Heraldic Sound

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This article is about the whys and wherefores of being loud and understandable as a herald. Several years ago I wrote a similar article and found from the commentary I received that including greater detail about the physiology of the voice might have been better. At the expense of brevity, the current work before you provides not only some simple rules which should improve your performance as a voice herald, but it also describes the physiology of being loud and how you can use that to your advantage.

Before we can start, however, we need a common vocabulary about our subject. This is easier said than done. Everyone uses different jargon when discussing the voice. No two vocal coaches agree. Speech therapists do not speak the same language as stage professionals. Vocal cords are sometimes called vocal folds. The "upper register" is somewhat equivalent to the "head voice." The "voice box" is confused with the "vocal organ." We could add more to this list, but this should suffice to get the point across. This confusion of terms is a problem. No one can understand each other. [I shall resist the temptation to mention the Tower of Babel.] Obviously, we need to define our terms.

The word "voice" itself is rather confused. It isn't the same as the anatomical mechanism that makes sound, nor is it precisely the sound itself of speech or singing. Timbre certainly is a significant portion of what we mean by "voice," but it's not the whole enchilada. To quote a researcher in vocal physiology: "it seems that we know exactly what we mean by the word voice as long as we don't try to define it." (Sundberg, 1987)

Let's define some terms. For our purposes, it's safe to say that sound is nothing more than extremely fast microscopic variations of air pressure. The human voice makes sounds that vary air pressure from about 100 times a second to over 2,000 times a second. In other words, the frequency range of the human voice is from approximately 100 hertz ("Hz") to 2,000 Hz.

The tube that carries the air in and out of the lungs is the trachea. At the top of the *trachea*, there's a pair of muscles shaped like flat folds of cloth, covered with a mucous membrane and supported by a box-like cage of cartilage. These two muscles are the vocal cords, so named because of the two cord-like ligaments that support them along the slit between them. The cartilage-supported cage that supports the vocal cords is the *larynx*. The slit made by the gap between the vocal cords is called the *glottis*. The vocal ligaments, the vocal cord muscles, plus the other laryngeal muscles all act together to control the length

and shape of the glottis. When air travels through the glottis, its length and shape determine the vibration rate of the vocal cords.

The vibrational frequency of the vocal cords is the same as the frequency of the sound that exists the mouth. The frequency of sound is the same as pitch. Pitch is merely how high or low a sound is. A low pitch has a low frequency, and high pitch a high frequency. Some of the famed Russian "double basses" can sing notes below 100 Hz, two and a half octaves below mid C; and some operatic sopranos can sing notes about 2,000 Hz, two octaves above middle C. Most human speech, however, is pitched between 200 and 800 Hz.

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When air travels through the glottis, the length and shape of the glottal opening determines how fast the cords vibrate. The sound that's produced is called *phonation*, with a pitch controlled by how fast the vocal cords vibrate. Without any other "shaping" of this sound, we would be no better off than barking dogs or noisy apes. The sounds that humans make, however, are much more complex than that of animals. The versatility of the human voice is the thing that separates us from the beasts of the earth; there are other creatures with functionally opposable thumbs and tool-using ability, like raccoons and certain simians, but none of them talk. The anatomical complexity of the human vocal apparatus is unique.

The vocal cord make rather simple sounds compared to the variety and complexity of human speech and song. Obviously, more than the action of the vocal cords shapes human sound. The vocal cords are very much like a double reed in an oboe, i.e., two membranes vibrating in unison to produce a pitched sound. Played by itself, a double reed from an oboe sounds like an anorexic duck. But when that duck quack of sound travels down the bore of an oboe, it is changed in frequency and timbre by the holes in the side of the instrument, and by resonance in the bore itself. What started out as a quack comes out of the oboe as music.

