Clarinet Clinic

Exorcising the clarinet's most persistent demons
An organized approach to tonguing, tone and tuning
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1. Training the Tongue, Developing the Tone

In general, a beautiful clarinet sound is considered to have five qualities: (1) *depth*, (2) *stability*, (3) *focus,* (4) *clarity*, and (5) an appropriate balance of "ring" and "darkness" that could be called *color*. The factors which control these qualities are: (1) breath support, (2) embouchure, (3) the position and action of the tongue, (4) equipment, including instrument, mouthpiece, reed and ligature. The purpose of this pamphlet is to briefly discuss how each quality can be taught and practiced to produce a clarinet sound which listeners will call "beautiful."

(1) The most basic need of all wind players is <u>breath support</u>. Without it, there is no depth, stability, focus, clarity, or even color.

"Breath support" is not the same thing as "blowing hard." "Support" implies that there is one force which opposes another, whereas "blowing hard" implies a force with no resistance to balance or stabilize the sound. To illustrate, think of the difference between a wooden board standing vertically and two boards leaning against each other in an inverted "V." The single board falls over easily, but the two leaning against each other remain standing because the gravitational force acting on one board resists the gravitational force acting on the other. The result is *stability*, which is an important result of good breath *support*.

In breath support, the opposing forces are the abdominal muscles (including those used to do sit-ups), and the diaphragm. Inhaling must be done by flattening the diaphragm--observed by the "tummy" dropping against the belt. Thus the abdomen expands **first**, and in progression, the middle and upper torso. The shoulders stay relaxed, and generally inhalation is much like yawning.

Exhaling is a balance between pushing inward and upward with the abdominal muscles, while keeping the ribcage large and the muscles in the center of the torso contracted. The abdomen will move inward and tilt upward, and there will be a feeling of reservoir in the upper part of the chest.

Thus, the two opposing forces in breath support are the abdomen pushing air out, while the diaphragm endeavors to hold it in. One set of muscles works against the other to produce stability, thus support.

(Demonstrate the sound of improved breath support by either playing in a standing position with one foot raised so that the thigh is horizontal, or in a sitting position with both feet raised so that the legs are straight and horizontal. Most people will feel and hear their sounds improve automatically by these demonstrations. The goal is to reproduce that sound when sitting or standing normally.)

(2) <u>Embouchure</u> consists of mouth parts--lips, tongue and teeth. See (3) *Tonguing* for a discussion of the tongue.

Most American clarinetists anchor the mouthpiece against the upper teeth, pushing upwards with the right thumb to stabilize the instrument. Fewer (though a substantial and influential minority) play "double-lip," with no direct contact between the upper teeth and the mouthpiece. While each embouchure style has its advantages and disadvantages, the "single-lip" (top teeth on the mouthpiece) is most common in the U.S.

The basic single-lip embouchure has these features:

a. top teeth on the mouthpiece

b. lips pushing toward the mouthpiece, creating a seal

c. pointed chin. While the lower lip muscles closest to the reed pull toward the reed, the muscles further down the chin pull away, creating a pointed effect on the end of the chin. The chin remains pointed and motionless as we play from one register to the other.

Additionally, a fourth feature can add smoothness and darkness--especially in the upper register:

d. the upper lip pushes downward onto the mouthpiece.

A good embouchure may be formed by saying "oo" (as in "too") and then keeping this formation firm against the facial bones. *Always set the embouchure* ***before*** *you attack the first note of a phrase*--students who try to correct the embouchure after the beginning of the phrase rarely develop good embouchure habits. The point at the end of the chin can be taught with a mirror or by holding the chin with thumb and first finger of the right hand while playing various fingerings with the left. Remember that no movement of the embouchure should be seen or felt (by the free hand) as the tongue articulates. The face is an *iron mask*--a firm, still foundation which provides even pressure all around the mouthpiece, holding it firmly but not squeezing the reed vertically. To check for excessive squeezing, be sure that the pitch produced on the mouthpiece alone is approximately concert C-natural--<u>never</u> as high as C-sharp.

(3) <u>Tonguing</u> seems to be the most difficult subject to teach, because the tongue is never visible while it is doing its work. The functions of the tongue are (1) To shape, or focus the sound and (2) To start, and often to stop notes.

As is also true of the embouchure, more than one approach to tongue position exists among professional clarinetists. Regardless of approach, some part of the tongue needs to touch some part of the reed to articulate between notes. *But also remember that it is the tongue that controls the focus of the tone*. Do not forget this all-important function of the tongue.

Mechanics: Think of the tongue as having three parts with three functions: back, middle and tip.

The back of the tongue (where the consonant "k" in "key" is made) controls the focus of the tone. By arching the back of the tongue, the tone will focus, making the tone closer to that of a flute than that of a saxophone. In all registers, the vowel sound formed by the tongue should be closer to "ee" or "eh" than to "ah" or "oh." Think of the back of the tongue as a pivot, similar to the way the knee forms a pivot when the legs are crossed and the foot of the upper leg swings forward and backward freely.

