

A Sketchbook Atlas of the Vocal Tract

SECOND EDITION

Cheri Montgomery

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S.T.M. Publishers
Nashville, TN

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Preface

A Sketchbook Atlas of the Vocal Tract is designed to help students gain articulatory awareness. It was written for singers, but has a broad range of practical applications. The visual-based approach makes it ideal for ESL studies or speech therapy. Readers discover accurate pronunciation by learning how breath and tone flow through the unique vowel and consonant formations of the English, Italian, German, and French languages. Sketch pages engage students in the learning process. The second edition contains additional units that cover the muscles of the tongue, lips, and palate.

Topics are organized according to point of contact. The first unit contains an overview of articulatory phonetics. Following units guide the reader through the major contact points: from bilabial consonants and front vowel formations, to glottal consonants and back vowel formations. Vowels unique to English, German, and French are introduced in the final units. Access to full color images, enunciation instructions, links to audio examples, and sketch pages are included. The novel method of charting vowels clearly identifies the unique formations that shape the vocal tract. This method was published in two articles: *Diction (Still) Belongs in the Music Department* and *Defining the Schwa for the English, German, French, and Russian Languages* published in the *Journal of Singing* (National Association of Teachers of Singing).

The International Phonetic Alphabet (IPA) is applied throughout the text. It is the standardized system for dictionary transcription and in use by educational programs throughout the world. Many students outside the U.S. are familiar with the IPA. For those new to the IPA, the symbols are easy to learn and closely align with spellings of the European languages. A free listening lab, IPA charts, and recommended resources are available at www.stmpublishers.com.

The transcriptions in this text are based on rules established by standard textbook authorities: Madeleine Marshall for English, Evelina Colorni for Italian, William Odom for German, and Thomas Grubb for French. Students are encouraged to sing the sample words. Singing slows down the articulatory process and releases the jaw providing more space to discover formation.

The content of this book represents experience gained from 20 years of teaching English, Italian, German, and French lyric diction at the Blair School of Music at Vanderbilt University; and from collecting and transcribing English, Italian, German, French, and Russian art songs as author of the *Lyric Diction Workbook Series* and co-author of *Exploring Art Song Lyrics* published by Oxford University Press.

Preface Continued

The voice is a phonetic instrument. Vowels and consonants are the basic elements of languages and serve as tools for vocal discovery. It is my hope that this workbook will help students enjoy the lovely sounds that are uniquely designed for the human voice.

Cheri Montgomery

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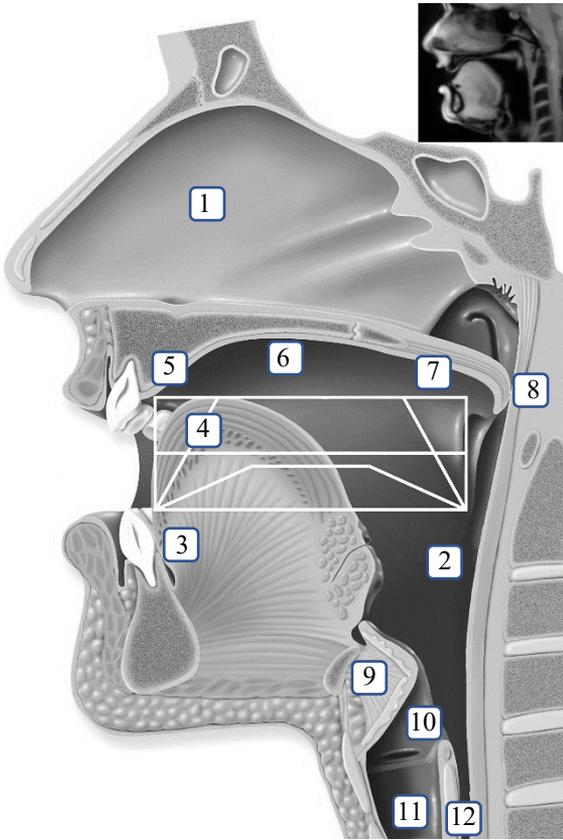
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UNIT 2:

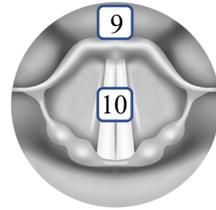
Steep closed front [i] and bilabial [p] and [b]

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STEEP CLOSED FRONT [i]



1. Nasal cavities
2. Pharynx (p. 144)
3. Tongue tip
4. Tongue arch (p. 12)
5. Alveolar ridge
6. Hard palate
7. Soft palate
8. Uvula
9. Epiglottis
10. Vocal folds
11. Trachea
12. Esophagus



Description. The term *front vowel* refers to a vowel that is formed with a forward tongue arch. Closed front [i] maintains the most forward arch of the tongue. In speech, front vowels are enunciated by spreading the lips. The singer must learn to release the jaw and form front vowels with the tongue (not lips). Front vowels are also called tongue vowels.

Enunciation. Release and lower the jaw. Find the space of *ah* without spreading the lips. The tongue tip touches the lower front teeth, the front of the tongue arches *far* forward, and the sides of the tongue contact the length of the upper molars (to the eye teeth). Raise the soft palate and direct vocalized tone toward the upper front teeth.

