Chapter IV: Breathing

4.1. "By studying sound, you are studying breath."

Undertake a study of breath, not breathing muscles. Study air, not muscles. Music is the big deal, not physiology. All physical functions have control systems in the brain. The body is too complex to be controlled directly by individual muscles. The musician produces results by studying product, so study breath, not body. There is no biofeedback to let you know the position of your diaphragm. The muscles used for breathing should be used with as little effort as possible; think of a bellows, with ease and efficiency of movement. Closures in the neck region and tightening or stabilization of the abdominal muscles are needed for defecation, childbirth, and combat, but a relaxed body is needed for the ease and efficiency of the movement of air needed for musical purposes.

A conditioned response is as good as a biological reflex. Don't correct habits, form new habits through repetition. New physical habits start crudely and gradually become more refined. Develop lyric melodies first. Then, move to other styles, but keep the same beautiful sound.

Singing is good for the brain, but bad for the breath, because singing involves very little air quantity. To use the body efficiently for brass playing, take in lots of air (think of it as fuel), so you can waste it. A good sound is indicative of good breath.

Put breath into perspective. The artist must dominate. Avoid paralysis by analysis. **While it is complex and very important, wind should occupy no more than 10 –20% of your musical thought.**

4.2. "Always maintain good posture."

You can breathe, at least to some extent, using any posture. However, the ability to take in air is greatest in a standing position and least in lying flat on the floor. With your instrument aside, stand comfortably tall; assume your best posture. Using your hand, feel your back's curve just above the belt. Sit down. Feel, reform, and maintain the same curve (lumbar arch). Now you're "standing" above the hips. Stretch your body upward to its tallest and longest form, with a relaxed frontal wall.

Stay tall even when seated. When sitting don't get shorter on exhalation; allow inhalation and exhalation to occur with simplicity. The torso as bellows moves air simply. The small inward curve in the lumbar area of the back is natural. Maintain this curve when either sitting or standing for efficient breathing. Think of keeping your head as close to the ceiling as possible. A long torso allows more space for the lungs to expand; the more you slump, the worse it gets.

Sit erect, not tense; get the rib cage out of the way of the diaphragm. Think of keeping the back of your head as close to the ceiling as possible, like a puppet on a string. Keep the spine long. Avoid rigidity, think length of torso, not breadth. Do not slouch, or lean in any direction - left, right, forward, or back. If the chin is pointing downward or upward, the airway is narrowed. All of these postures will result in less usable air capacity than sitting or standing

tall. Of course, you can play in any posture, but breathing with full breaths in and out is most efficient while sitting or standing erect without tension. Think vertically (chest up and diaphragm down) when breathing. The lateral (sideways) motion of the ribs will come automatically.

Poor posture results in regional breathing, that is, using air from some region(s) of the body and not from others. Maintaining the lumbar arch encourages generalized breathing. Generalized breathing is more efficient, since no one group of breathing muscles does more work than any other group, but they all work together in coordinated fashion to use 100% of the total vital capacity (the maximum volume of air that can be contained within the lungs; see appendix B). Ribs raise best in a "sit tall" position. Then, no one region has to work too hard.

Use the psychology of up and down movements of the rib cage, and lateral expansion will come naturally. Keep the body long when breathing both in and out. Staying tall will allow you to use "minimal motors," that is the least amount of effort. The standing posture has the maximum respiratory function. It releases muscles that restrict breathing. In nature it is the posture used when you need the most air – to run or fight. If playing is easier standing than sitting, the sitting posture is probably bad.

Think of filling with air from your nose to your toes. As you blow, think of getting taller, not shorter. Don't change the position of your head or shoulders. Don't lower or raise the chin. Either position will restrict the airway. Look straight ahead, and keep that chin line the same, especially in the high range. **Have a long spinal column before breathing and stay tall while playing.**

4.3. "Order air as external wind, not as internal pressure."

Breath is the fuel supply, not music. However, to make music efficiently and beautifully, you must have large quantities of air in flow, not pressure inside the body or mouth. The body knows nothing about playing an instrument, but it does know a great deal about movements of air. Air is compressable. You need a high flow rate so that the pressure remains low. Exaggerate quantity; minimize pressure. Air pressure internally should never be greater than external wind pressure. The maximum for FF high range trumpet playing is about 3 pounds, but most brass playing can be done with a pound or less of wind pressure at the point of constriction. Too much pressure reverses the function of wind. If you blow hard, you have more pressure, but less quantity; so, you'll have less air with which to work, especially at the ends of phrases (see Teaching Brass by Kristian Steenstrup, p. 114).

To get the full range of body motion, and hence air flow, both in and out, you must order external wind. "Support" is just the movement of air based on the needs of the embouchure. The sound of wind, "WHO", validates the inward movement of air; it should sound the same as air blowing out; it is neither silence nor a strained sound. Think of the air stream flowing outside of the lips, not between the diaphragm and the lips. Think of blowing to a point two or more feet in front of you. If you order pressure, you won't get wind, because in order to get pressure, that is pelvic pressure, the airway must be constricted by the tongue, throat, and/or the abdominal muscles. High internal pressure generated by a closed throat and/or high tongue position is called the Valsalva maneuver. Brass players often do this when

working with air pressure rather than wind or motion. When you play with pressure, you move air downward, not outward. Static air pressure fools the brain, but it does not move air (to the lips, where moving air is needed).

There is no wind without pressure, but pressure without wind is possible. If you order wind, you will get pressure, but if you order pressure, you may not get wind. "Wind" is the stimulus for air movement instead of pressure. Visualize air as wind; move wind both in and out. Let the requirement for external wind be the master, and let the quick upward movement of the diaphragm be the slave. The diaphragm is a large muscle that separates the lungs from the organs of the lower abdominal region. On inhalation, the diaphragm contracts and moves downward, lengthening the lungs. On exhalation, the diaphragm relaxes moves upward, shortening the lungs. The diaphragm is the floor of the chest and the roof of the abdomen (see figures 4A and 4B).

Form an "O" with the lips. Blow out. Listen to the sound of air moving out freely, and match that sound when breathing (blowing) in. When breathing in think of lifting feathers, not weights. ¾ of a pound of pressure is all that is needed to hold in a full breath. "Suction" is the stimulus for diaphragmatic descent and general expansion in the thoracic region (see figure 4A). Be conscious of "wind" when playing.

The body cannot distinguish between pressure behind the tongue and blowing wind. Therefore, it is important to keep the tongue and throat out of the way of the air stream when playing. In any case, blow the air against and through the lips, not the throat or tongue. The tongue is best controlled by diction (see chapter V). An expression of surprise on inhalation will open the throat; swallowing will close it.

Make a hissing sound, "sssss". This is high pressure with a low flow rate caused by a high tongue position. To avoid a high tongue position and a closed throat, think the syllables "ah" "oh", or "oo" as in "who" (more about this in Chapter V). Blow air against the back of your hand while you pronounce the syllable, "WHO". This is low pressure with a high flow rate. Always try to achieve a high flow rate with low pressure. Think of two vertical lines (see figure 1 below). The tall line represents airflow rate; and the short line represents pressure. Think of these two lines while doing breathing exercises (see section 4.6.) and while playing, in order to achieve high flow and low pressure.

