from one vowel to the other -- spread for [i], rounded for [u]. Repeat silently, again noting kinesthetic sensations. Then produce a set of four back rounded from close to open, starting with [u], (symbols [u, o, ɔ, ɑ]).

13.4 Add lip rounding to [i, e, ɛ] ([a] is omitted for the time being), producing three front rounded vowels (symbols [ɣ, ʊ, ɔ]). Now alternate these with back rounded vowels, noting the tongue movement, which is now the only factor differentiating the sounds (i.e. say [ɣ - u, ʊ - o, ɔ - ɔ]).
13.5 Slurring. Start at [i] and slur to [a], i.e. lower the tongue (and/or the jaw) at a uniform rate, thus passing through all the front unrounded vowel positions from close to open. Do this in the reverse position and repeat silently.

13.6 Do the same from [y] to [a] and back from [a] to [y], repeating silently again, and then do the same from [u] to [a] and [a] to [u].

13.7 Interrupt the slur at intermediate points (e.g. slur from [i] to [a] stopping at [e] or [e] etc.), and then try to interrupt between two vowel types (e.g. between [i] and [e] or [o] and [o] etc.).

13.8 Bracketing. Say [i], then [e] several times, and then try to produce a vowel half way between them. This will be of the [e] type. Repeat this with other pairs of front and back vowels. (E.g. [y], [a]; [a], [o] etc.).

13.9 Back unrounded vowels. Say the sequence of back rounded vowels again [u, o, æ, a]. Now try to say a similar sequence with the lips unrounded, keeping the same tongue positions. These are back unrounded vowels (symbols [w, y, æ, a]). Try slurring these, noting the sensations of their production, and alternate them with the front unrounded vowels (i.e. say [w - i, y - e, æ - æ, a - a]).

The Cardinal Vowels

(The quotations in this section are all from D. Jones, An Outline of English Phonetics 8th Ed., 1956.)

"The values of the cardinal vowels cannot be learned from written descriptions; they should be learned by oral instruction from a teacher who knows them."

14.1 Learn to make CV 1 [i]. In this sound "the raising of the tongue is as far forward as possible and as high as possible consistently with its being a vowel, the lips being spread." The teeth are close together, almost touching.

14.2 Learn to make CV 5 [o]. This is a sound "in which the back of the tongue is lowered as far as possible and retracted as far as possible consistently with the sound being a vowel, and in which the lips are not rounded." Note that the jaw is fully open and pulled back.

14.3 Imitate the pronunciation of CV's 2, 3, and 4 [e, e, a], forming a series of auditorially equidistant steps between CV's 1 and 5. Note that in pronouncing [e, e, a] the jaw is held in a forward position, and is progressively lowered.
14.4 Imitate the pronunciation of CV's 6, 7, 8 [e, o, u]. These vowels form a series of similar auditorially equidistant steps. Note that the lip rounding increases steadily.

14.5 Practice slurring from one vowel to another, e.g. from [i] to [e], [o] to [u] etc. Also try slurring from [i] to [u], [e] to [o] etc.

14.6 Try to produce vowels half way between two cardinal vowels, e.g. between [i] and [e], [e] and [e] etc.; and between [i] and [u], [o] and [o] etc. You can do this either by saying the two vowels and then trying to produce a sound half way between them; or by slurring between the two vowels once or twice, and then trying to stop half way.

**Secondary Cardinal Vowels**

15.1 Prolong CV l [i], and add close lip-rounding taking care to keep exactly the same tongue position. This forms the secondary cardinal [y].

15.2 Practice saying [iyiyi].

15.3 Compare also [y] and [u]; say [uyuyu], and note the sensation of moving the tongue backwards and forwards. The rounded vowel half way between [y] and [u] is [w].

15.4 In a similar way learn to make the secondary cardinal [œ] by adding close lip-rounding to the tongue position of [æ]; and the secondary cardinal [œ] by adding open lip-rounding to the tongue position of [æ].