The center of the tongue affects the depth in the tone. A "dip" or "swail" is formed in the area between the back and the tip. Many people naturally form that swail when they whistle, making their whistling a perfect model for clarinet tongue position. Others benefit by thinking of a small weight sitting just behind the tip of the tongue, pushing steadily downward (remember that the back of the tongue is still up). Still others are helped by thinking of the center of the tongue avoiding the very tip of the reed, or of the tip of the tongue approaching the reed at a right (90-degree) angle.

The tip of the tongue is responsible for articulating the beginnings (and often ends) of notes. The tip of the tongue touches the reed slightly below the tip of the reed--I often place a pencil dot a millimeter or two back from the very tip of the reed in the center and ask students to touch that spot with the very tip of the tongue. The tone begins as the tip is removed from the face of the reed. Be sure that the tongue retains its shape when the tip is off the reed (and sound is happening) as well as when it is on the reed (resulting in silence).

(While the tip of the tongue is resting lightly on the reed, try blowing so that the reed vibrates, though with a muffled sound. If the tip of the tongue is finding the correct location on the reed, this is possible--if the tip of the reed is being stopped, producing this muffled tone is virtually impossible).

Training: Knowing the proper mechanics is one thing--the greater challenge is forming the mechanics into habits. Learning proper tonguing is no different from learning a good golf or tennis swing. A golfer goes to a driving range, rents a bucket of practice balls, and tries to apply the principles of a good golf swing time after time until it becomes automatic. We say the swing is being "grooved in." For the clarinetist, the driving range is the practice room, and the bucket of golf balls is a tonguing etude. An etude like the Demnitz etude found in David Hite's Melodious and Progressive Studies Book 1 Page 16 (and in many other collections) works very nicely. This particular etude has two slurred sixteenth notes followed by two separated sixteenths--generally the same pitch. This is preferable to an etude which asks for constant tonguing. The etude becomes a tonguing "warm-up."

To initially locate the proper position of the tongue, make an embouchure around a finger. Place the tip of the tongue on the finger, approaching the finger print from below, as one would approach the reed. The finger provides the biofeedback needed to be sure that the tongue is touching the correct part of the reed. Then, immediately replace the finger with the mouthpiece, keeping the tongue in precisely the same position.

Be very methodical about the use of the tonguing etude each day. Always use a metronome, starting each day at a speed which is easily manageable to tongue very lightly. Thus, the staccato markings will be totally ignored, and the absolute minimum separation between tones is the goal. The key to a successful tonguing warm-up is **minimizing**: *minimize the distance that the tongue is withdrawn from the face of the reed* during a tone, and *minimize the pressure with which the tongue is pushed onto the reed* during a silence. (Remember that staccato is achieved by leaving the tongue on the reed longer--not by hitting the reed more forcefully). After playing through the etude at the first, very manageable tempo, move the metronome up one number and play through it again, continuing in this way to the fastest possible tempo. If the goal of **minimizing** the distance and force of the stroke is taken seriously, the highest tempo soon becomes easier, in which case, start the daily routine one number higher and make the final speed also one number higher. Be sure that the two extremes of tempo are at least twenty beats per minute apart, such that the exercise is repeated a half dozen times at least.

The key to controlling the tone on clarinet is controlling the tongue--largely **minimizing** the distance and force of the tongue stroke and keeping the back arched in the "ee" position. The farther the tongue moves away from the reed, the more "spread" is heard in the sound. Conversely, the closer the tip of the tongue is to the face of the reed, the more focused the tone will be. Since the pocket of air held in the swail in the middle of the tongue controls the shape of the tone, the less the tongue moves, the more consistent the sound is.

Some Pitfalls: Perhaps the most confusing bit of information that teachers give students is to "keep an open throat." To most students, this suggests a vowel sound such as "ah" or "oh," which places the back of the tongue much too low in the mouth. The result of such a tongue position is upper register attacks (for example, "B" above the staff) in which the desired pitch is preceded by a lower-pitched "grunt" or "undertone." Remember that low pitches are produced by lower airspeed and higher pitches are produced by higher airspeed. Ask the student to hold a hand in front of his/her mouth and whisper very loudly "ha, hee, ha, hee, ha, hee." The student discovers that the faster airspeed is produced by the "hee," with the higher arch of the back of the tongue.

Another very common mistake is attempting to focus the tone by increasing the lip pressure on the reed, either by biting or by pulling the clarinet inward toward the body, prying the teeth into the reed. Focus comes from tongue position--the high arch of the back of the tongue and the tip's closeness to the reed--not the constriction of the reed. Learn to recognize the difference between focus and "pinch."