Figure l: Pressure-flow relationship

The Bernoulli principle illustrates why this is important (see figure 2 below). In the direction of the arrows, air moves constantly through a tube whose diameter is wide in section A, then becomes narrower in section B and then opens up again in section C. Imagine that section A represents the lungs, B represents the narrowed passageway of the throat and oral cavity, and C represents the lips. The air pressure (in the direction of the flow) in A becomes greater as the diameter of B becomes smaller. As the pressure in A increases, the quantity of air reaching C decreases. The point for brass musicians is to keep the throat and oral cavity as open as possible, so air pressure does not build up internally, because of constriction, and lessen the air flow to the lips. Air is the fuel for the embouchure. The embouchure will not work properly, if it is starved for air. Equalize the air pressure on both sides of the buzz. Remove resistance by moving large amounts of air in and out. Blow from the lips and let the abdominal dimensions change. Waste air, especially in articulated passages. There are many potentials for blockage. You must relax. There is a natural stimulus to achieve relaxed openness. Say "oh" as if surprised. Also, yawn (without a wide open mouth). Take in and blow out the greatest amount of air at the beginning of each breath. Blow against and through the lips; not against the throat or tongue .

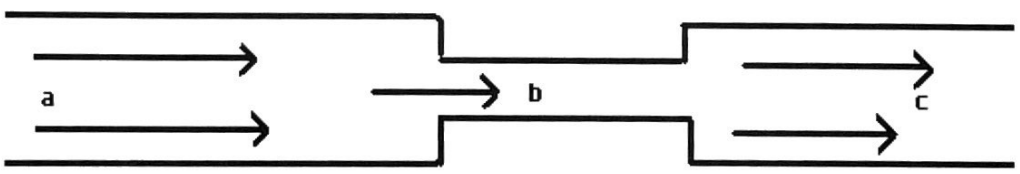

Figure 2: Bernoulli-Principle

The same muscles that produce wind also can produce internal pelvic pressure. Therefore, you must order the product, not the method. Get used to moving the air in all sorts of ways outside the body. Use a piece of paper, a bag, or breathing aids to visualize this. Air sensed inside the body creates unneeded pressure. Air pressure limits quantity. You can alter the size of your abdominal region without moving air by protruding your stomach and pulling it in without breathing, resulting in static air pressure, not moving air. However, a change (expansion and reduction) in the body is needed to move air. Breathing from the lips gives the best signal to the body to take in the maximum amount of air. Air should not be interpreted in any body cavity, because the body will interpret air as pressure, which triggers the pelvic pressure syndrome, which results in closures.

If you play by pressure, as you run out of breath, the larynx will close to maintain air pressure. Don't play by resistance; play by product. Don't use excessive wind pressure when playing in the high range, but transfer the ease of low and mid range playing to the high range. Like closing the nozzle of a hose to maintain watering distance when the flow of water is reduced, the body will react to a lack of air by creating closure to keep up the pressure.

Of course, there is some pressure with wind, but you don't have to add additional pressure. But, there is also pressure without wind as in defecation and childbirth. These pressure syndromes are in the blueprint of our brains, but not needed for music. However, they can creep into your playing and cause problems. Air as pressure brings closures and downward pushing. Think wind, not pressure. Play with as high a flow rate and as little pressure as possible. Develop a sense of quantity, or volume of air not power of the air. Don't go by the strength of muscles, but by the strength of wind. What is needed is motion, not powerful contractions. Think of airflow as thick, slow and easy, not thin, fast and hard. To get the breath flow at the embouchure, motivate wind, not pressure. Air moves with speed until it hits something; then it moves only with strength. Think of the air as a bow on a string instrument, always moving but not pressing down too hard. Think of a full breath as a full bow – frog to tip. **Be conscious of how much air moves, not how to move air.**

Although the muscles of the torso can support 125 pounds on the chest and abdomen, these muscles can generate only about 3 or 4 pounds of static pressure. Sensors in the lungs protect the delicate tissue and prevent large pressures from being generated so you won't crush the lungs. A cough involves about 3 ½ pounds of pressure. You have to blow like crazy to generate 3 pounds of internal pressure. Only high range fortissimo trumpet playing requires this much pressure. Otherwise, most brass playing requires much less, only 1 pound or less. Tuba requires the least, a maximum of only about ¾ of a pound. Go for a strong tone, not strong body.

You cannot control the breath when the activity is centered behind the lips. Don't push against resistance. Develop breath control and correct obstructions by playing long tones with and without crescendi and diminuendi. Keep the best possible quality of sound through each tone. Don't base playing on effort, especially in the high range, but on sound. While playing your body senses pressure, not vibration. When you simply blow from the lips, you will not be working hard. Weakness is your friend. If there is hard work, your muscles are fighting each other. The breathing in muscles may be fighting the breathing out muscles. Don't push and pull at the same time.

The diaphragm is the main muscle for lowering the air pressure in the lungs (sucking in the air). In repose the diaphragm is near the heart. On inhalation the diaphragm contracts and moves down, lengthening the lungs, creating more room for air (see figure 4A). On exhalation the diaphragm relaxes and moves up, shortening the lungs, expelling the air (see figure 4B). When you blow, the brain will normally deactivate the inspiratory function. However, if you are using air to create pelvic pressures, the diaphragm will not deactivate, but will fight against its antagonist, the abdominal muscles and continue to push down resulting in closures in the throat or tongue to maintain abdominal or pelvic air pressure, starving the embouchure for a sufficient quantity of air. Think of air as wind outside the body and the inspiratory muscles will automatically relax and allow the expiratory muscles to work efficiently. At the end of a breath,

do not worry about getting ready to inhale; the body will take over naturally and automatically switch gears, if you think of simply changing direction of the air stream. Isometrics (like flexing your biceps) will not move air.

A sensation of having to release air before taking another breath means there is too much internal pressure. Pressure should be equalized on both sides of the lips. The pressure inside the body should be the same as air pressure outside the body. When you blow wind, emptying the lungs, the body will get smaller.

Pull in your stomach with a positive sense of blowing. Be careful not to innervate the breathing in muscles while blowing. On exhalation don't fight getting smaller, but focus on the psychology of wind moving out from the lips. Don't think of air inside of any body cavity, but outside the body. Blowing from the lips is the master; the body (pulling in of the abdominal muscles) is the slave.

A free and open low and mid range will protect the high range, because pressure doubles with each octave higher. Thus, if you have 10 ounces of pressure on a low "C", you'll have 20 on middle "C", 40 an octave higher, etc. If you start with 5 ounces, upper octaves will have 10 and then 20, etc. making the high range much easier. Think of blowing slowly for pp and faster for FF. Use thick air, not thin. Thick air is like pushing a chair across the floor with your hand; thin air is like using one finger to push the chair. Air should be thick at the beginning and end of each note.