15.5 Compare both these sounds with a central vowel [a]; say [a] then [œ] several times, and also [æ] then [œ] several times.

15.6 Learn to say the secondary cardinal vowel [u] by combining the tongue position of [u] with spread lips. Practice the sequence [uuuuu].

15.7 Move from [u] to [i], and note that the tongue movement is the reverse of that in exercise 15.3. The unrounded vowel half way between [i] and [u] is [+].

L.23 Note the following Swedish words with rounded and unrounded front vowels: --

ny: new ni: you host autumn

now host horse

nut vet know

worn vet mind
Diphthongs

16.1 Practice diphthongs. Say the first element (e.g. [a]) then the second (e.g. [e]) then slur rapidly from the first to the second. In all diphthong practice at this stage use 'decrescendo' stress, i.e. start with considerable breath-force and allow this to die away during the slur. Diphthongs of this kind are called falling diphthongs.

16.2 Produce diphthongs starting from CV 2 and moving to each of the other cardinal vowels which you have learned, i.e. say [ei, eə, eə, eo, eu, ey, ée, əə, òu]

16.3 Repeat exercise 16.2 with each of the other cardinal vowels as a starting point.

Semi-vowels

17.1 Diphthongs with increasing stress are known as rising diphthongs. Such sounds are often said to consist of a semi-vowel followed by a vowel. The semi-vowel corresponding to [i] (i.e. the first element in a rising diphthong beginning with [i]) is [j]; that corresponding to [u] is [w]; and that corresponding to [y] is [u].

L.24 Note the following contrasts in French: --

mjet crumb mute mwet sea gull
lje tied li him lw Louis
ui eight wi yes

Palatals

18.1 Say [x] and while still producing fricative noise move the articulation further forward until the front of the tongue is articulating with the hard palate. You should now be forming a voiceless palatal fricative (symbol [ç]).

18.2 Slide the tongue backwards and forwards from [x] to [ç], noting how the pitch of the hiss changes, being higher when the tongue is forward, lower when it is back.

18.3 Produce [ç] again and then the voiced counterpart of this sound (a voiced palatal fricative -- symbol [j]). Alternate [çjçjçj].
Note the following German words: --

\begin{align*}
\text{\textquotesingle } \text{voxe} & \quad \text{week} & \quad \text{\textquotesingle } \text{le\textasciitilde t} & \quad \text{bad} \\
\text{\textquotesingle } \text{ax\textquotesingle qo} & \quad \text{attention} & \quad \text{\textquotesingle } \text{q} & \quad \text{I} \\
\text{maxt} & \quad \text{power} & \quad \text{\textquotesingle } \text{li\textasciitilde} & \quad \text{milk}
\end{align*}

Make a complete closure at the same place as you have been articulating \([\text{\textasciitilde}, \text{\textasciitilde j}].\) The symbols for the voiceless and voiced palatal stops are \([\text{c}, \text{\textasciitilde j}].\) Pronounce these before, after and between vowels, saying \([\text{ca}, \text{ci}, \text{ja}, \text{ji}, \text{aca}, \text{aci}, \text{aja}, \text{aji}]\) etc.

Make a complete closure with the front of the tongue against the hard palate as for \([\text{c}, \text{\textasciitilde j}].\) above, but this time lower the velum. Initiate a voiced pulmonic egressive air-stream to produce a \textit{voiced palatal nasal} (symbol \([\text{n}]).\) Learn to produce this before and after vowels -- \([\text{\textasciitilde a}, \text{\textasciitilde i}]\) etc.

Produce the voiceless counterpart of this sound (symbol \([\text{\textasciitilde n}]).\) Alternate \([\text{\textasciitilde \textasciitilde n}, \text{\textasciitilde n}]\) and compare once again with \([\text{\textasciitilde j}, \text{c}].\) Also produce \([\text{\textasciitilde n}]\) before and after vowels.

Make a closure at the hard palate once more (as for \([\text{\textasciitilde j}].\) and then try to lower or both sides of the tongue. Initiate a voiced pulmonic egressive air-stream to produce a \textit{voiced palatal lateral} (symbol \([\text{\textasciitilde a}]).\) Learn to produce this before and after vowels.