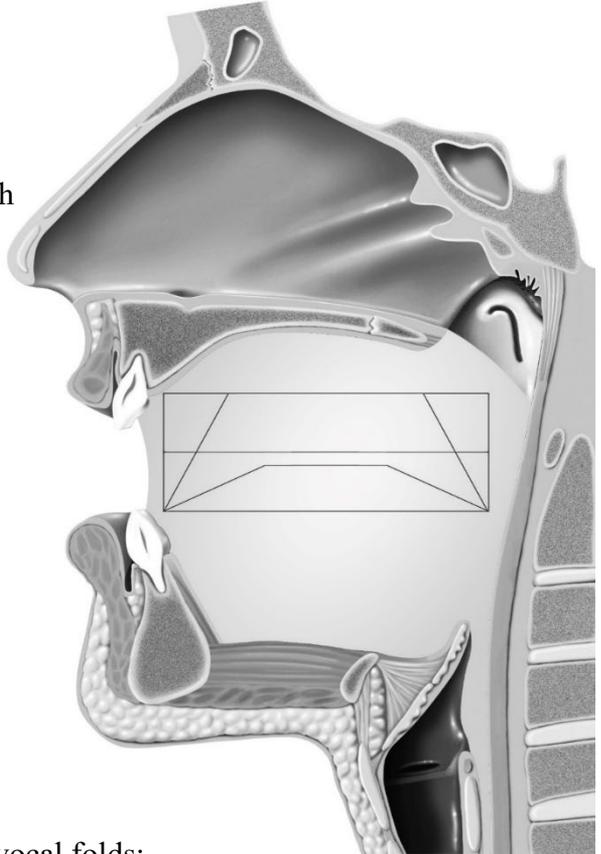
Warnings. Form [i] with the arch of the tongue (*not* by spreading the lips). Do not replace [i] with [ɪ]. Avoid the low placement of [i] in spoken English. Do not mask the brilliance of [i] by making it dark or covered. Avoid a nasalized tone. Maintain an unaltered formation of the vowel throughout vocalization.

Examples: *eve, reed, seat, eagle, dreamer, pleading*

VOWEL WORKSHEET

Sketch the tongue and palate formation of steep closed front [i] and label the numbered points of the vocal tract:

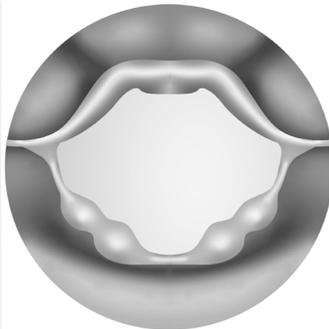
1. Nasal cavities
2. Pharynx
3. Tongue tip
4. Peak of tongue arch
5. Alveolar ridge
6. Hard palate
7. Soft palate
8. Uvula
9. Epiglottis
10. Vocal folds
11. Trachea
12. Esophagus



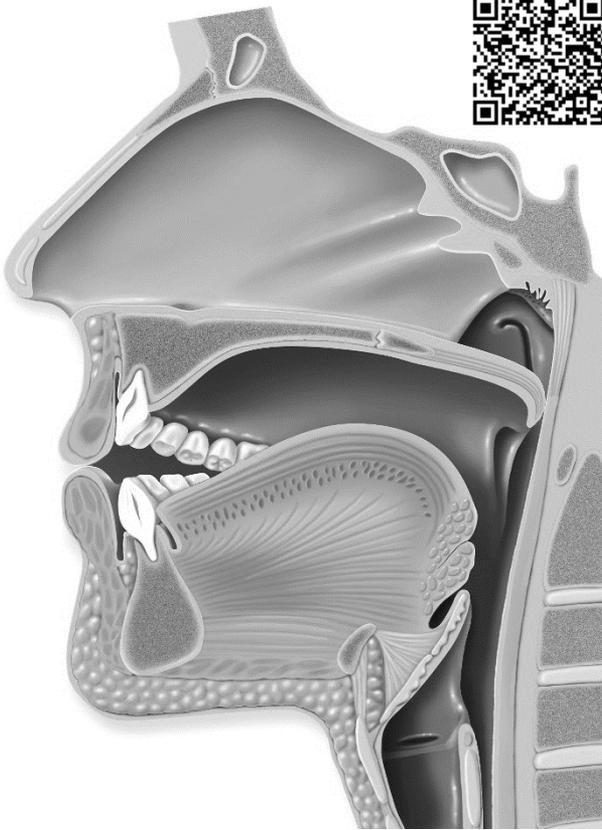
Full color image:



Sketch and label the vocal folds:



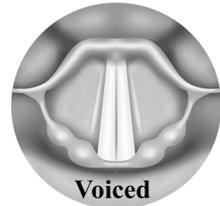
BILABIAL STOP



[p]



[b]



Description. The [p] sound has the same point and manner of articulation as the [b] sound. The [b] is voiced while [p] is voiceless. The [p] and [b] sounds are cognates. Bilabial [b] and [p] are classified as plosive in Italian and French.

Articulation. Relax the lips with the inside edges barely touching. The lips should feel loose and buoyant. Raise the soft palate and release the jaw. Expel a sufficient stream of air to pop the lips open for [p]. Vocalized tone is added while the lips pop open to articulate [b]. This action allows the consonant to project. Note: [p] and [b] have a rounded lip formation when followed by a rounded vowel.

Warnings. Compressed lips muffle the consonant sound and constrict the vocal apparatus. Do not press the lips together or curl them outside in.