To focus air at the lips, say "pa, pa, pa", or "pu, pu, pu". Also, while blowing out freely, cover your lips with your index finger, and, without puffing out your cheeks, continue to blow so that pressure builds up against your finger. Release your finger, and continue to blow, following through with a "who" sound of rushing wind. **Continually strive to play with more airflow and less air pressure.**

4.4. "Keep breaths full and relaxed."

Your potential capacity for air is much greater than what is needed for daily life. Respiratory muscles are breathing muscles, only when you use them for breathing. Sit-ups and lifting, etc. require much more strength than is needed in playing. Brass players need to form the habit of quantitative breathing, not strength breathing.

Stay tall and take big breaths. It is better to have too much air rather than too little. The need for air is set by the embouchure, not the instrument. You need enough air so that the embouchure can vary the pitch freely and easily. You'll never know exactly how you do it, but you need large quantities of wind moving freely in and out. It is not necessary for the musician to know all about the breathing apparatus.

Movements of air, not muscular strengths, are needed to make music with minimal motors. Normalize bodily functions for breathing with as much ease as possible. Think "HO" on inhalation; the larynx moves down and the vocal chords open up. Breath expansion should occur simultaneously all over. The lungs do not fill up like a pitcher filling with water from the bottom up. Air goes to all sections of the lungs at the same time. Your abdominal muscles can

support weight of over 100 pounds, but excessive tightening of the abdominal muscles to play a brass instrument is not necessary, since you will need a maximum of only 3 pounds of wind pressure.

A large breath involves chest and diaphragmatic breathing working together (see figures 4A and 4B). You need generalized air motion, not just one part of the torso. Generalized breathing involves more groups of muscles both in and out, so that any one group of muscles doesn't have to work as hard as in regional breathing. With generalized breathing everything becomes easier than with regional breathing.

Also make replacement breaths specific as to quantity. Imagine the bow of a string instrument. Exaggerate and allow the study of extreme "frog to tip" breathing, so that playing can be done comfortably generally between ¾ and ¼ of your vital capacity. "Frog to tip" breathing gets us away from regional breathing. Regional breathing sustains life in different postures - bent forward, back to one side, or lying down. When you have a whole breath, all regions have to work together efficiently. Development of efficient breathing requires the full length of movement in breathing – as full to as empty as possible. To take in a full breath, first blow out all of your air, remain empty for 15 seconds, then inhale.

Avoid jerky muscular motions when breathing. Inhalations and exhalations should both involve smooth simple movement. Use multiple senses – sound, sight, and touch to encourage breath wind. Study the sound of inhalation, and think of that exaggerated "WHO" sound on exhalation. Look at yourself in the mirror inflating and deflating while you are taking full breaths in and out. Note that the whole abdominal wall, especially the part under the sternum moves in and the rib cage moves down immediately upon exhalation. Associate the inward motion of the abdominal wall with ease, not strength. Nevertheless, trained breathing procedures should be based on quantity of air, not shape change. Shape change is resultant, not causative. Work with air, not anatomy.

Avoid stopping the air between notes or direction of air stream in to out. Any kind of static air will upset your playing. Keep air moving up and out, not down and in. Become acquainted with breath as motion while blowing simple phrases in slur in mid range.

The relaxation pressure curve (see figure 3 below) illustrates why full breaths are so important. When the lungs are completely full of air, the breathing muscles and lung tissues are stretched. When relaxed they generate ½ to ¾ of a pound of relaxation pressure as they return to repose. With a full breath, this relaxation pressure makes quickly exhaling a large quantity of air very easy. Below the point of repose, however, blowing becomes increasingly less efficient, because the body wants to expand to the point of repose, while blowing requires further reduction. (More and more muscle power is needed to move less and less air.) Since airflow slows up toward the bottom of vital capacity, **it is difficult to use air when you're running out of it**.

From total lung volume down to repose, relaxing the body will push air out of the lungs resulting in easy blowing. Like a rubber band stretched and released, the body will return to its original shape and size. Between repose and residual air, however, relaxing the body will pull air into the lungs. Therefore, blowing out is difficult, when your air volume is below the point of repose. Residual air cannot be blown out. Relaxation pressure is like a rubber band stretched and released, returning to its original shape. (Long time assistant to Arnold Jacobs, Brian Frederiksen, has likened the relaxation pressure curve effects in the body to balloons. When the

air in a fully inflated balloon is released, almost all the air quickly rushes out. However, some air still remains within the balloon in repose. Almost all of that air in repose can be squeezed out, but a little bit will remain no matter how hard you squeeze.)

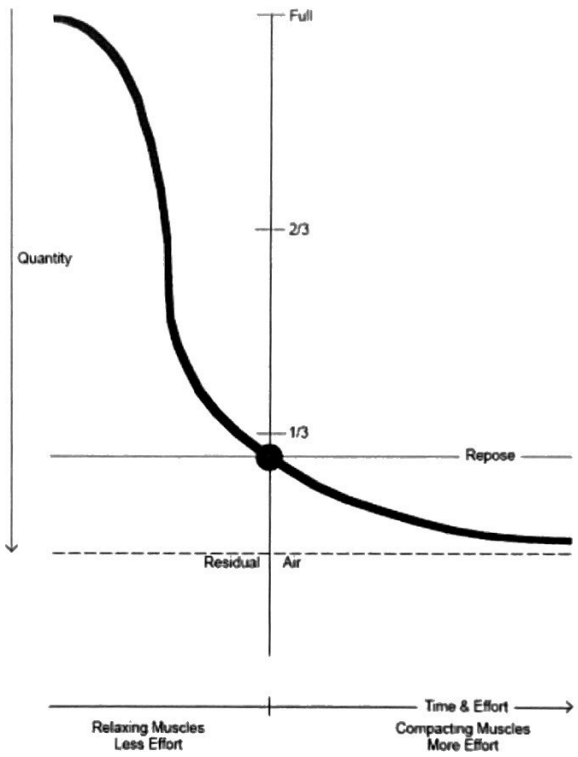

FIG. 3 RELAXATION PRESSURE CURVE

Figure 3: Relaxation Pressure Curve

For ease of playing, always play with a reserve of air. Large breaths are needed to stay above the point of repose so you will have a sufficient quantity with which to work in all musical situations without having to work against yourself to blow air out. Fill up the top portion of your lungs, too. If you play with as little pressure as possible, you will be able to sense the point at which you get into the lower part of the relaxation pressure curve. (As Edward Kleinhammer (CSO bass trombonist 1940-1985) often said "It is always better to have it and not need it than to need it and not have it.") You can't take in too much air. Learn to have full lungs with no internal pressure. (Don't artificially pressurize fully inflated lungs before exhaling.) There are many reasons not to play or breathe in the lower part of the relaxation pressure curve. Muscular effort is needed to squeeze air out. Airflow slows up at the end of capacity. In 1 second you can remove 80% of your useable air; 3 or 4 seconds are needed to remove the rest. This explains the need for playing with more air in your lungs than you have in repose. Normally at the end of a phrase you should still have a lot of air, so that you can take

the next breath comfortably. To reiterate: it is difficult to use air when you're running out of it. If you finish a phrase in distress, you probably took in too little air as replacement breath. For full and smooth replacement breaths, plan breaths ahead of time. Imagine the syllable "Ho" just before taking a breath and keep the last note of the previous phrase ringing in your mind. The point is to take in as much air as possible and avoid shallow breathing. Those with small lung volumes should just breathe more often.