(4) The equipment that one plays is the easiest of these factors to control--but is often left to chance. A bad clarinet, mouthpiece, reed and ligature will never make a sound comparable in beauty to good equipment, no matter who plays it. Good equipment which is worn out or in disrepair will hinder rather than help.

Instrument. One is wisest to purchase a brand of clarinet which is well-established among professionals. I switched to Buffet Crampon clarinets over twenty-five years ago: my personal preferences are the Buffet R-13 and Festival models, both wood and Greenline. For young students, I recommend the student-line Buffets without reservation.

Regardless of brand name and model, both the upper and lower joints need to hold a vacuum for at least several seconds when all of the tone holes and the end of the joint are sealed. If this is not the case, replacement or adjustment of pads by a qualified repair technician will be necessary. If the instrument holds the vacuum but the key height is not properly adjusted, certain notes may be fuzzy and flat, or excessively bright and sharp. Be sure all of the tone holes and the bore are free of collected residue or lint.

The Barrel Joint needs to be appropriate for the instrument. Wooden barrels, being closest to the source of moisture and temperature change, often wear out before the rest of the instrument. If one tries several new barrel joints and finds that most of them are an improvement over what one has been playing, it is safe to assume that the old barrel is past its prime. The standard Buffet B-flat clarinet barrel is 66mm. in length--shorter barrels (also available from Buffet) will allow the clarinet to play higher and longer ones will allow the instrument to play lower. Always be sure that the instrument tunes well with itself (take an electronic tuner with you when you try barrels). If one chooses to play a barrel joint not made by the manufacturer of the clarinet, one risks falling in love with a sound or feel, but making the instrument out of tune within itself. See the following section, 2. A Guide to Clarinet Intonation.

The mouthpiece strongly affects tone color--the balance between brightness and darkness. Remember that the way a mouthpiece tunes varies as the interior design (chamber and backbore) varies. The most common intonation problem caused by mouthpieces is flatness of throat tones and other short fingerings. All other factors being equal, a more open mouthpiece will require a softer reed to achieve the same resistance. Medium to short facings are usually more "reed friendly" than longer facings, though a player might like a longer facing because of the warmth that the facing might provide. Remember also that mouthpieces wear out--the facing either accumulates scratches or nick marks from careless treatment, or the side rails begin to tilt inward as a result of slow erosion caused by the (slightly convex) reed's vibration. As a mouthpiece wears out, one naturally picks progressively harder reeds to compensate for the loss of resistance in the facing. The final symptom of erosion on the insides of the rails ("rail tilt") is a high-pitched whistle or "chirp" associated with articulation. With rail tilt of this magnitude, the mouthpiece should either be replaced or refaced. In most cases, replacement will be the easiest option.

So in summary, a mouthpiece needs to (1) sound good to the player and listener, (2) sound even in all registers--not brighten above the staff or become "tubby" elsewhere, (3) TUNE WELL--Take an electronic tuner along when you try mouthpieces, and (4) the facing needs to accommodate different reeds--not just the one reed you've been playing for the past month!

A discussion of reeds could be endless, but a number of important points are made in 3. Some Comments on Single Reeds, below.

Conclusion: Remember that learning to produce a beautiful clarinet sound is partly intellectual and partly athletic, and that the best sound and intonation do not come from poor equipment. Just as an athlete requires daily repetition of calisthenics and the motions used for a particular sport, the clarinetist requires careful daily repetition to stay "grooved in."

2. A Guide to Clarinet Intonation

Playing the clarinet "in tune" may be one of the most complicated jobs in an ensemble. On the very simplest level, assuming one can hear the difference, one pulls out at the barrel to flatten the overall pitch and pushes in to raise it. The purpose of this section is to help the clarinetist, teacher and director understand the many nuances which can make a world of difference between adequate and excellent clarinet intonation.

<u>Pulling out, pushing in</u>

Pulling out at a tenon joint makes the pitch of all notes which emit from holes below that tenon joint lower. "Pulling out" flattens the notes which emit from holes immediately below the "pull" more than those which emit from holes farther down the clarinet. Thus, an extreme pull at the barrel may cause throat tones* (the pitches e through b-flat between the chalumeau and clarion registers, written on the lowest three lines of the staff--open G, for example) to be flat in relationship to the longer fingerings like the b or c immediately above the break. For this reason, it is best to tune the open G first, lowering the pitch by pulling between the barrel and upper joint. Once open G has been adjusted, tune the C above it (sometimes called "tuning note C"), lowering this pitch by pulling the lower joint from the upper--between the two hands. If middle-line B is sharp, one could pull at the bell, but remember that since low E flat on many clarinets, pulling at the bell would make the low E even flatter.

The most common tuning mistake made is pulling out too far at the barrel to bring "tuning note" C down to pitch. Flat throat tones will result every time.