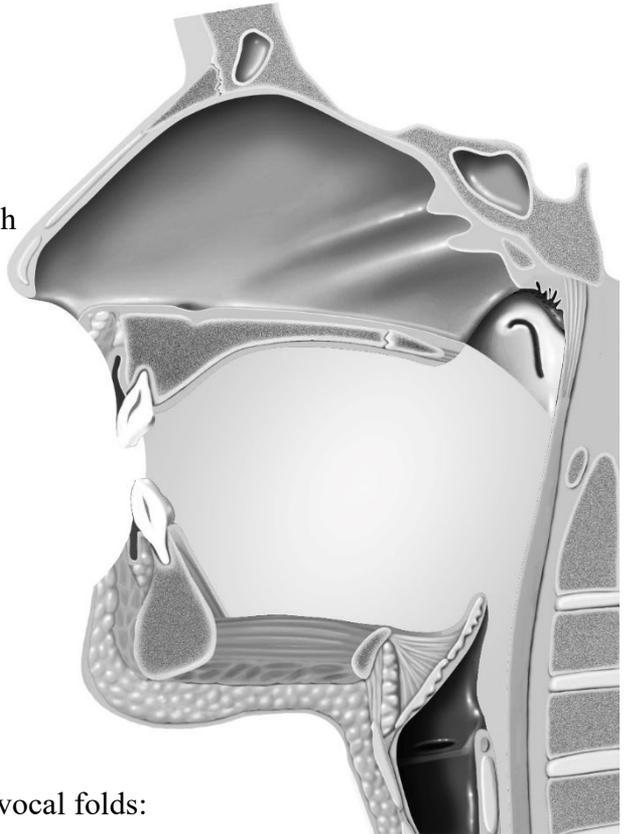
Examples of [p]: *pup, pen, pine* / round the lips for: *pray, purse, poem*

Examples of [b]: *babble, bubble, blackbird* / round the lips for: *boat, born, bold*

CONSONANT WORKSHEET

Sketch the lip, tongue, and palate formation of bilabial stop [p] and [b] and label the numbered points of the vocal tract:

1. Nasal cavities
2. Pharynx
3. Tongue tip
4. Peak of tongue arch
5. Alveolar ridge
6. Hard palate
7. Soft palate
8. Uvula
9. Epiglottis
10. Vocal folds
11. Trachea
12. Esophagus

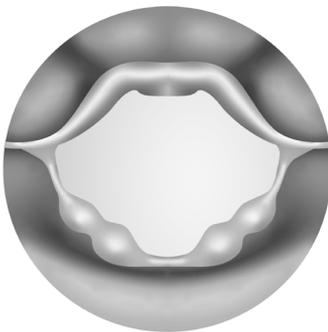


Full color image:

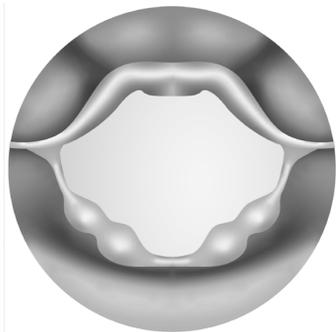


Sketch and label the vocal folds:

[p]



[b]



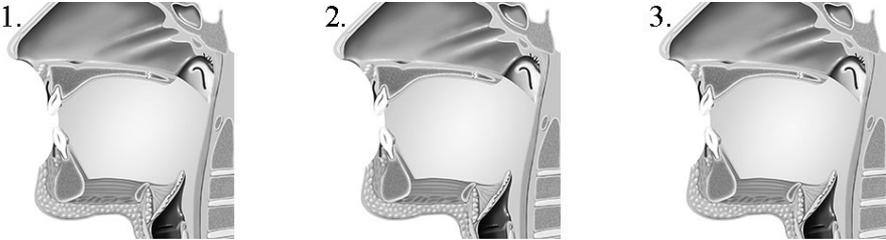
Articulatory process for *bee* [bi]

Step 1: Form the space of *Ah*: release the jaw, allow the tongue tip to touch the lower front teeth, and raise the soft palate (this closes the nose gate)

Step 2: Allow lips to lightly contact

Step 3: Pop the lips open while arching the tongue forward to sing the [i] vowel

Assignment: Sketch the lip, tongue, and palate formation for each step



Articulatory process for *beep* [bip]

Step 1: Form the space of *Ah*: release the jaw, allow the tongue tip to touch the lower front teeth, and raise the soft palate (this closes the nose gate)

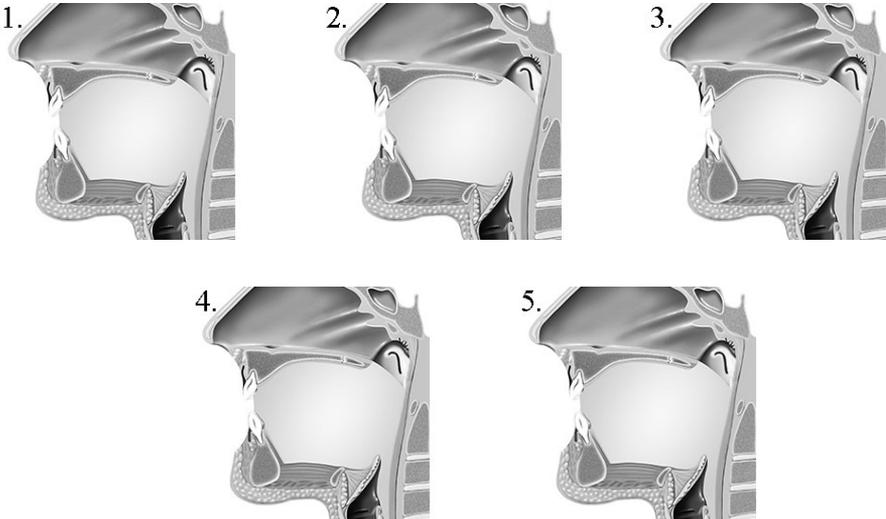
Step 2: Allow lips to lightly contact

Step 3: Pop the lips open and release a puff of air while arching the tongue forward to sing the [i] vowel