Produce the voiceless counterpart of this sound (symbol \([\text{\textasciitilde a}]).\) Alternate \([\text{\textasciitilde a}, \text{\textasciitilde \textasciitilde a}, \text{\textasciitilde a}, \text{\textasciitilde \textasciitilde a}].\) and again compare with \([\text{\textasciitilde j}, \text{c}].\) \([\text{\textasciitilde n}].\) Produce \([\text{\textasciitilde a}]\) before and after vowels.

Note the following Italian words: --

\begin{align*}
\text{mas\textquotesingle ka\textasciitilde ni} & \quad \text{Mascagni} & \quad \text{fa\textasciitilde mi\textasciitilde a} & \quad \text{family} \\
\text{\textquotesingle d\textasciitilde j\textasciitilde \textasciitilde y\textasciitilde l} & \quad \text{lilies} & \quad \text{\textquotesingle fi\textasciitilde \textasciitilde a\textasciitilde c} & \quad \text{son} \\
\text{di\textasciitilde ze\textasciitilde \textasciitilde nco} & \quad \text{drawing} & \quad \text{\textquotesingle o\textasciitilde ni} & \quad \text{every}
\end{align*}

\textbf{Uvulars}

Say \([\text{x}].\) once more and move the articulation back until the extreme back of the tongue is articulating with the uvular and end of the soft palate. This is a voiceless \textit{uvular fricative}. (Symbol \([\text{x}].\))

Slide the tongue backwards and forwards again from \([\text{x}].\) to \([\text{x}].\) (and forward to \([\text{\textasciitilde n}].\)) noting how the pitch of the hiss becomes lower still as you go further back from the velar position.
19.3 Produce [χ] again and then try the voiced counterpart of this sound (a voiced uvular fricative — symbol [ʁ]). This is the French "r". Try alternating [χʁχʁ].

L.27 Note the following French words: —

<table>
<thead>
<tr>
<th>French</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>îcbo</td>
<td>bull</td>
</tr>
<tr>
<td>bybo</td>
<td>office</td>
</tr>
<tr>
<td>wui</td>
<td>road</td>
</tr>
<tr>
<td>kaiχ</td>
<td>four</td>
</tr>
<tr>
<td>iεiχ</td>
<td>letter</td>
</tr>
<tr>
<td>o;iχ</td>
<td>other</td>
</tr>
</tbody>
</table>

19.4 Make a complete closure at the same place as you have been articulating [χ]. The symbols for the voiceless and voiced uvular stops are [q, ʁ]. Say these sounds before, after, and between vowels, saying [qa, qi, qa, si, aqa, ʁqi, aṣa, iṣi] etc. Try varying the amount of voicing and aspiration.

19.5 Now, with lowered velum produce voiceless and voiced uvular nasals (symbols [N, ʁN]). Make these before and after vowels — [ана], [ини], [ага], [іγі].

L.28 Note the beginning of the fable of "The North Wind and the Sun" in Eskimo: —

[qattex'se:ne sο'le asе'bо:ne'botto:ne tsi'me:me'not ne'n'oppa:]

Dentals and alveolars

20.1 Dentals and alveolars may be made with either the tip of the tongue (apical), or the blade (laminal). Which is your normal pronunciation of the initial sounds in "tie, die, nigh"?

20.2 Are the final sounds in "oat, ode, own" made in the same place?

20.3 Learn to produce all these sounds with the opposite (laminal or apical) articulation.

20.4 Both dentals and alveolars may be pronounced in both ways. Laminal dentals usually have articulatory contact on both the teeth and the front part of the teeth ridge; they may therefore be called denti-alveolars. In these exercises the following symbols will be used; descriptive terms in parentheses may be considered redundant:

