EXCELLENCE IN SINGING

multilevel learning and multilevel teaching

VOLUME 1: Beginning the process

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Redmond, WA

smooth and even upward pressure against the bottom of her lungs, which creates a smooth and even outflow of air.

For singing, your student trains the opposing pressures so that they feel smooth, steady, and even and give her command over a wide range of musical expressions. She learns to use opposing pressure to maintain a smooth outflow of air.

Phonation

Your student creates vocal sound by molding the air stream flowing out of her body into pulses. Her body performs this function, called "phonation," within her *larynx,* a complex, walnut-size structure in her throat. It is made of several cartilages, muscles, and membranes, including the vocal folds.

Your student's vocal folds create a valve that opens and closes the airway. To chop the air into pulses, her vocal folds open and shut rapidly—as many as 880 times a second for A5 or 1,000 times a second for C6—and each time, a pulse of air shoots through.

Not long ago many voice scientists believed that individual muscle movements moved the vocal folds open and shut during phonation. They thought that a neuron fired, and the vocal folds opened; another neuron fired, and the vocal folds shut.

But scientists now know that the air inside the body plays a major role in opening and closing the vocal folds during phonation. The muscles close the vocal folds loosely enough to allow the air to push through, which interacts with the folds and causes them to vibrate open and shut. Your student can experience a similar sensation by making motorboat sounds with her lips: she closes her lips loosely enough to allow the air blowing through to vibrate them. The important point is that her muscles only pin her lips

together and the air interacts with the muscles to cause them to open and shut.

Besides the sheer speed of the movements, the air and vocal folds interact in many ways. They push, pull, stretch, bend, recoil, and fling each other in many ways. (See the "Myoelastic aerodynamic theory," on page 175.)

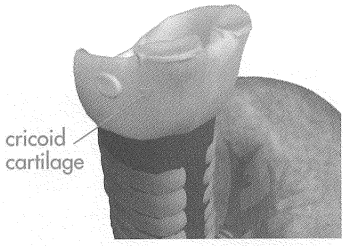
To illustrate this high-speed, complex interaction of the tissues and air, we look at phonation as it is happening within your student. Keep in mind that the descriptions apply to all human voices. We first look at the anatomy of the larynx—its cartilages, muscles, and membranes. We then look at the interplay between the tissues and air. Finally, we look at where your student can introduce changes to optimize phonation for singing.

For a clear picture of the moving tissues and air, see the animation films, *The Singer's Voice: Vocal Folds* and *The Human Voice*.[5] The films describe each step of this continuous and rapidly changing process.

Cartilages of the Larynx

Your student's larynx has three main cartilages that are relevant to phonation: the cricoid, thyroid, and two arytenoids. All muscles within her larynx attach to these cartilages, which give the muscles something firm to pull against when they contract. Though firm, these cartilages are flexible and play a dynamic role in phonation. If they were stiffer—made of bone perhaps—your student could not produce the range of tones she does.

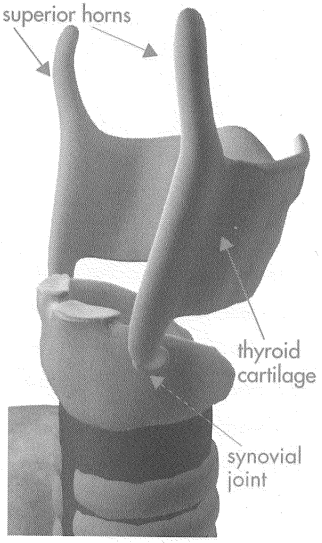
Figure 4. The cricoid cartilage.



The cricoid cartilage

Your student's *cricoid* cartilage sits on top of her trachea and, though circular, its back is larger than its front, resembling the shape of a signet ring. Her cricoid forms the foundation for the other parts of her larynx. (See Figure 4 in sidebar.)

Figure 5. The thyroid cartilage.



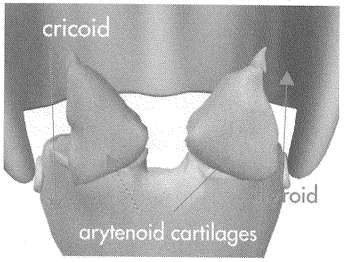
The thyroid cartilage

Your student's *thyroid* cartilage rises above her cricoid. (See Figure 5 in sidebar.) It is the largest cartilage of her larynx and resembles a medieval shield. The front of the thyroid has a protruding prominence called the "Adam's apple," which is larger in men than in women. Your student can feel the front of her thyroid cartilage by placing her hand on her throat and swallowing. She will feel it move up and down.

- The thyroid cartilage is completely unrelated to the thyroid gland.

The back of her thyroid cartilage is open. It has four extensions, called "horns." The two top horns—called the "superior horns"—attach to her *hyoid bone* with ligaments. The two bottom horns, called the "inferior horns," attach to the outer walls of her cricoid through small ligaments. The bottom horns attach with a *synovial joint*—a flexible joint that enables a much wider range of sounds than a rigid joint would allow.

Figure 6. The arytenoid cartilages.



cricoid

The arytenoid cartilages

Your student's two *arytenoid* cartilages sit on the back of her cricoid. (See Figure 6 in sidebar.) Each arytenoid has three pointed tips: the *muscular process* toward the side; the *apex,* at the top; and the *vocal process,* in front. These three tips are like handles, allowing the muscles to grip and pull the arytenoids. When pulled, the arytenoids rotate forward and toward each other.