Step 4: Allow the lips to lightly contact

Step 5: Pop the lips open while releasing a puff of air

Assignment: Sketch the lip, tongue, and palate formation for each step

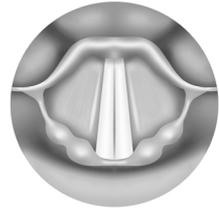
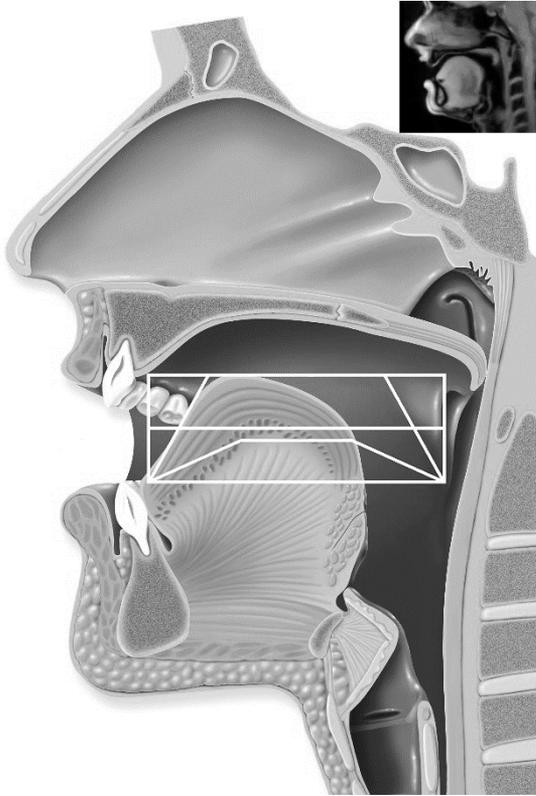


UNIT 5:

Moderately steep closed front [e] and open [ɛ]

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Open [ɛ] formation	32
Open [ɛ] worksheet	33
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MODERATELY STEEP CLOSED FRONT [e]



Description. English does not have a pure [e] vowel. An approximation of the sound is found in words of foreign origin and in the unstressed or secondary stressed syllable of a few words: *café, nativity, debut*.

Enunciation. Release and lower the jaw. Find the space of *ah* without spreading the lips. The tongue tip touches the lower front teeth, the front of the tongue arches forward, and the sides of the tongue contact the upper molars. Raise the soft palate and direct vocalized tone toward the upper front teeth. Maintain an unaltered formation throughout vocalization.

Warnings. Form [e] with the tongue arch (not by spreading the lips). Do not replace [e] with an open [ɛ] vowel. Closed [e] is closer to a closed [i] vowel.

Italian exercise. Contrast the following: *say/se* [se], *day/vede* ['vede], *twenty/venti* ['venti], *fresh/fresca* ['freska], *destiny/destino* [des'tino]

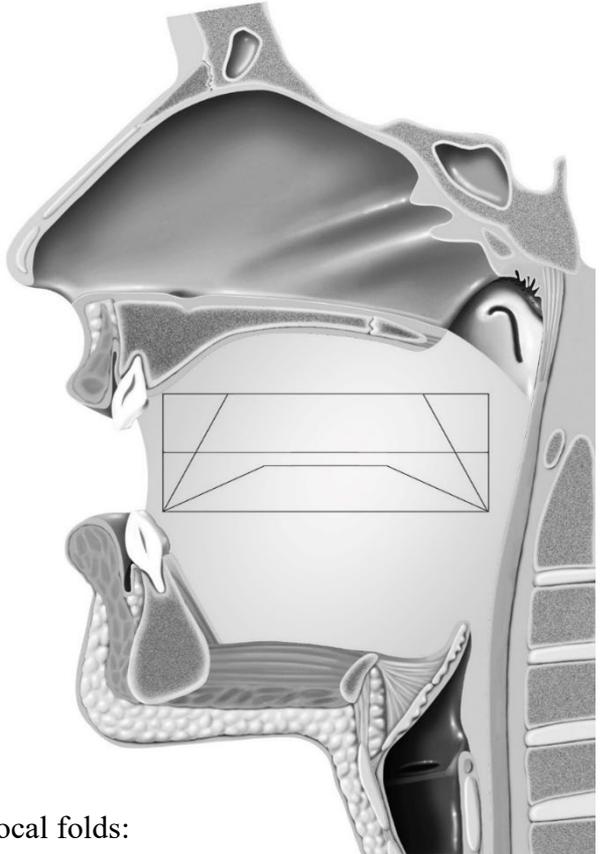
German exercise. Contrast the following English/German words: *state/stet* [ʃte:t], *way/weh* [ve:], *gate/geht* [ge:t], *sail/Seele* ['ze:lə]