<table>
<thead>
<tr>
<th>(apical)</th>
<th>(laminal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>dental</td>
<td>d</td>
</tr>
<tr>
<td>denti-alveolar</td>
<td>ç</td>
</tr>
<tr>
<td>alveolar</td>
<td>d</td>
</tr>
<tr>
<td>alveolar</td>
<td>ç</td>
</tr>
</tbody>
</table>

Learn to say:  

<table>
<thead>
<tr>
<th>Arabic</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>ada</td>
<td>aɡa</td>
</tr>
<tr>
<td>ata</td>
<td>aɡa</td>
</tr>
<tr>
<td>ana</td>
<td>aɡa</td>
</tr>
<tr>
<td>ada</td>
<td>aɡa</td>
</tr>
<tr>
<td>aɡa</td>
<td>aɡa</td>
</tr>
<tr>
<td>aɡa</td>
<td>aɡa</td>
</tr>
</tbody>
</table>

Repeat with other vowels.
L.29 Note the following contrasts in Temne (a West African language): —

<table>
<thead>
<tr>
<th>Temne</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>ṭor</td>
<td>descend</td>
</tr>
<tr>
<td>ṭókó</td>
<td>fowl</td>
</tr>
<tr>
<td>jésté</td>
<td>soon</td>
</tr>
</tbody>
</table>

(The [t̚] is both more aspirated and affricated.)

L.30 Note the following contrasts in Isoko (a West African language): —

<table>
<thead>
<tr>
<th>Isoko</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>ṭójú</td>
<td>louse</td>
</tr>
<tr>
<td>ṭójú</td>
<td>gang</td>
</tr>
<tr>
<td>ūdú</td>
<td>farm</td>
</tr>
<tr>
<td>ūdú</td>
<td>chest</td>
</tr>
<tr>
<td>ṭójí</td>
<td>drums</td>
</tr>
<tr>
<td>ṭójí</td>
<td>drinks</td>
</tr>
</tbody>
</table>

20.5 Differences in alveolar and dental fricatives [s, z] also occur. Learn to make these sounds in both ways.

Retroflex, post-alveolar and palato-alveolar sounds

21.1 An apical articulation with the back part of the alveolar ridge and the tip of the tongue curled upwards is called retroflex. An apical or laminal articulation in the same place but with the front of the tongue raised is called palato-alveolar. (The term post-alveolar may be used when a less specific label is required.)

21.2 Produce retroflex stops before, after, and between vowels; say [ta, ti, at, ata, ˀti, da, də, ad, ād, ada, ādə].

21.3 Make voiced retroflex nasals in similar contexts [na, ni] etc.

L.31 Note the following contrasts in Malayalam (a language spoken in India): —

<table>
<thead>
<tr>
<th>Malayalam</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>mūttu</td>
<td>pearl</td>
</tr>
<tr>
<td>muttu</td>
<td>density</td>
</tr>
<tr>
<td>kutti</td>
<td>peg</td>
</tr>
<tr>
<td>stabbbed</td>
<td>child</td>
</tr>
<tr>
<td>kān̄ni</td>
<td>kān̄ni</td>
</tr>
<tr>
<td>kān̄ni</td>
<td>Virgo</td>
</tr>
<tr>
<td>kān̄ni</td>
<td>link in chain</td>
</tr>
<tr>
<td>kān̄ni</td>
<td>boiled rice</td>
</tr>
<tr>
<td>kān̄ni</td>
<td>crushed</td>
</tr>
<tr>
<td>kān̄ni</td>
<td>and water</td>
</tr>
<tr>
<td>ēṇṇā</td>
<td>named</td>
</tr>
<tr>
<td>ēṇṇā</td>
<td>me</td>
</tr>
<tr>
<td>ēṇṇā</td>
<td>oil</td>
</tr>
<tr>
<td>ēṇṇā</td>
<td>worn out</td>
</tr>
<tr>
<td>ēṇṇā</td>
<td>cocomanut</td>
</tr>
</tbody>
</table>
21.4 Learn to produce retroflex fricatives [ʂ, ʐ] before, after and between vowels. Say [ʂa, ʂi, ʂa, isi] etc.