A similar scenario holds for the human voice. A phonation produced by the vocal cords travels upwards as a vibrating column of air through your pharynx, better known as your throat. The muscles and mucous membranes of the throat envelope the cage of the larynx; acting together, they can change the physical dimensions of the air passage through the throat, and thereby "shape" the sound that started at the vocal cords. Once that sound has passed through the throat, its journey can be further influenced by the position of the tongue and soft palette, the gap of the teeth, the shape of the lips, the opening of the nasal passages, and the resonance of the sinuses and skull. In comparison, the sound of an oboe is simple.

Now we have a functional vocabulary to discuss the human voice, though there are still some terms yet to be defined. Our choice of jargon, however, is neither better nor worse that those used by stage professionals, singers, or physicians — it is merely the set of words we shall use here. Different professions use different vocabularies when discussing the human voice and this is worth knowing if you ever want to talk about vocal production from one of the voice-related professions.

The Problem of Clarity

The vocal cords are oscillators, and the phonation sound they produce is also called a "voiced sound." We must make this distinction because the human voice can also make "unvoiced sounds." Whispering is a good example of an unvoiced sound. In whispering, the vocal cords are held so tightly by the laryngeal muscles that they cannot vibrate. Instead, they make the vocal tract so narrow that turbulence is created, making the breathy noise characteristic of whispering.

An unvoiced sound is created in the vocal tract every time a noise is made without discernible pitch, tone or resonance. The air turbulence created by teeth, like the consonant "f," is unvoiced sound — as are many of the other consonant sounds. Academic linguists actually have several different categories of sounds to sort the consonants into; we, however, do not require that level of refinement. For heraldic purposes, we really only need to differentiate between phonation and "unvoiced" consonants.

Here we run into conflicting vocabularies again. In the singing or stage fields, an articulation is one of the unvoiced or partially voiced consonants. In vocal physiology, articulation often refers to the total shaping of phonation in the vocal tract. For our purposes, we shall use the former definition of articulation as commonly used by stage professionals. As for the latter, we shall call that simply vocal shaping.

At the risk of oversimplifying, phonation is the essential property of vowel sounds and articulation is an essential property of most consonants. In general, phonation is heard better than articulation, regardless of relative intensity. Part of this is due to duration: phonation sounds usually last longer than articulation. In engineering terms, phonation is cyclic sound and articulation is transient sound. But the other reason that phonation is heard better is perception. Absolute loudness and perceived loudness are actually two entirely different things. If you sing a scale at a loudness level which sounds constant (to both you and your listeners), you are actually increasing in absolute loudness as measured by decibels. If you have access to a decibel meter, you can verify this for yourself. This phenomenon is somewhat amazing if you think about it: all these years our ears have been lying to us.

The unvoiced sounds of consonants can never be louder than that of phonation. They don't last as long and they lack the air support behind a vocal sound. They also lack perceived loudness, which is actually more important. This leads to my first basic rule of voice heraldry: *go slow and over-enunciate your consonants*. Put room around them. If you don't do this, your words at a distance will sound like a bunch of indistinct vowels strong together. Don't believe me? Go listen to your local example of a bad voice herald, and you'll find this is true.

Rule 1: Go slow and over-enunciate.

The Problem of Loudness

Loudness is not a function of lung capacity, as many people mistakenly believe. It's a function of subglottal pressure. Loudness comes from how well you can push exhaled air against the underside of your vocal cords. This is not exactly an easy thing to explain. It is easier to demonstrate.

Take a deep breath. Now hold it. While you're holding it, deliberately try to push it out. Did you feel an uncomfortable tingle in your through, like you wanted to cough? If you did, then you have just consciously felt subglottal pressure. Loudness is dependent on how well you can provide a high subglottal pressure while releasing enough air through your glottis to make the vocal cords resonate. The volume of air which passes through the glottis is NOT what makes loudness — it's the pressure applied to the underside of the vocal cords. There's another demonstration which might convince you of this.

Light a candle and place the flame a finger length from your mouth. Now talk. If you're like most people, the air you exhale will make the flame flicker or maybe even go out. So far so good. Relight the candle, if necessary, and proceed to step two of the demonstration. With the candle in the same position as before, sing. "Row row row your boat" will suffice if you can't think of anything else. The candle will flicker, but less than when you are talking. Now increase your volume as you sing. Now increase your volume as you single. The candle should not flicker. The louder you sing, the less the candle flame will be disturbed.