French [e] exercise. Contrast the following English/French words: *pray/prés* [pre], *desire/désir* [dezir], *serenade/sérénade* [serenada]

VOWEL WORKSHEET

Sketch the tongue and palate formation of moderately steep closed front [e] and label the numbered points of the vocal tract:

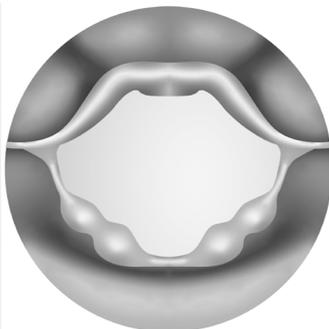
1. Nasal cavities
2. Pharynx
3. Tongue tip
4. Peak of tongue arch
5. Alveolar ridge
6. Hard palate
7. Soft palate
8. Uvula
9. Epiglottitis
10. Vocal folds
11. Trachea
12. Esophagus



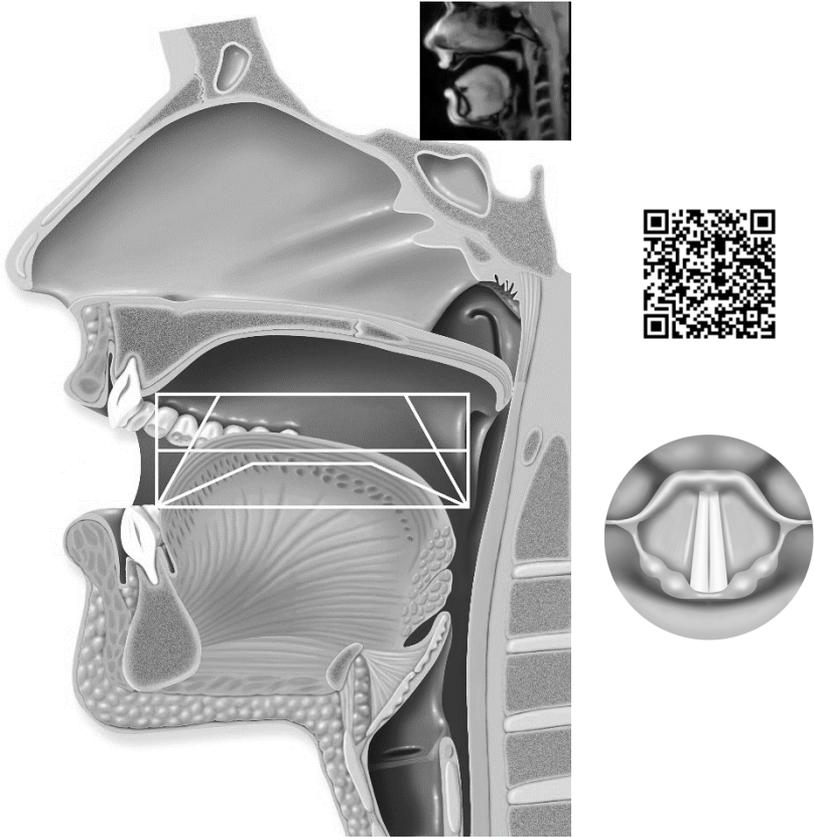
Full color image:



Sketch and label the vocal folds:



MODERATELY STEEP OPEN FRONT [ɛ]



Enunciation. Release and lower the jaw. Find the space of *ah* without spreading the lips. The tongue tip touches the lower front teeth, the front of the tongue arches forward, and the sides of the tongue contact the upper molars. The angle of the tongue arch is similar to [e] but with a lower plateau (there is more space between the tongue and the roof of the mouth). Raise the soft palate and direct vocalized tone toward the upper front teeth. Maintain an unaltered formation of the vowel throughout vocalization.

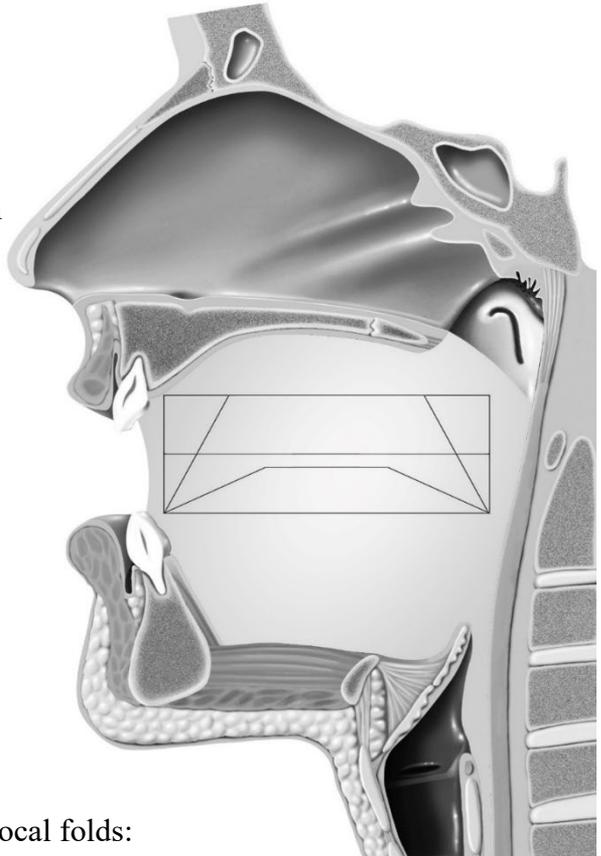
Warnings. Form [ɛ] with the tongue arch (*not* by spreading the lips). Do not sing [ɛ] with a breathy tone. To clarify the vowel: enunciate [ɛ] with the tongue in the [i] position. It is easier to focus [ɛ] with a forward arch of the tongue.