On inhalation, full breaths are needed to take advantage of relaxation pressure while playing. To experience relaxation pressure, sigh. To experience a full breath, after inhaling as much air as you can, blow all of that air into a bag. Then suck all of the air out of the bag. Stay full, then immediately play. Stay between full and repose. Both ends of the vital capacity have minor complications. When the "frog to tip" area of the vital capacity is expanded through vigorous breathing exercises, you will have more with which to work in the middle. You cannot work with the lungs until you experience full and empty (not counting residual air).

The key is to fill and empty. Every area of the lungs fills equally at the same rate. Thinking about full breaths allows more air than thinking about regional breaths. Imagine that you are blown up like a balloon. Exaggerate the thickness and quantity of air. Strength cannot be applied to music. Moving air can. Too much "push" creates too much resistance. The lips must vibrate. Make them vibrate with minimal motors. Breathing does not require strength; so don't use it. Extra strength will cause stiffness and tension. Exaggerate weakness. Practice hard blowing with a clenched fist; then contrast that with easy blowing with a relaxed arm and fist. Use easy blowing when playing. Muscle fibers can only contract completely or do nothing. The idea is to contract as few muscle fibers as possible to get the job done. Minimizing the effort will maximize the quantity.

Comfortably large breaths are needed. Generally stay in the middle third of your vital capacity. Be comfortable at phrase ends. Most players breathe for first notes. It is better to breathe for the last notes of a phrase and ensure their quality. How much air is left at the end of a phrase is more important than how much air you take in. Avoid unintentional diminuendos (slowing of breath flow) at phrase ends. Hold a note as long as possible keeping breath secondary to the sound in the brain. Can you increase your vital capacity? No, but you can go to the limits of what nature intended through the study of air, not air apparatus. Easy and efficient use of the breath requires the use of a high percentage of your vital capacity. Let there be resultant work efforts based on the needs of the embouchure; don't add to it. Don't make a hard job out of an easy one. Take in more air than you think you will need. Take in and blow out the greatest amount of air at the beginning of both inhalations and exhalations.

Don't get in the way of the natural function of breathing. Of the 659 muscles in the human body, 654 are opposing pairs. Muscles can only contract, and when they do contract, antagonist muscles oppose them. Exhaling muscles are much stronger than inhaling muscles. Opposing muscle groups make stiffness without movement. The strengths generated by isometrics result in immobilization, which is a loss of respiratory function. A bellows-like bodily movement is the opposite of isometrics. Put friction outside the body. Practice weak movements; think of change, not stability.

Relaxation means that one set of opposing muscles "lets go". On inhalation the exhaling muscles "let go". On exhalation the inhaling muscles "let go". Concentrate on the period immediately before blowing to make sure you are completely relaxed. A build-up of

pressure indicates isometrics. Minimal motors means the least amount of muscle innervation needed to get motion. Fire as few muscle fibers as possible, and find weakness and flabbiness through palpitation. With fingers together, repeatedly and vigorously jab your abdominal region between the rib cage and hipbone while doing breathing exercises and playing (see figures 4a and 4b). On exhalation let rapid deflation take place, so that you get smaller like a balloon that is deflating. Twist and turn; put one foot on a chair; or walk up stairs while playing. Use of large muscles will help you loosen up the small muscles needed for breathing efficiently. You can then concentrate on where the air goes, not what it does inside the body. If playing is hard work, it is because your exhaling and inhaling muscles are fighting each other.

You can go into the combat mode (not appropriate for wind playing) without knowing it. Over application of strength hinders playing. Muscle isometrics may cause a quiver in the sound. Practice by breathing hard and easy without the horn. Then transfer the easy breathing to playing while communicating your musical message. Keep a positive sense of blowing, but think of the tonal results, not the efforts needed to produce them. When you push too hard with the breath, the embouchure becomes resistant. Blow wind with speed, not power.

Because of a lack of biofeedback, there is no awareness or sense of the position of the diaphragm. So, don't breathe from the diaphragm, breathe from the lips. With blowing, the rib cage moves down and in, and the diaphragm moves up making the lungs shorter (see figure 4B), but think of blowing from the lips. On inhalation the rib cage moves up and out, and the diaphragm moves downward making the lungs longer (see figure 4A), but think of sucking from the lips. There is no system of nerves in the diaphragm to tell the brain in what position the diaphragm is. The diaphragm has only pain sensing nerves. Suck air in and blow the air out; the diaphragm and the rib cage will perform. There is no way to suck air in unless the diaphragm moves down. Don't develop strength; develop quantity. "Suction" is the biological signal to the brain that coordinates the enlargement of many muscle groups. Advice to "support with the diaphragm" misses the point. The diaphragm contracts and pulls down during inhalation. It relaxes and moves up during exhalation. If the diaphragm moves downward during exhalation, closure in the throat will result.

There is also no direct communication from the throat muscles, but a relaxed throat is an open throat, and a contracted throat involves closures. A high chest tends to relax the abdominal wall making airflow easy. Stiff abdominal muscles tend to pull the rib cage down, when it should be free to move both up and down and in and out.

Correct breathing is stretching and relaxing motions. But, if you expand in order to breathe, straining might result. So, <u>breathe to expand; don't expand to breathe.</u> Expansion in the body should lag behind inhalation. Order wind, not shape change. If you order wind, you'll get wind. If you order shape change, you'll have pseudo-function. Concentrate on suction at the lips with minimal friction. Don't fill up in sections; air goes simultaneously to all parts of the lungs. A capacity breath involves all parts of the body, not just some parts.

Simultaneously as the diaphragm moves down, the rib cage moves up, and also expands laterally. The psychology of "suction" signals a full breath using minimal motors. Instead of multiples of pounds, use multiples of ounces. Become acquainted with the <u>sound</u> of air blowing out. ("WHO") Then inhale, reversing the flow, while keeping the sound even. The study of the slow breath as quantity is needed to develop comfort and ease in the fast breath.

If the abdominal muscles are tight, the lower part of respiration is taken out of function (because the diaphragm cannot move up and down simultaneously). Practice full, slow, even breaths. Emphasize quantity over time. Whenever you can, take slow breaths, because they are more efficient than fast breaths. Develop fast breaths by studying the ease, evenness, and smoothness of slow breaths. Keep the quantity the same, even when taking a quick breath. Base both slow and fast breaths on quantity – the language the body can understand. Use rhythmic breath drills to develop easy, full, fast breaths (see sec. 4.6.).