What's happening is this: in order to sing louder, you unconsciously increase the subglottal pressure and simultaneously decrease the amount of air passing through the glottal opening. It's a weird concept if you've never thought about it before, but this is actually what's happening. But stop to think for a moment: how else do you think opera singers can sing all those loud notes without taking a breath every two seconds?

Singing is more efficient at producing loudness than speaking. But what is singing really? Well, singing is different than speech in two ways: (1) conscious control of pitch, and (2) sustained phonation. Recall that sustained phonation is nothing more than a vowel sound which lasts longer than usual. What does this mean to you as an SCA voice herald? It means that if you deliberately go slow and draw out your vowel sounds, then you will be louder than your normal speaking voice.

Now, singing your announcements is silly. Singing is sustained phonation plus pitch. But you can get all the loudness that comes from the high subglottal pressure of singing without singing. How? By sustaining phonation without controlling pitch. What does this mean in practical terms? It means you should go slow and take time to sustain your vowel sounds. You can demonstrate this to yourself. Get some air into your lungs and do a loud "oyez" for at least five seconds. [If this is uncomfortable, then lower your volume until it feels better.] In drawing out that "oyez" for several seconds, you have just sustained phonation without singing.

***Rule 2:* Go slow and sustain vowel sounds whenever possible.**

The Problem of Lung Capacity

Why discuss lung capacity when subglottal pressure controls loudness? The answer is simple: without exhaled air, there can be no subglottal pressure. You need air to push at the underside of your vocal cords while letting some air through the glottis. The functional word here is push. The lungs do not have their own pushing mechanism; they rely on the muscles of your chest and abdomen. The muscles of the chest are wimps compared to the muscles of the abdomen, so most of the pushing is done by the latter. But in order to push, the abdominal muscles need something to push against. In order to produce a high subglottal pressure, you have to push hard; but you can't do that without inflated lower lungs to push against. The more you can inflate your lungs, the harder you can push. Why? Because full lungs have already moved a bit into the abdomen neighborhood, and your abdomen wants its space back — and this situation exists even before you start to exhale.

The greater the inflation of your lower lungs, the more the abdomen is pushed from above. The greater the displacement of the abdominal muscles, the more they can push back. Well-inflated lungs allow you to sustain a high subglottal pressure, which in turn enables you to be loud. The trick here is to put as much air as possible into the lungs, and the lower lungs especially. This is the basis of that old adage about breathing "diaphragmatically." The diaphragm is the vernacular for the flat cap of muscles on the top of the abdominal cavity. In order to fill your lungs completely, the diaphragm must be displaced downward. The volume just vacated by the diaphragm is now available for the lungs to expand into, thus letting a lot of air into the lower lungs.

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The demonstration for breathing "diaphragmatically" is as follows. Exhale, really exhale; get every little bit of air out of your longs. Really work at it. Now don't breathe, for as long as you can stand it and then some. When you finally do breathe, you will probably inflate your lungs, including your lower lungs, in one great whoosh. You've just displaced your diaphragm, forcing the rest of the abdominal muscles to bulge out. You should notice that your ribs and abdomen expand outwards. If you didn't see this happening, then you haven't gotten the knack yet.

But, remember: the volume of air you take in when breathing diaphragmatically is not as important as pushing against your lungs from below with your abdominal muscles to create subglottal pressure. Loudness is not a matter of volume: it's a matter of pressure.

Rule 3: ***Use your abdominal muscles when you breathe.***

The Problem of Injury

Though this is a somewhat simplified explanation, it is true that you can actually bruise the muscles of your larynx. If you're heralding and you feel like you want to cough, or if you feel a "tickle" in your throat, stop. The irritation comes from a subglottal pressure that's too

high. The only way to get rid of that nasty feeling is to lower the subglottal pressure. You can do this by pushing less hard with your abdominal muscles. If you can't get rid of the irritation by lowering your volume a bit, then stop. If you continue, you'll bruise something in your larynx.