<u>Barrel length</u>

Some clarinetists find that their equipment tunes so sharp that they need to pull more than they would like at the barrel to bring the pitch down. The large air gap between the barrel and upper joint makes the throat tones unmanageably flat. Two possible solutions for this problem are (1) using tuning rings, and (2) getting a longer barrel.

Tuning rings are hard, flat O-shaped rings, looking somewhat like garden hose washers, the inside diameter of which matches that of the clarinet's bore at the bottom of the barrel, and the outer diameter of which matches the inside of the female socket of the lower barrel tenon. The rings occupy the airspace created by a large pull, resulting in higher throat tones than would be produced with such an extreme pull without the ring. Various thicknesses of rings are available.

Though the more expensive option, the best solution generally is to obtain a longer barrel. The standard barrel on a Buffet B-flat clarinet, for example, is 66 millimeters in length--Buffet barrels can be obtained in lengths ranging from 62 to 69 mm.

<u>Other barrel variations</u>

The most obvious barrel variable is its length. Variations of interior diameter and degree of taper also influence the instrument's tuning. The important choices that each manufacturer makes between larger or smaller interior diameter, and the degree and location of taper, give that maker's product its distinctive tone and tuning characteristics.

In the broadest sense, increasing the barrel diameter makes the twelfths larger. Thus, a clarinet whose clarion register (from middle-line B to C above the staff) is sharp in relation to the lower register will be helped by a barrel with a narrower diameter, and one whose clarion register is flat will be helped by a wider barrel.

On a somewhat more refined level, the degree of taper influences the relationship between the lower (fundamentals--the chalumeau and throat tones) and clarion registers. Barrels taper in an inverted cone--the larger end near the mouthpiece and the smaller at the bottom. A taper of, say, .01 inch will influence the relationship between the clarion and lower registers differently than a taper of .005 inch.

On the most refined level, the exact interior shape of the barrel marks the real difference between one maker's barrels and another's. There are many sources of barrels which affect the tone, focus and intonation--made of materials ranging from wood to plastics or hard rubber, to a combination of these or other materials. The most practical advice I could give is to be sure you consider not only the tone, but the tuning characteristics of any barrel whose purchase you are considering. A barrel with an a beautiful tone color or focus that causes the clarinet to be out of tune within itself is a poor investment.

Mouthpieces and tuning

The very same advice (see barrels, above) applies to mouthpieces. On the simplest level, some mouthpieces will play sharper and some will play flatter than others. Again, the sources of these variations are numerous.

While it is possible that the length of one mouthpiece may vary from that of another and thus affect tuning, it is far more likely that the largest pitch variations have resulted from differences in the chamber and bore of the mouthpiece. For example, short fingerings--especially throat tones--are flattened by the removal of material from the baffle (the back wall of the chamber, that one sees when looking directly into the window of the mouthpiece--increasing the size of the chamber). Because removing material from the baffle often darkens the tone, the manufacturer (or someone else who may have done some "custom" work on the mouthpiece) may have made the chamber larger in this way for some very valid reasons.

The most practical advice I could give is, when shopping for mouthpieces, (1) take a tuner with you. If a clarinetist invests in a mouthpiece with a beautiful tone and terrible intonation characteristics on that clarinetist's instrument, he or she has only bought a headache. And (2) use more than one reed to try mouthpieces to be sure that the facing will be “reed-friendly.”

This is not to say that a mouthpiece which tunes badly on one clarinet necessarily tunes badly on all clarinets. A clarinet whose short fingerings and throat tones are naturally sharp might be helped very much by a mouthpiece which places these tones lower. Again, take a tuner when you go to buy mouthpieces and pay attention to the way it tunes on the instrument that you intend to play.

Mechanical considerations

When a clarinet is designed, the exact placement and size of each hole is determined through careful calculation. When holes are to be covered by pads rather than fingers, the proper opening distance for each pad is essential for correct intonation. Unfortunately, any manufacturer's calculations will be spoiled in the following ways:

a. Dirt can accumulate in tone holes or the register key tube, causing notes which emit from them to be flat and often fuzzy. Cleaning the holes restores the notes' original pitch.

b. Using thicker pads or bumper corks will keep keys from opening far enough, giving a note which is fuzzy and flat. Cork can be sanded to open the key, and a qualified technician can replace an improperly thick pad with one of the proper thickness.

c. Using a thinner bumper cork, compression of the cork, or loss of a bumper cork might cause a key to open too far, resulting in a sharp note. A common example of this problem is throat A-natural. Often a clarinet section's unisons will be generally in tune on an F or C scale until "throat A". Inspection of the instruments reveals many different pad heights--perhaps some corks are missing altogether. Because the hole for throat A (and also G-sharp) is only needed for those notes and not others in different registers, all A's and G-sharps can be tuned by adjusting the cork thickness. (Remember to tune the open G's first by pulling out or pushing in at the barrel.)

d. A key could be bent, causing a sharp note (key raising too far) or more often, a flat note (key remaining too close to the tone hole). Many keys on the clarinet are common victims of this problem--especially the keys opened for lower register C-sharp, E-flat, and "forked" low B and E-flat. A qualified repair technician can correct this problem.