21.5 Post-alveolar fricatives may be made with the front of the tongue raised, but with the fricative articulation being made either by the tip or by the blade of the tongue. If a distinction is required, an apical articulation may be symbolized [ʃ, ʒ] and called palato-alveolar; and a laminal articulation may be symbolized [ɕ, ʑ] and called alveolo-palatal.

L.32 Note the following contrasts in Telugu (a language spoken in India): --

\[
\begin{array}{lll}
alveolar & \text{post-alveolar} & \text{retroflex} \\
\text{maasaw} & \text{aaʃa} & \text{kəsəʃəw} \\
\text{mouth} & \text{ambition} & \text{decoction} \\
\text{haasʃəw} & \text{druʃʃəm} & \text{baasʃəw} \\
\text{sarcasm} & \text{scenery} & \text{commentary}
\end{array}
\]

21.6 Consider your own consonants in words such as "she, show". How can they be described in terms of the categories in these exercises?

21.7 What are your consonants in "raw, oar" etc.?

L.33 Note the following contrasts in Fante (a West African language): --

\[
\begin{array}{lll}
\text{ótcə} & \text{he catches} & \text{ótcwɛ} & \text{he cuts} \\
\text{ódzə} & \text{he leaves} & \text{ódzwɛ} & \text{he calms} \\
\text{ɔcf} & \text{*caterpillar} & \text{ɔɛmjɛ} & \text{he looks at}
\end{array}
\]

**Review**

22.1 Produce intervocalic voiceless plosives at as many places of articulation as possible; note:

\[
p, t, ʈ, t, t, c, k, q, ?
\]

22.2 Repeat exercise 22.1 with voiced stops and nasals. Note the symbols here:

22.3 Produce as many voiceless fricatives as possible; note:

\[
\phi, f, \theta, ʂ, s, s, \ʃ, s, ʂ, s, x, x, \r, t
\]
22.4 Repeat exercise 22.3 with voiced fricatives. Note the symbols here:

22.5 Review the trills, taps, flaps, and apical and uvular approximants; note:

\( r, ɾ, l, ɻ, r, ɭ \)

22.6 Review the voiced laterals; note:

\( l, l, ɭ, l, ɭ \)

22.7 Produce the corresponding voiceless sounds. Note the symbols here:

22.8 What pulmonic egressive consonants have been omitted in this review? Note them here:

22.9 Produce consonants of the type summarized in the chart below:

<table>
<thead>
<tr>
<th>Airstream Mechanisms</th>
<th>Pulmonic</th>
<th>Glottalic</th>
<th>Velaric</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Egressive</strong></td>
<td>( k, f, m )</td>
<td>(Ejective) ( p', t', ts' )</td>
<td></td>
</tr>
<tr>
<td><strong>Ingressive</strong></td>
<td></td>
<td>(Implosive) ( ɓ, ɗ, ɠ )</td>
<td>(Click) ( t, ɭ, ʒ )</td>
</tr>
</tbody>
</table>

22.10 Review consonants with secondary articulations (labialization, palatalization, velarization, pharyngalization); added nasalization; different degrees of aspiration and voicing; laryngealization; and breathy voice.

22.11 Make sure that you can produce all the vowels noted below.

\[ i, t, u \quad y, u, w \]

\[ e, o \quad ǝ, ɻ \]

\[ ɛ, ɔ \quad ə \]

\[ a, ɑ \]
Read the following approximate specifications; produce each of the sounds (or groups of sounds) indicated before, between and after vowels; and write the appropriate symbol (or symbols) in the right-hand column.