Acute pain, on the other hand, means you've already bruised something. If your throat hurts, stop. Pain is a sign that capillary bleeding is taking place in the laryngeal muscles. That's what bruising is: capillary bleeding brought on by some kind of trauma. The phenomenon is not confined to the muscles immediately below the skin, but can happen anywhere in the body. The capillary bleeding associated with bruising creates edema in the tissues which will persist long after the bleeding is stopped. Congealed blood is a component of that edema and is the cause of those lovely colors you see when you have a bruise. Along with the edema, however, is scar and/or adhesion formation as the by-product of healing the abused capillaries. Edema and scarring in the larynx can permanently degrade your voice. By not stopping when your throat hurts, you prolong the bleeding in your laryngeal muscles, leading to edema which will take longer to dissipate, and causing more scar tissue to form than if you had stopped abusing your voice earlier.

You can also pull and tear the glottis; and you can detach the various pieces of cartilage of your larynx. Both of these can permanently injure your voice. Injuries like these are most often seen in cases where someone was shouting or screaming. These drastic injuries happen when someone expels everything in the lungs while using a high subglottal pressure. The combination of high air velocity and high subglottal can cause serious injury to the larynx. Not all of those stories about people screaming themselves mute are apocryphal; some of them are true.

There are other things that can screw up your voice. One of them is to disturb the mucous that lines the airway. Mucous is a lubricant. It protects the tissues of your airway from desiccation. If the mucous layer is disturbed, thinned out or temporarily removed, the tissues it protects can dry out. Dried tissues crack and bleed. It should be a no-brainer as to why this is bad.

Heralding puts a lot of air through your throat, much more than usual (unless you work as an acting or singing professional). All that air can disturb the mucous lining of your throat and larynx, drying it up, thinning it and/or removing it in places. You can help prevent this by keeping your throat moist, principally by drinking a lot of water. Water helps in two ways: it wets your throat, which helps to preserve the mucous lining, and it keeps you hydrated, which helps the mucous membranes stay I the mucous-production business. It's worth remembering that the vocal cords are covered by a pair of mucous membranes. If they don't function as they should, then the vocal cords themselves can dry out, and dry vocal cords are a desiccation abrasion waiting to happen.

Unfortunately, too much mucous and other stuff lining your throat is also bad for your voice. For example, if you have a cold, you have more material lining your throat than usual.

A nice wad of phlegm coating the surfaces of your larynx forces you to use a higher sub-glottal pressure just to talk normally. For your vocal cords, it's the equivalent of jogging around the block while carrying a heavy box. It's more work. This isn't a big deal unless you're going to exert your voice by heralding in the Barn in Pennsic. In that case, the combination of excessive subglottal pressure and irritated, phlegm-inhabited throat will bruise and possibly abrade your airway. You're better off no exerting your voice under these circumstances.

You can get rid of too much muck in your throat by dissolving or diluting it away. Alcohol is a great solvent for this, as are the acidic fruit juices like orange juice and grapefruit juice. Black coffee is also a decent solvent. If you're just waking up and have a wad of muck to clean out your throat, one of these probably won't hurt you. Overall, however, water is always a better choice than a solvent-like beverage. Under normal conditions, you want to keep and maintain your throat mucous in a hydrated state, and not thin it or wash it away.

It may seem like a good idea to coat your throat with something before heralding, to preserve your throat mucous and to prevent your throat from drying out. This isn't a bad idea if you've got a sore throat or cold. It's not a great idea, however, if you're going to herald. Adding something thick to line our throat is much the same as having a lot of phlegm in your throat: you now have to employ a greater subglottal pressure to achieve even your normal speaking volume. At heraldic volumes, excess subglottal pressure will wear your voice out faster, and may potentially bruise y our laryngeal muscles if you don't stop soon enough.