Influence of heat and cold

As is true of other wind instruments, clarinets rise in pitch as the instruments become warmer. When rehearsing in a cold room, the instruments cool during rests or breaks in rehearsal, and may be suddenly flat in comparison with other instruments that may have been played more continuously. Remember that moisture from the breath also condenses inside the instrument more readily in the cold (necessitating more frequent swabbing), and that playing a wood instrument in very cold air may increase the possibility of cracking.

Influence of dynamic

Anyone who has played long tones with an electronic tuner has noticed that louder clarinet sounds tend to be lower than softer tones—totally the opposite, incidentally, of the flute's natural tendency. For this reason, it is especially important to play a full tone when tuning--a reasonable *mezzo forte* at least--or else one risks being too flat because the barrel and lower joint were pulled out to accommodate the softer, sharper sounds. It is also possible that the adjustment made for a loud movement or section might leave the instrument too sharp for a slower, softer movement. If one steps onstage for the Mozart Clarinet Concerto with a slightly cold instrument tuned with a full sound, then it is likely that the clarinet will feel uncomfortably sharp (as the instrument has warmed up during the first movement) in the softer, slower second movement. In such a case, it makes a great deal of sense to automatically pull the barrel and lower joint out--even without referring to the standard tuning pitch. Remember then to push back in (though now with a warm instrument, possibly not as far as before) for the louder movement which follows.

Influence of air density

When we check our pitch with an electronic tuner, we notice that the first tone on a new breath is always sharper than the pitch after a few seconds of blowing. This has nothing to do with embouchure pressure, as many suppose, but is because a small amount of air at the very end of the inhalation never reaches the part of the lungs where oxygen is exchanged for carbon dioxide. When the reed vibrates in lighter, oxygen-laden air at the beginning of the breath (that which only went in as far as the windpipe and bronchial tubes but not into the alveoli) it vibrates slightly faster than it would in the presence of heavier carbon dioxide.

This influence of gas density on pitch is proven inadvertently by people who consume carbonated beverages before or while they practice any wind instrument. When a small burst of carbon dioxide from the beverage unexpectedly mixes with air coming from the lungs, a large but momentary drop in pitch is unavoidable. Helium--a very light gas--has an effect similar to its effect on the human voice. A breath of helium-laden air causes the pitch of any wind instrument to raise, sometimes as much as a major third!

While this bit of knowledge might seem at first to be useless scientific trivia, it comes into play more often than we realize. Do not tune to the very beginning of a sound: the true pitch of the instrument is not heard until the pitch settles a second or two after it begins. Thus, "staggered breathing" is devilishly difficult in a soft, exposed unison passage because every time someone takes a breath, the first notes of the new breath are naturally sharp in comparison with others who did not breathe. For this reason, having all clarinetists breathe in the same spots eliminates many pitch problems. One can even use this knowledge in selecting fingerings: for example, the soft open G at the beginning of the second movement of Muczynski's *Time Pieces* can be played with a lower fingering (for example, with 3L down) on the first quarter note than on any other open G in the phrase. A phrase which begins on a soft low B-natural might require not only the forked (chromatic) fingering--which tunes lower--but finger 2R might need to slightly cover the middle tone hole to bring the pitch down.

<u>Fingering Choices</u>

Most notes on the clarinet can be played with more than one fingering and some, *altissimo* G, for example, may have a dozen or more. On even the best-designed, built, and maintained clarinets, one fingering might be different in pitch from another--on the same note. In many cases, the standard fingerings are the ones which are the easiest to negotiate technically, but not always the ones with the truest pitch. In slow passages where technical feasibility is not a problem, substituting better sounds or pitches for easier fingerings makes sense. Some important examples, from low to high, are:

	Standard Fingering	Better Pitch
Chalumeau B	T123/2	T123/1 fork
Clarion F-sharp	TR123/2	TR123/1 fork
Altissimo E-flat	TR 23/1 fork, E-flat key or TR 23/2, E-flat key	TR23/ 3, E-flat key
Altissimo F-sharp	TR 2/, E-flat key	TR 2/, fork, E-flat key (touch the key very near the axle upon which the rings pivot to avoid closing the top pad on the lower joint)
Altissimo G	TR 2/ 12, E-flat key	TR 1 /1 3, E-flat key

The standard fingering for altissimo F-sharp is very low, and the standard G immediately above that is very, very sharp. One can easily see that there is little hope for the third octave of a G major scale being in tune with the "standard" fingerings.