Examples: *gem, echo, rest, hedges, pleasant, breathless*

VOWEL WORKSHEET

Sketch the tongue and palate formation of moderately steep open front [ɛ] and label the numbered points of the vocal tract:

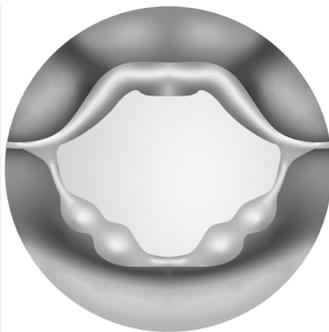
1. Nasal cavities
2. Pharynx
3. Tongue tip
4. Peak of tongue arch
5. Alveolar ridge
6. Hard palate
7. Soft palate
8. Uvula
9. Epiglottis
10. Vocal folds
11. Trachea
12. Esophagus



Full color image:



Sketch and label the vocal folds:



Articulatory process for *web* [wɛb]

Step 1: Form the space of *Ah*: release the jaw, allow the tongue tip to touch the lower front teeth, and raise the soft palate (this closes the nose gate)

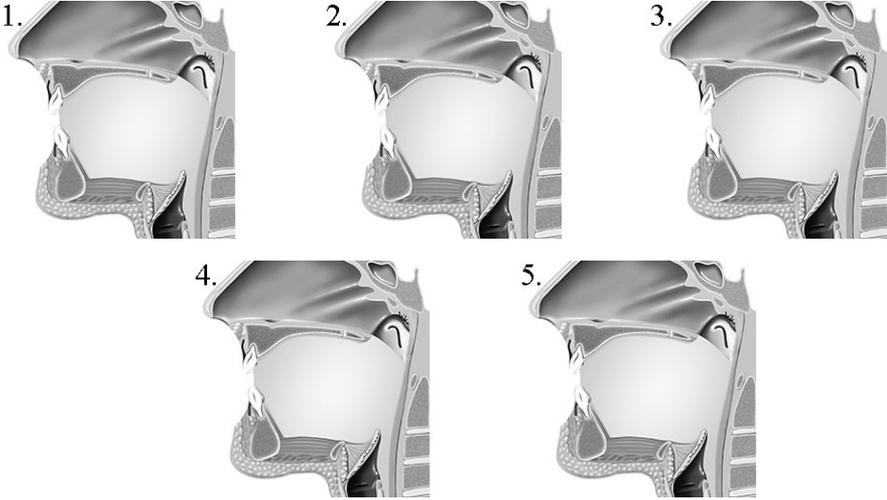
Step 2: Gently round the lips and sing an abbreviated [u] vowel

Step 3: Release lip rounding while arching the tongue forward to sing [ɛ]

Step 4: Allow the lips to lightly contact

Step 5: Pop the lips open while singing a shadow vowel

Assignment: Sketch the lip, tongue, and palate formation for each step



Articulatory process for *may* [mɛɪ]

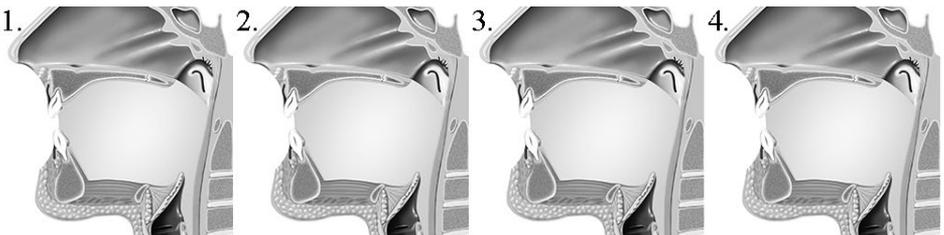
Step 1: Form the space of *Ah*: release the jaw, allow the tongue tip to touch the lower front teeth, and relax the soft palate (to open the nose gate)

Step 2: Allow lips to lightly contact while humming the [m] consonant

Step 3: Pop the lips open while raising the soft palate, arching the tongue forward, and singing the [ɛ] vowel (yawning raises the soft palate and closes the nose gate).

Step 4: Tilt the front of the tongue farther forward and sing a short [ɪ]