Inhalations are mechanical – like filling a tank. You're not a musician when you breathe in, but you must immediately switch and concentrate on music when you play. Don't tense lips (quasi embouchure) when inhaling. Purse the lips out, so that the air doesn't cause friction, but moves in smoothly. Take in large volumes of air, so that you can waste it; it's free. Don't conserve air. Take a full breath even when playing a soft or short phrase. Old habits come back when you're low on air. When playing (exhaling) let artistry be the driving motivation. Emphasize the quality of phrase, not length of phrase until development is advanced. Do not associate blowing with pitch (high or low). Always blow straight ahead. Think of blowing a wide air stream – much wider than the vibrating surfaces of the embouchure. When speeding up the air stream, maintain the width. Think of pushing an object with the palm of your hand rather than a pointed finger. Establish a rhythmic pulse in blowing. Blow each attack rather than a steady air stream interrupted by the tongue used as a valve for articulating. In staccato passages, deflate faster than the same passages played in slur. Blow cold, not hot air. Think of blowing out candles, matches, feathers, or tissue paper. **Suck and blow external wind.**

A large meal before playing is not recommended, especially for those with low lung volumes. Obesity pushes the diaphragm to a high position and doesn't allow for easy descent. Fat gets into spaces where it shouldn't be. There is a decrease in lung volume with age. At about age 45 lung tissues begin to calcify and gradually loose elasticity. Make sure that breathing habits formed at a young age are good habits, so that you can adjust to having less air as you age. Throat closures and tonguing problems may creep into one's playing as a result of this decrease of lung function due to aging. So, the older you are, the more you need a full breath. The lessening of lung function with age increases the importance of forming good breathing habits when you are young.

4.5. "Focus on the psychology, not the mechanics of breathing."

The mechanics of respiratory function are complicated; the psychology of respiratory function is simple. When you concentrate on the psychology of breath, the anatomical structures will take care of the physical activity needed to do the job. Most actions we perform are anatomically too complicated to think about. Learn to communicate with the bio-computer part of the brain. Look for child-like simplicity, not complexity. The study of respiration should not be taken out of context. The needs of the embouchure set up the requirement for the breath. You do not blow just for an embouchure; you have to sing with the lips. This is not done by knowledge of musculature or measurements; it's done very much by the knowledge of sound, by concept of tone.

Think of what wind does, not of how you produce it. Imagine blowing out matches or candles with a "hoo" sound (as previously mentioned). Blow cold, not hot air. Think of palm trees bending in a strong wind or a moving sailboat. Picture dry leaves and paper being blown down the street. Figuratively blow up a balloon. Visualize a river of wind both in and out. Imagine water flowing easily out of an open hose (not pressurized by a narrow nozzle). Think of the tone of the instrument as a ball riding at the top of a spurt of water. For loud playing a faster spurt of water pushes the ball higher. For soft playing the ball rides on a lower and slower spurt of water. Think of using a bean blower to hit a target across the street. Imagine blowing flies away from your face. Use arm movements to simulate movements of air in and out.

You cannot put the brain in charge of individual muscles; coordinated groups of muscles are needed for function. You are not able to make value judgments about which muscles are being innervated. You cannot observe by self-awareness; you must use external stimuli. Visualize thick, fast air moving with minimal motors.

There is no sensory awareness of air below the larynx, so feel air at the lips and don't judge breath by body movements. Permit change in the shape of the body; don't create changes in the shape of the body. The descending diaphragm is the only muscle that protrudes the abdomen. But forget all of that when playing. Avoid pseudo-function, that is, body movement without the movement of air. The diaphragm normally cannot be felt directly. The body can lie; it can change shape without taking in air and look as if air has been taken in. Tell the truth to your body. The body changes with breathing. Taking in air will enlarge it; blowing out air will make it smaller. Like a bellows, it needs to move to function. Breath is a variable. Don't stabilize it, but use it for fuel for vibration. A car will not go unless the engine gets gas. Stability means no motion, which means no wind. Quantities of air require motion.

If you order shape change, you'll get shape change. If you order air as wind, you'll move air. The quantity and speed of air can't be heard. Focus on taking in air, not moving the body. Disassociate deflation from blowing and enlargement from inhalation. Deflation merely accompanies, and is a result of blowing. Enlargement merely accompanies and is a result of inhalation. Study the breath, not breath mechanics. What is important is the quantity of air that you take in and blow out. Avoid a large sensory involvement, or self-analysis of tissue in function. Concentrate on the movement of air, not movement of the body. **Breathe to expand; don't expand to breathe.**

Provide signals (suck and blow) from the brain to coordinate the breath. Concentrate on blowing air externally rather than relying on the felt sensations of breathing. Have weakness in the body. Relaxed tissue under the jaw means the tongue is back and out of the way and the throat is open. Think of air as product, not method. The psychology of blowing is imagining where the air lands, not where it comes from.

You can't blow out what you haven't taken in. The front of the mouth is easier to control than throat opening; so when breathing, the area of the opening of the lips should not be larger than the throat opening so that resistance to the air is at the lips, not the throat. The more you are aware of air in and out at the lips the better – especially on replacement breaths. Don't just order a breath, you must order quantities of air sucked into the mouth with minimal friction. Change to in from out instantly, as in changing direction of an imaginary violin bow, or your hand from push to pull. The change of direction is abrupt; and that requires relaxed

blowing. The brain must send the correct suction order to the body in order to disengage opposing muscle groups so that, without pause, the change of direction is instantaneous. Think of wind suddenly changing direction. Change from blowing to sucking, not blowing and sucking at the same time. There should be no pause between sucking and blowing.

"Suction" is the key, the signal to the brain for full, relaxed inhalations. When running respiration is unconscious, being triggered by the primitive part of the brain. In playing, get as close as possible to this primitive, unconscious, and automatic inhalation and exhalation by doing isolated breathing exercises away from music (see sec. 4.5.). Breathe to expand, not expand to breathe. Use the psychology of suction through a straw. Imagine an air stream that is a reverse blow. Picture sucking in a bubble of air next to or above your head like the caption bubbles above comic book characters. Try to suck in air from the other side of the room. Think of taking in a length of air stream in quickly on replacement breaths, not just a sip of air. Don't gasp or swallow. **Order a large quantity of moving air at the lips.**

Pedagogy Course OPTIONAL FROM HERE

4.6. "Establish good breathing habits through exercises away from the horn."

There are no short cuts in music, but there are ways to maximize efficiency. Understanding is different than application. You can do it wrong and still sound good, but you will sound even better with efficient use of the air. We are structured for survival, not music. Respiratory activity is only one of the uses of the diaphragm and abdominal muscles. We want reflexes of respiration, not defecation or combat (tightening of abdominal muscles for the protection of the internal organs). Furthermore, normal respiratory functions must be adapted for music. Unlike usual and natural situations you must train the breath as a person using full breaths - "frog to tip", like the bow of a string instrument, so that normal musical movements of air become easy and efficient. You can't have an efficient respiratory system that is immobile. The lower and upper parts must both move. The rib cage and the abdominal region move simultaneously. When the ribs and chest move up, lower abdominal tension will lessen. To inhale, the diaphragm goes down, the tummy goes out, and the rib cage goes up, and expands laterally. Do not, however, consciously raise the shoulders. (But, do allow the shoulders to raise naturally with the chest.) To exhale the diaphragm goes up, the tummy moves in, and the rib cage goes down, and contracts laterally (see figures 4A and 4B). This should be done completely away from music until full breaths become normal and natural; only then should they be reapplied to instrumental function. Bypass old habits by forming new ones. Focus on respiration only temporarily. When playing, 85% of your mental focus should be on music. We need respiration, but it should not be overdone. We need air for fuel, but fuel is not music.