<u>Fingering alterations</u>

Most advanced clarinetists are at least aware of the "half-hole" device--rolling the left index finger downward to open the hole approximately halfway rather than lifting it--for many fingerings above high C-sharp (TR 23/12). The half-hole device does three things: (1) the note fingered will be lower in pitch than it would be with the left index finger raised. If the left index finger covers more of the hole, the pitch will be lower, and if it covers less, the pitch will be higher. Since tone quality and security are almost always compromised by "lipping" down in the altissimo, using the half hole offers a more secure means of adjusting the pitch. (2) Upward slurs to these fingerings are smoother and easier to control, and (3) it darkens the tone of these notes slightly.

Some notes are notorious on many clarinets for sharpness, especially at low dynamic levels--low A, B, and D natural are examples. In some cases, a finger or fingers below the highest open hole can be partially closed with a finger, and in other cases, one or several fingers can be held closer to the open holes to bring the pitch down. On low c, for example, all of the right hand fingers can be held close to their tone holes by bracing the middle of the finger against the lower joint rod. Remember that the dynamic and the location of the note within the breath have their own effects.

3. Some Comments on Single Reeds

During many years of playing commercial reeds, hunting and discarding in some of the most reed-unfriendly climates on earth, my ways of being sure that I will have a good reed have changed. Playing commercial reeds, I was obliged to develop ways of dealing with reed warpage. In more recent years, I have devoted full energy to reedmaking, and in so doing have taken many steps away from the fear of walking on stage with an inadequate reed. Today, my average reed is far better than my reeds of a short decade ago. Some ideas which have accumulated over the past decades follow.

Regardless of how good one's best reed is, the only real safety comes in numbers. One can be far more confident that one reed out of ten select ones will behave well on concert night than that one reed out of a select one or two will. So continually add new reeds to your storage system. If you have ten good reeds and rotate them, they all grow old together. Then, all of a sudden, we realize that all of our reeds have weakened, and that our embouchures have accommodated the deterioration. The introduction of new reeds to the system takes time--we wouldn't trust something right out of the box to last through a whole concert--so we're stuck without a satisfactory reed. Have some reeds in your system which are new, some which are at the peak of their playability, and some which are in decline but are still useful for practice.

Whether reeds are handmade--made from a blank which was already "cured" or from a box of commercial reeds, they must be broken in. This includes limiting the time that a new reed is played to just a few minutes for the first several days, and it includes carefully sealing and polishing the vamp (cut part) and the back (flat part) of the reed.

Reed players frequently make the statement that a new reed has gotten "soft." Players perceive "softness" not because the density or strength of the cane has changed, but because the distance between the tip of the reed and the tip of the mouthpiece has decreased as a result of the reed warping inward. Inward warpage can happen because of playing a new reed too long before it is completely broken in, or because the reed has been allowed to dry on the top while remaining wet on the bottom, as would happen on a mouthpiece from which the moisture has not been removed. An oboist quickly discovers that soaking an oboe reed in one's mouth causes the reed become very open, possibly making the reed seem far too hard to blow. Conversely, leaving water inside the reed and drying the outside causes the reed to close. Why? Because reed cane (and all wood, for that matter) warps <u>toward</u> water. The same opportunity for such closure of the tip opening on clarinet and saxophone presents itself anytime we remove the instrument from our mouth for a length of time, allowing the outside to become dry while the inside of the mouthpiece retains moisture.

<u>Understand warpage</u>. A common practice among handmakers of single reeds is the curing of the blank (the flattned piece of cane, the wide end of which has not yet been cut to form the vamp of the reed). This is done by soaking and drying the blank many times, usually in saliva, often accompanied by sanding the blank until it remains flat between soakings. Once it retains its flatness between soakings, it is judged to be ready to be made into a reed.

The problem is, any blank or finished reed, cured or not, will warp as the humidity changes. The first time I took reedmaking tools to my summer orchestra in a very dry climate, I brought with me with about twenty blanks that I had cured very well, ready to be made in the new location for the early rehearsals of the summer festival. Even though these blanks were very stable in the more humid climate, they became wildly convex with the change from high humidity to low. Conversely, blanks made stable in the dry air become uniformly concave upon returning to humidity a month later. The obvious conclusion is that the reed is its own built-in hygrometer: thus, only by watching the flatness of the back of the reed, we know if the climate is too wet or too dry <u>for that particular reed</u>.

Generally, two kinds of humidity-induced warpage happen to reeds: (1) convex, when the sides of the flat back reed pull off of a flat surface and the center stays in contact, and (2) concave, when the sides touch a flat surface and the center arches off the surface. To see the warpage clearly, I use a piece of glass and a drop of water. One can decide quickly by where the water is in contact and where it is not whether the reed is convex or concave. When a reed is convex, it is telling us that it has dried too quickly, and when it is concave, it has dried too slowly. Two solutions seem to exist for controlling this warpage then: either adapt the reed blank to the climate before making the reed, flatten the blank and make the reed, and then hope that the climate doesn't change drastically; or control the humidity in the environment in which the reeds are kept, regularly checking the backs and making any adjustments to the humidity as needed. For commercial reeds, the latter solution is most viable, since sanding the back of a warped commercial reed never completely flattens it, and changes the center-to-side proportions significantly..