<table>
<thead>
<tr>
<th>Air-stream</th>
<th>Articulators</th>
<th>Stricture</th>
<th>Symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pul. egr.</td>
<td>bilabial</td>
<td>fricative</td>
<td></td>
</tr>
<tr>
<td>Vel. ingr.</td>
<td>velar</td>
<td>stop</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>dental</td>
<td>stop</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>alveolar</td>
<td>lateral fricative</td>
<td></td>
</tr>
<tr>
<td>Vel. ingr.</td>
<td>alveolar</td>
<td>stop</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>velar</td>
<td>stop</td>
<td>with nasal plosion</td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>palatal</td>
<td>stop</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>alveolar</td>
<td>stop</td>
<td>with lateral plosion</td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>palatal</td>
<td>lateral frictionless</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>alveolar</td>
<td>flap</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>retroflex</td>
<td>stop</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>palatal</td>
<td>fricative</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>retroflex</td>
<td>fricative</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>labiodental</td>
<td>frictionless</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>bilabial</td>
<td>stop</td>
<td>with nasal plosion</td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>glottal</td>
<td>stop</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>palatal</td>
<td>nasal</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>bilabial</td>
<td>stop</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>uvular</td>
<td>fricative</td>
<td></td>
</tr>
<tr>
<td>Vel. ingr.</td>
<td>alveolar</td>
<td>stop</td>
<td>with lateral plosion</td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>retroflex</td>
<td>nasal</td>
<td></td>
</tr>
<tr>
<td>Pul. egr.</td>
<td>uvular</td>
<td>trill</td>
<td></td>
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<tr>
<td>Pul. egr.</td>
<td>bilabial</td>
<td>lateral frictionless</td>
<td></td>
</tr>
<tr>
<td>Glot. egr.</td>
<td>uvular</td>
<td>stop</td>
<td></td>
</tr>
</tbody>
</table>
CONSONANT CHART

<table>
<thead>
<tr>
<th>Nasal</th>
<th>Bilabial</th>
<th>Labio- dental</th>
<th>Dental &amp; Alveolar</th>
<th>Palato- Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
<th>Labio-velar</th>
<th>Uvular</th>
<th>Pharyngal</th>
<th>Glottal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>m</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>Plosives</td>
<td>p b</td>
<td>t d</td>
<td>t d</td>
<td>c j</td>
<td>k g</td>
<td>q g</td>
<td>?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implosives</td>
<td>b d</td>
<td>d</td>
<td></td>
<td>g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ejectives</td>
<td>p' t' k'</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Central) Fricative</td>
<td>φ β f v s z s z</td>
<td>j z</td>
<td>g j</td>
<td>x y</td>
<td>χ θ</td>
<td>θ θ</td>
<td>h h</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lateral Fricative</td>
<td></td>
<td>l j</td>
<td></td>
<td></td>
<td>m w</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(Central) Approximant</td>
<td></td>
<td>j</td>
<td>j</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Lateral (Approximant)</td>
<td></td>
<td>l</td>
<td>l</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Trill</td>
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<td>r</td>
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<td></td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Tap</td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Flap</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

When there are two symbols together the one on the left represents a voiceless consonant.

DIACRITICS

<table>
<thead>
<tr>
<th>voiceless</th>
<th>e.g. ø</th>
<th>nasalized</th>
<th>e.g. ŵ ŋ</th>
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<tbody>
<tr>
<td>aspirated</td>
<td>h</td>
<td>labialized</td>
<td>w (or) w</td>
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<tr>
<td></td>
<td>th</td>
<td></td>
<td>t (or) t'</td>
</tr>
<tr>
<td>murmured</td>
<td>b</td>
<td>palatalized</td>
<td>j (or) j</td>
</tr>
<tr>
<td></td>
<td>b'</td>
<td>long</td>
<td>t (or) t'</td>
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<tr>
<td>laryngealed</td>
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<tr>
<td>raised</td>
<td>* (or)</td>
<td>w* (or) w*</td>
<td>half long</td>
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<tr>
<td>lowered</td>
<td>t (or)</td>
<td>θ (or) θ*</td>
<td>velarized or</td>
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<tr>
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<td>(or) &gt;</td>
<td>t (or) t'</td>
<td>pharyngalized</td>
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<tr>
<td>advanced</td>
<td>(or) &lt;</td>
<td>t (or) t'</td>
<td>syllabic</td>
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<tr>
<td>dental</td>
<td></td>
<td>i</td>
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