There are many learning approaches. Use multiple senses to reinforce each other – sound, sight, and touch. Do not go by the feel of the body, but use sight and touch, even when playing, to form free-blowing habits. While doing quantitative breathing exercises, look in a mirror, palpate the abdominal region. With fingers together, repeatedly and vigorously jab the abdominal region between the rib cage and hipbone (see figures 4a and 4b). Feel the tension of muscle contraction. Use collapsing, guided by sight and touch, as a tool to overcome excess muscle tension. Weakness is your friend. At all times when doing breathing exercises, keep the abdominal area like jelly. Very little strength can produce much motion of air. Learn about air

as motion. Breathe through a tube (7/8 in. diameter or smaller) between the teeth and over the tongue to ease the tension. Listen to the sound of freely moving air in and out. The main approach, however, is suction and blowing. Keep the sucking and blowing rhythmical. Neural inhibition allows a sudden change of direction of the air without a period of relaxation (pause) in between. One muscle group will contract while the opposing group will let go. To change directions, the opposing muscle groups will suddenly reverse roles.

Picking up the horn will trigger a continuation of your current physical habits. If you want to change your habits and replace them with better ones, you must introduce strangeness, new stimuli – breathing aids, mouthpiece playing, sight, touch, mental imagery, etc. Don't try to apply new habits to music until they're established as conditioned reflexes after weeks and months of repetition away from the horn. In the study of physical skills, one starts with crudity and gradually gets more refined finding the easiest and most efficient motions. When doing breathing exercises, the mouth aperture should be the same as the throat opening. If the mouth is open too far, friction will build in the throat, where we have no conscious control. Conscious control of the air is at the lips. To feel the air at the lips, wet the lips and pant breathing in and out quickly. Send an instant burst of air to the lips with an "H" sound clearing the airway. Breathing exercises should be done with as much ease and weakness in the body as possible. Waste air with frictionless breathing; don't waste sound. If you control the sound, you'll be controlling the breath. Suck and blow from the lips. Focus on what air does after leaving the body, not how it gets out.

Some breathing exercises can be done without any breathing aids; some can be done with simple common objects such as drinking straws, PVC or plastic tubes, balloons, or paper or plastic bags. Some breathing exercises may be done with inexpensive diagnostic devices (see appendix B). But remember, a tool has no brains. Development depends on judicious use of breathing exercises and aids. In general these devices promote visual awareness. They help communicate verbal and intellectual understanding to the body. Some breathing aids give a visual read out of the quantities of air. They can be instruments of positive change as substitute stimuli, if you remember the visual aspect, not the feel. Use visual aids to measure where air lands, not where it comes from.

Breathing exercises away from the horn should always be done with exaggeration and vigorously through a small lip aperture. If you do not feel dizzy after a few repetitions of vigorous breathing exercises, you're probably not using your full capacity. To recover from dizziness, rest without breathing for several seconds. Let the senses of sight, sound and touch reinforce each other for efficiency in developing good breathing habits using the advice described earlier in this chapter – namely good posture (sec. 4.2.), external wind, not internal pressure (sec. 4.3.), full and relaxed breaths (sec. 4.4.), and all with a focus on the psychology, not mechanics of breathing (sec. 4.5.). Also, use the syllable, "oh" throughout (see sec. 5.3.). To help reduce tightness in the breathing muscles, use hand and arm movements, bend your body to either side as well as forward and back, walk around, do deep knee bends, etc. while doing breathing exercises. Large physical maneuvers act as governors to keep the brain from racing ahead. Breathing exercises should be done away from musical challenges. Repetition should be done for weeks or months of conditioning, before applying to music.

The following breathing exercises can be done without any breathing aids, but with a metronome set to 60 to 80 beats per minute to establish a steady tempo:

(a) Slowly and evenly inhale for 6 beats, and exhale for 6 beats. Do 3 or 4 repetitions without pause between inhalations and exhalations; then stop. Palpate the abdominal region (see figures 4A and 4B) while breathing and resting to make sure the abdominal muscles are relaxed. Look in a mirror to be sure movements of the body are smooth and even. "Take a breath" is a non-specific thought. Make it specific by simultaneous hand motions. Use hand motions to simulate the movement of air in and out for the purpose of encouraging specific quantities as well as smoothness and evenness of the movement of air both in and out. Do variations of this exercise using different numbers of beats from, say, 10 down to 1. The goal is to fill completely and empty completely smoothly and evenly regardless of the number of beats. Rest between sets to recover from any hyperventilation (dizziness, or light-headedness).

(b) While conducting a 5/4 time pattern, exhale on beats 1,2,3&4 and inhale on 5. Be sure to use your full capacity on both inhalation and exhalation. The idea is to establish a dominance of quantity over time. Breathe in the same amount of air on beat 5 as you blow out on beats 1 – 4. After 3 or 4 measures stop and rest. Inhalations should be relaxed like a modified yawn with the mouth only partly open. To maximize air intake quickly, imagine saying "oh" as if surprised when inhaling. Vary the tempo on successive repetitions to gradually decrease the time of a full, yet smooth and relaxed inhalation. Reduce the time of inhalation without reducing the quantity of air taken in. Also, while conducting a subdivided 4/4, or an 8/8 pattern, exhale on the first 7 eight-notes, and inhale on the eighth eighth-note. Using full breaths, establish quantity over time. Rest after three or four repetitions. Vary the tempo.

(c) Using hand motions to simulate the movement of air, breathe in 1/3 of your vital capacity. Stop and evaluate; are you 1/3 full? Then breathe in the next one-third of your vital capacity. Stop and evaluate; are you 2/3 full? Then take in the last third of you vital capacity. Stop and evaluate; are you now completely full? In the same manner blow out 1/3 so that you are now 2/3 full. Then, blow out another third, and then another. Then, inhale 2/3, down to 1/3, up to full, back to 1/3, down to empty, up to full, etc. stopping and evaluating after each inhalation or exhalation. In the same manner, inhale and exhale in fourths of your vital capacity. This exercise helps to develop an awareness of quantity. Equate arm speed and position with the movement and quantity of air. You should be able to move air as fast as you can move your arm.

(d) Standing in front of a mirror with your arms at your sides, inhale for 5 counts while simultaneously and gradually raising your arms until your hands come together above your head on the fifth count. Hold this position with your lungs full of air, and since you can't sense quantity directly, see what you look like when you're full to capacity. Then, blow out slowly over 5 counts while gradually lowering your arms until they touch your sides when you are again empty on the count of 5. Repeat so that you associate arm position with the quantity of air in the lungs.

(e) Inhale as much air as possible and retain the breath without pressure. Muscle and lung tissue have elasticity – so to get the best use of air, without throat closure, hold with zero internal pressure, and with the mouth remaining open, count loudly – 1,2,3,4,etc. about one count per second. Hold your hand in front of your mouth and feel the air rushing out with each count. Allow yourself to get smaller. Palpate the abdominal region occasionally to avoid tightness or tension. Keep shouting out counts in this manner as long as possible. This is to develop a sense of slow exhalation without constriction or abdominal tightness.