I am well aware that in the following statement I risk being branded a heretic by a substantial contingent of the clarinet world, but I firmly believe that trying to keep the back of a reed from warping by pinning it down to a flat surface--<u>especially a non-porous flat surface</u> (like glass) is precisely antithetical to our goal of discouraging warpage. Remembering that cane warps toward water, what happens when we pin the back of a wet reed to a nonporous surface? The thin edges of the reed dry first, trapping water between the nonporous surface and the thicker center of the reed. The cane warps toward the water resulting in much more pronounced convex warpage than if the reed had been left backside-up in the same atmosphere. The best solutions to the problem of convex or concave warpage along the length of the reed clearly include humidity control, making completely ancillary any sort of mechanical influences like rubber bands or various kinds of clamps on the top, or glass or plexiglass surfaces on the back. What might work well for a completely malleable substance like plaster or putty is inapplicable to reed cane.

There is a variety of warpage where the tip of a reed sometimes becomes wavy, especially when it has been allowed to dry for a long time and then just barely wet again. This waviness is nothing to be concerned about--it is merely an indication that the reed has not been sufficiently soaked. Soaking and playing restores the straightness to the tip.

<u>Cane is the one greatest variable</u>. When I began to intensely study reeds, I bought a dial indicator and devised a grid upon which I could make measurements of reeds. By hand, I could make any two reeds identical in measurement, but one might play very well and the other might not play passably at all. Later, as a reedmaker, I would cut one reed blank out of a tube of cane and label the tube and the blank. Except for obviously irregular areas in the tube, I found that if one excellent reed could be made from the tube, then virtually all of the reeds from that tube would be excellent as well. If the first blank out of the tube could not be made to play well, then time is wasted by making any more reeds out of that tube. Thus, the finest measurements in the world applied to a poor piece of cane equals a bad reed. On the other hand, very good cane can be somewhat forgiving of a few irregularities of shape or design.

<u>Reed width and overall reed shape</u>. The width of a reed affects the way in which it responds and the ease with which the sound will focus. A "spread" sound is often due to a reed which is too wide for the mouthpiece. Any cane which hangs over the side of the facing can be removed with light sandpaper on a flat surface such as glass. However, if a little narrowing is good, much narrowing is not necessarily

better. The point at which the sides of the reed exactly match the sides of the mouthpiece facing is the ideal width--removing more cane will cause the reed to become bright and thin-sounding. Often, the reed's tone will darken up to the point that the width is correct. It is not unusual for a commercial reed to require some narrowing to adapt to a mouthpiece--even of the same brand name. Never assume that the same trademark signifies complete compatibility.

Secondly, the shape of the reed should not be ignored. Generally, a more V-shaped reed (narrower at the heel) will focus more easily than one wider at the heel. So the same number of strokes on a piece of sandpaper applied to each side of the stock (the uncut part) of the reed only will cause the sound to be more focused, even without touching the vamp area!

<u>Tip thickness</u>. There is only a very small range of thickness measurements that can work for the tip of any reed. Somewhere between thirty-five ten-thousandths and five thousandths of an inch (.0035 to .005 inch) seems to be the best range. A reedmaker becomes sensitive to the feel and sound of the reed clipper as it cuts through the tip--thinner than .0035 hardly makes a noise at all, and more than .005 makes an audible "snap." When a tip is thicker than .005 inch, the altissimo register becomes sluggish--the rest of the range might work, but if the reed has been left much thicker than .005 at the tip to gain proper resistance, the cane is just too soft to make a good reed anyway. With tips much thinner than .0035, one begins to run the risk of producing very high-pitch whistles or "pressure squeaks."

Interestingly and ironically, thinning the tip--especially toward the center of the tip--of a reed often darkens the sound, all other factors being left equal. In general, the darkness of the tone depends on the quality and density of the cane, and the mechanical relationship between the tip and the heart of the reed. A relatively thick heart and a relatively thin tip makes a more dark but still colorful sound than a thicker tip and thinner heart. This is my preference.

The obvious application of this knowledge is to the practice of clipping reeds to regain the resistance we desire. The reed gets soft because it bends inward, decreasing the tip opening. We feel less resistance, so we clip a small piece off of the tip of the reed, leaving the tip thicker than .005 inch. The tone is bright and ugly, and the altissimo no longer works. *It makes more sense to thin the very tip after clipping--especially in the center--to regain darkness and upper register response.*

<u>Relationships within the tip</u> We must understand that the tip of a reed needs to be a flat incline for the first few millimeters--the very end of the reed is no place for the center to be thicker than the sides. Further back into the heart area the differential will be considerable, but not at the outset. Clipping the reed with the reed clipper, the curved blade cuts through thicker cane out on the corners of the tip and thinner cane in the center. Thus, a very desirable difference of measurement is found between the corners and the very center of about .002 inch. Without this relatively thicker corner than center, the reed becomes lifeless. Most commercial reeds have this differential already--but in the balancing process players sometimes thin one or both corners of the tip. This usually is a mistake.