Rule 4: *If it hurts, stop.*

Rule 5: *Drink a lot of water. Avoid substitutes*

The Problem of Pitch

The speaking voice has its own range of frequencies. Not varying pitch makes you a dull, "monotone" speaker and greatly varying pitch makes you an animated, possibly melodramatic speaker. Most of us fall in-between these two extremes. But when we speak loudly, most of us tend to increase the pitch of our voices. This is a natural consequence of increasing the subglottal pressure: the vocal cords tighten and vibrate a bit faster than usual. There is nothing wrong with this, except that you can wear out your voice faster. Tense vocal cords will wear out faster than relaxed ones, as will any other body part with muscles in it. In fact, when most people "raise their voices", not only do the laryngeal muscles tighten, but so do the muscles of the neck and upper back.

You don't need the muscles of your neck and upper back in order to speak loudly. It won't hurt you to herald with tight neck and back muscles, but you'll feel better at the end of day if you remember to relax. There's a simple trick to get your neck and back muscles to relax while singing or speaking loudly. It's easy: start an heraldic announcement. Now, without lowering the volume, touch one ear to one should. Now do it with the other ear and

shoulder. Don't stop heralding while you do this. Now windmill your arms, and stretch them if you feel like it. If you can make an heraldic announcement while moving your head, shoulders and arms, then you're managed to relax the upper body muscles which are normally tense when people shout. There's a simple rule of thumb I learned years ago from a stage professional: if you can't touch your chin to your chest while speaking or singing on stage, you're not relaxed enough.

In general, you should herald at a pitch which is comfortable for you. Many people find that a whole step or two down the scale is a comfortable, relaxed pitch for them, but this isn't true for everyone. Julius Caesar and Winston Churchill both deliberately went up in pitch when speaking in public, because they carried better than way. You will get better loudness and more effective subglottal pressure if you go lower instead of higher, but if it's uncomfortable, don't do it. Going up or down a whole step or two isn't going to make or break anyone's heraldic career, and it's always better to do that which is comfortable vocally than to fulfill someone else's expectations for so-called vocal technique. The only people I would seriously dissuade from going up in pitch while heralding are women whose voices are already high in pitch. Loud "piping" voices can be extremely penetrating, and sometimes painful to listen to if overdone.

Rule 6: *Use a pitch that carries well and is comfortable for you*.

There are some advantages to heralding at a pitch that's just a little different than your normal speaking voice. If you discover that you carry better at a different pitch, then you should herald at that pitch, all other circumstances being the same. You can find this out simply by heralding at different pitches, and having a friend tell you which carried best. Changing the pitch at which you herald does one other thing for you: it makes you stop and think before you open your mouth, and that's never a bad idea. Personally, I always pause before I herald. This allows me to (1) assess my audience; (2) assess my space, (3) lower my pitch; (4) relax my neck and (5) suck in a lot of air.

To summarize, my rules for heraldic vocal production are:

1. **Go slow and over-enunciate.**
2. **Go slow and sustain vowel sounds whenever possible.**
3. **Use your abdominal muscles when you breathe.**
4. **If it hurts, stop.**
5. **Drink a lot of water.**
6. **Use a pitch that carries well and is comfortable.**

Much of the physiological discussion here is highly derivative of a book by Dr. Johan Sundberg, M.D., entitled *The Science of the Singing Voice*, published in English by Northern Illinois University Press, 1987. This is possibly the best book I've ever found on the subject. The content of this paper has also benefited from my work experience in mechanical acoustics while working at Kollmorgan Corp.; and from discussions I've had over the years

with stage professionals associated with Frederick Loewe Productions in New York City, through whose auspices I got to sing and dance on Broadway once as a child; with members of the Volksoper (Vienna), Metropolitan (New York City), Hartford, and San Francisco Operas; and with Dr. Johanna Meyer-Mitchell, M.D., of Concord, California, who has spent many lunches with me discussing a wide variety of physiological phenomenon, including that of the human voice.