(f) Inhale as much air as possible and retain the breath without pressure. Don't swallow. After retaining a full breath, pant and palpate the abdominal region to validate fullness and lack of internal pressure. Then, blow out as if by surprise. Then laugh out loud emphasizing the "H" aspirant – HA,HA,HA, etc. Large volumes of air are released by blowing freely, rather than being pressurized and released. Eventually, this sense of free blowing can be applied to playing your instrument.

(g) Take in a full breath, and while beginning to exhale, cover completely the opening in your lips with your index finger. Without puffing out your cheeks, continue to blow for five counts, even though no air is escaping and pressure is building. Then while still continuing to blow, pull your finger away and release the air with a "WHO" sound. Continue to follow through with the blowing until empty. Be careful not to make any choking or grunting sounds. This is to develop a sense of Quantity of air moving freely, moving external wind blown from the lips. Do the same using a mouthpiece. Blow air (not buzz) through the mouthpiece and use a finger to plug the stem end and then release. When playing, use this sense of quantity of air moving through the lips. Use the concept of "follow-through", like swinging a baseball bat or golf club.

(h) Looking in a mirror, place one hand with fingers spread over your stomach and the other hand on your sternum. Change shape by protruding your stomach and lifting your chest without taking in any air. Do the same while inhaling a full breath, but let the expansion in your body lag behind the inhalation, so that you are breathing to expand, not expanding to breath. This exercise illustrates how "the body can lie". If you order your body to change shape, you will get shape change, but no air. However, if you order air, you'll get air accompanied by shape change. If you fill your lungs, the body will expand automatically as it needs to. Repeating full breaths with your hands on the stomach and sternum will encourage full and relaxed breaths that permit the body to move and expand without constriction or tightness. Exaggerate weakness, but also exaggerate the instant inward pull-in of abdominal muscles on exhalation as training, not music. Also do this exercise with your hands 3 in. from your stomach and sternum. Then as you breathe, extend yours hands outward and inward, always keeping them about 3 in. from your body. Look at yourself in the mirror while playing on the mouthpiece and horn and observe the in and out, and up and down movements of the body on inhalation and exhalation.

(i) Place both index fingers under both sides of your rib cage. Then change shape by lifting the rib cage without and with air intake. Pretend that you are a puppet with strings attached to, and pulling up, both sides of the rib cage and the sternum. This exercise will help relax the abdominal muscles and allow the diaphragm to move freely – down on inhalation and up on exhalation. Also, with both index fingers under both sides of your ribs, simulate with your fingers the movement of the diaphragm – down on inhalation and up on exhalation.

(j) Blow against the back of your hand with a hissing sound – ssssssss. (high pressure and little quantity) Next, blow with the sound - "WHOO". (high quantity and little pressure) Wetting the back of your hand will help you to notice the difference in the quantity of air felt against your hand; sssssssss is thin air and WHOO is thick air. Use thick air.

The following breathing exercises use simple, common objects:

(k) Holding a piece of paper by the upper right-hand corner at arm's length, blow against it so that you see it move. Then, suspend it further and progressively further away from you and blow toward it to make it move at the various distances. See how far you can place it from you and still make it move. This will help develop the concept of external wind. Do the same with matches or candles.

(l) Cut a drinking straw into 3 equal sections. Inhale full breaths as quickly as possible through one section, then two, then all three sections at once, placing the sections between the teeth and over the tongue. Then do the same with a 3 to 4 in. section of ½ in. diameter plastic tubing. Then do the same with a 3 –4 in. section of 7/8 in. diameter PVC pipe. The purpose of this exercise is to develop a sense of suction for full breaths with resistances felt at the lips, not in the body.

(m) Obtain a 3 - 4 in. section of 7/8 in. diameter PVC pipe. Drill 3 holes in the pipe – 1/16, 1/8, and ¼ in. in diameter. Stop up one end of the pipe with a wine bottle cork. Placing the PVC pipe between your teeth and over your tongue, suck and blow full breaths with all of the holes open and then, with one hole and then two holes closed by covering them with your fingers. Do the same after putting your mouthpiece in the open end of the pipe and while buzzing tunes. This will help you develop a sense of external wind on both inhalations and exhalations as well as when playing the horn.

(n) Using a paper or plastic bag, or a rubber breathing bag that will hold about 1 ½ times your vital capacity, fill it up by blowing into it continuously. Immediately suck out all the air and then play on the mouthpiece or horn. Use of a bag will let you see enlargements and will allow you to do several repetitions without hyperventilation. This will help develop <u>full</u> breaths. Look in a mirror and see if your body expands as much without the bag as it does with the bag. But when applying this to music, remember the <u>sight</u> of the bag being blown up and the <u>sound</u> of the mouthpiece or horn, <u>not the feel; feeling can lie.</u>