<u>Balance</u>. There is no such thing as a reed which is balanced for all mouthpieces. *Balance* simply means that the resistant areas of a reed match the less resistant parts of the mouthpiece facing *for that player.* Briefly stated, *in order to be balanced, the reed must be a mirror image of the mouthpiece facing*.

There are two very good tests to determine whether a reed is balanced or not. First, rolling the mouthpiece on its axis in the mouth while playing a short-tube note (like open G on clarinet or third-space C on saxophone), one might notice that a more colorful sound is found slightly off center. The side that the lip is pressing when the tone is most colorful is the resistant side. Second, one might move the reed very slightly to one side of the facing or the other. When the reed responds best moved to the left, the right side is too resistant, and vice versa. With a well-shaped reed, removing some wood from the more resistant side of the vamp, from the beginning of the cut to about halfway to the tip, generally will balance the reed. As we become more adept at balancing reeds, we develop a "feel" for the right amount to take from each point along the resistant side of the vamp.

Vamp length. The traditional knowledge about vamp length is that the vamp should be exactly as long as the window of the mouthpiece. However, other factors being equal, a longer vamp will be more difficult to focus at loud dynamics than a shorter vamp. Also, whether the beginning of the vamp on the shoulder (the scribe mark) is straight across or U-shaped is significant. One can make the lower register of a reed respond better by scraping on the shoulder where there is a U-shaped scribe mark to make the scribe mark straight across. However, the upper register may not "hold" or focus the the tone as well as before.

One who makes reeds on a machine like the ReeDuAl (tm) which copies the shape of one reed onto a blank finds that any difference between the thickness of the blank and the model reed will be reflected in the length of the vamp of the new reed. If the blank is thin and the model is thick, the new vamp is shorter than that of the model reed because the cutting edge has lifted off the blank closer to the tip. Conversely, a thin model and a thick blank will render a very long vamp. This knowledge can be used to the reedmaker's advantage if a longer or shorter vamp is desired for focus reasons.

Reed thickness. As one examines the cut end of a tube of cane it become clear that the fibers are more dense toward the outside of the tube (near the bark), and they become less dense toward the center. Thus, a reed made from a thin blank will have a harder tip--formed from the denser fibers near the bark, and a reed made from a thick blank will have a tip which has fewer fibers and is thus softer. When the blank becomes very thick (in excess of .140 inch, for example) the tip has so little fibre that the reeds may often whistle or pressure squeak. It seems that the neighborhood of .112-.120 inch is optimum for clarinet reeds on my mouthpiece, however in making reeds for other mouthpieces, I have gotten better results with thinner or thicker blanks. As one varies the thickness of one's reeds, the relationship of tip and heart might need to change, as a harder tip will require a thinner heart to vibrate satisfactorily at all, resulting in a bright-sounding reed.

Summary. Problems with reeds boil down to two categories: mechanical and organic. Organic problems cannot be repaired mechanically--bad cane makes bad reeds. Mechanical considerations include warpage, balance, tip-to-heart relationships, tip center-to-corner relationships, vamp length and reed thickness and width. Understanding the function of each of these considerations leads to greater control of reeds and thus greater control of our lives as players.

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Exorcising the Clarinet's most Persistent Demons

Some Exercises for Focused Tone

- *The "Tongue Tickler"*
- *Tonguing on the finger*
- *Tonguing in the upper register*
- *Tonguing at very soft dynamics—in the upper register!*
- *Squeak study--harmonics*
- *Playing in the upper register without the register key—approached both from above and below*
- *Vowel sound of "teeee"*
- *Setting the embouchure <u>before</u> you attack—not <u>as</u> you attack.*
-

Exercises for Correcting Embouchure Pressure

- *The mouthpiece alone produces concert c-natural—not higher*
- *Pushing down with the upper lip*
- *Practicing double lip as a corrective device*
-

Achieving Tonal Depth

- *Good breath support is not the same as blowing hard*
- *The dip in the center of the tongue*
- *Pushing down with the upper lip*

Increasing Darkness of Tone

- *The mouthpiece*
- *The dip in the center of the tongue and the pressure of the upper lip*
- *Increasing the differential between the tip and heart of the reed*
-

Some Revelations

- *Improving reed mechanics will not fix an organic problem with a reed*
- *"Grunting" in the upper register and dropping the tongue down out of the mouth are directly related. Keeping an "open throat" may be the worst advice we can give if we do not understand the tongue's function in tone production.*
- *"Keeping fingers close to the keys" can be both good and bad advice. Know the difference!*