Assignment: Sketch the lip, tongue, and palate formation for each step

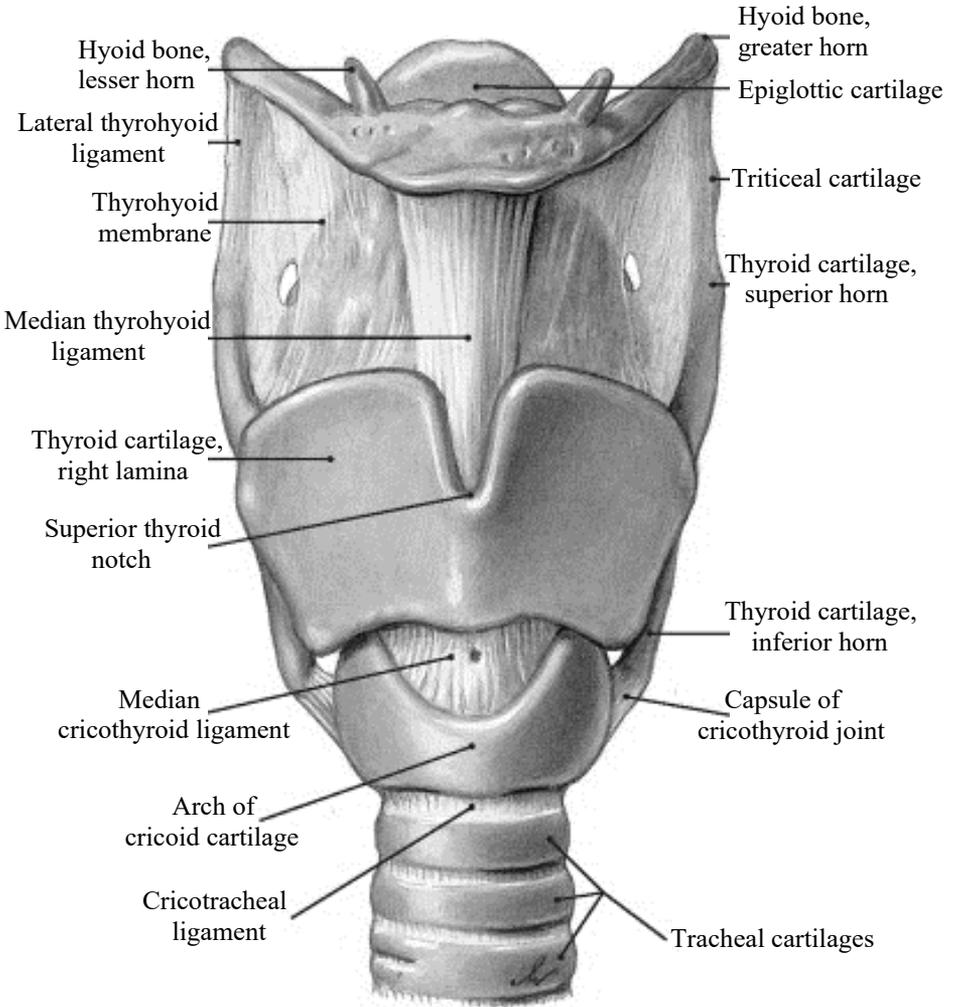


UNIT 28:

The Larynx

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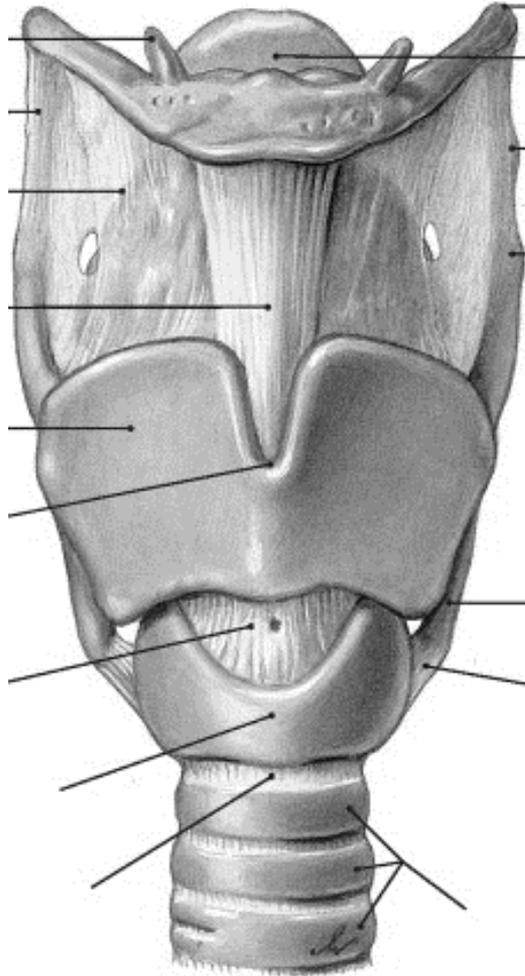
THE LARYNX



Full color image:



WORKSHEET



Exercise: provide a numbered label for the blank points above

1. Hyoid bone, lesser horn
2. Lateral thyrohyoid ligament
3. Thyrohyoid membrane
4. Median thyrohyoid ligament
5. Thyroid cartilage, right lamina
6. Superior thyroid notch
7. Median cricothyroid ligament
8. Arch of cricoid cartilage