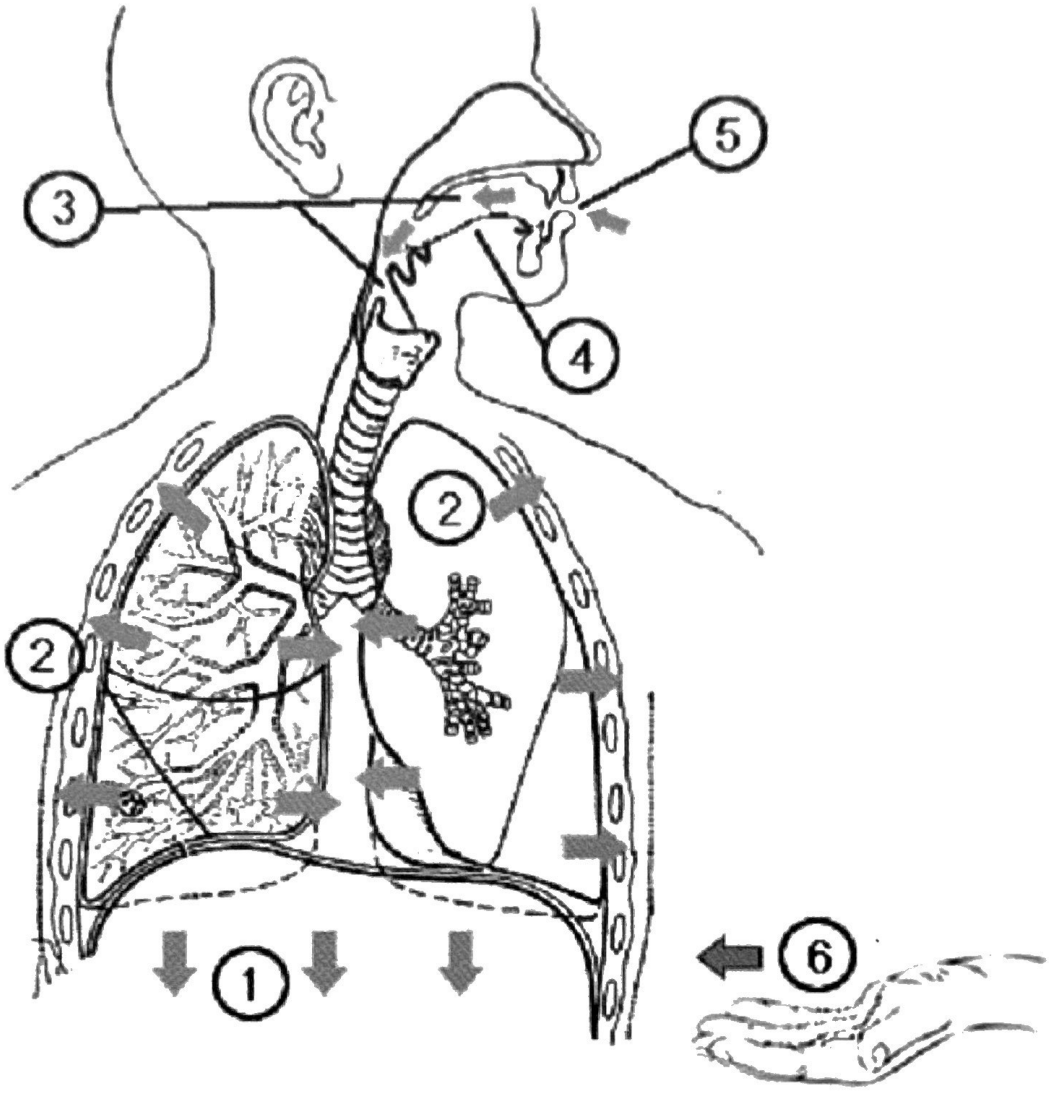

Figure 4A: Inhalation

(1) Diaphragm moves down.
(2) Lungs inflate in all directions.
(3) Oral cavity and throat open with "OH" sound.
(4) Tongue is out of the way with "OH" sound.
(5) Opening at the lips is no larger than the throat space (the diameter of your thumb).
(6) While doing breathing exercises and playing, palpate the abdominal region between the rib cage and hipbone to insure that abdominal muscles are relaxed.

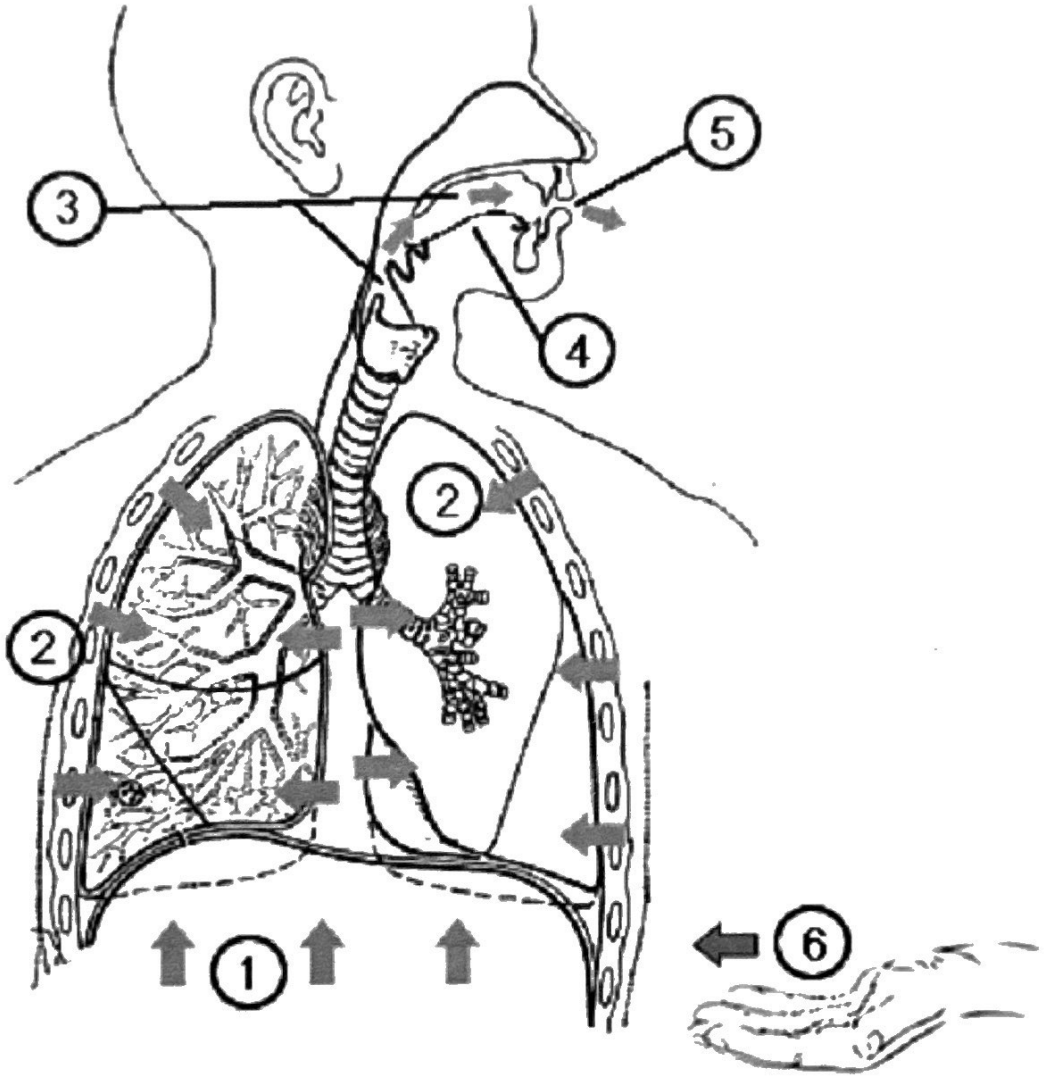

Figure 4B: Exhalation

(1) The diaphragm moves up.
(2) Lungs deflate in all directions.
(3) Oral cavity and throat open with "HO" sound.
(4) Tongue is out of the way with "HO" sound.
(5) Air moves as wind out from the lips; lips vibrate freely.
(6) While doing breathing exercises, buzzing, and playing, palpate the region between the rib cage and hipbone to insure abdominal muscles are relaxed.

(Descriptions of various manufactured breathing devices and the exercises in which they are used can be found in appendix B, or by contacting Wind Song Press, Ltd. at http://windsongpress.com.)

These devices give a visual validation of quantities of air movements. Use them with as little effort as possible. They can also challenge you to blow against various resistance and effort levels. You should do some high flow and low pressure blowing contrasted with static pressure. Do only a little high resistance blowing. By looking at the gauge or ball, you will take your mind off the body and think less of self-analysis and more about what you're accomplishing in response to challenges. **Gadgets only enhance the learning process, not by feel, but by cooperation with the gauge or ball. Study breath, not breathing apparatus. After a period of conditioning, apply your skill of moving large quantities of air to music by a memory of the visual aspects, not the feel of exercises using these devices. Large breaths will not make an artist, but an artist will perform more efficiently with large breaths.**

Photograph courtesy of Nathan Zassman