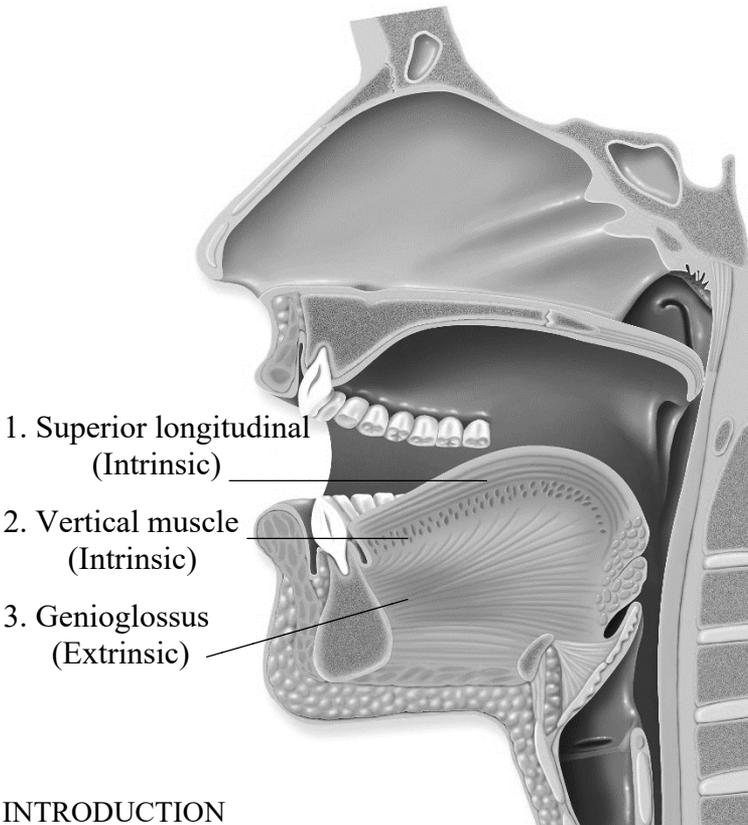
9. Cricotracheal ligament
10. Hyoid bone, greater horn
11. Epiglottic cartilage
12. Triticeal cartilage
13. Thyroid cartilage, superior horn
14. Thyroid cartilage, inferior horn
15. Capsule of cricothyroid joint
16. Tracheal cartilages

UNIT 29:

The Tongue

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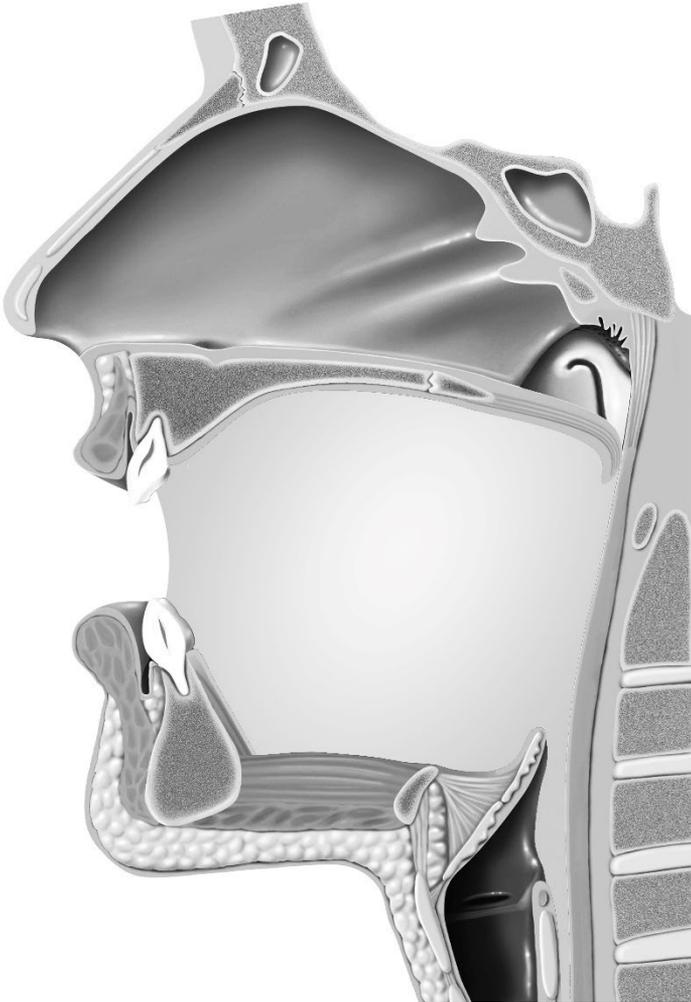
CROSS SECTION OF THE MOUTH



INTRODUCTION

The tongue is divided into a left and right half with all muscles of the tongue being paired. Each half contains four extrinsic and four intrinsic muscles. The extrinsic muscles are attached to a bone or muscle outside the tongue. They control the larger movements of the tongue by altering the position of the tongue. The intrinsic muscles have their origin within the tongue. They control the smaller movements of the tongue by altering the size and shape of the tongue. The intrinsic muscles are activated for speech and singing. The extrinsic muscles are likely activated while singing due to an increase in the size of the oral cavity which creates a greater distance for the tongue to travel. The three tongue muscles labeled above have been visible in the worksheets to this point.

CROSS SECTION OF THE MOUTH WORKSHEET



Exercise: sketch the muscles of the tongue and provide a numbered label for the muscles listed below.

1. Superior longitudinal (intrinsic)
2. Vertical (intrinsic)
3. Genioglossus (extrinsic)

Full color image:



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END NOTES

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<https://creativecommons.org/licenses/by/3.0/legalcode>. Changes were made to indicate the palatoglossus muscle.

³ Intrinsic muscles photo credit: Remko van Deijk. *Functional Swallowing Units (FSUs) as organs-at-risk for radiotherapy. PART 1: Physiology and anatomy*.
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⁴ Soft palate muscles photo credit: von Arx, T., Lozanoff, S. (2017). Hard and Soft Palate. In: *Clinical Oral Anatomy*. Springer, Cham.
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⁵ Lip muscles photo credit: Uldis Zarins. *Anatomy of Facial Expression (Anatomy for Sculptors)*. Anatomy Next, Inc. 1/1/2017.
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