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Tuning the Double Reeds

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Wind Instrument Bores

- Any discussion of tuning instruments must begin with a clear understanding of the bore of wind instruments. I have included this review with familiar instruments to establish a baseline of what should be, and what shouldn't be done to tune conical bore instruments.

- There are 2 types of bores: ***tubular*** and ***conical***.

- However, many instruments have evolved as a ***hybrid*** of both bores.

- *A hybrid could be a tube with a cone/bell at the end like a trumpet or clarinet, or a cone with tubing in the acoustic path, like the valves and slides on a horn or tuba*.

1) The only true tubular bore is the modern flute.
(Interestingly, piccolos can be tubular or conical with a reverse cone.)

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2) Clarinets, trumpets and trombones are hybrid instruments.

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3) Double reeds, saxophone, cornet, horn, euphonium
and the tuba family are conical.

Changing Length Changes Pitch

- No matter what the bore, in order to affect the overall pitch of a wind instrument, you must change the length of that instrument. If that change of length affects the shape of the bore, mild to very radical intonation issues can happen, especially at the 1st overtone above the fundamental (usually the octave).

- We are all familiar with tuning tubular instruments.
- The flute head joint, a brass instrument's tuning slides.
- These work quite well as the inside *diameter* of the tube is not significantly altered when the length is changed.

Clarinet Issues

- Tuning a clarinet is more problematic, for when the length of a clarinet is extended, the inside bore diameter is suddenly changed where the expansion “gap” is created.
- Using tuning rings can easily rectify this issue, by filling the gap, which then restores the integrity of the clarinet tubes’ inside diameter.
- The “gap” issue on the larger clarinets is solved by incorporating a tuning tube, much like a flute.

Brass Instruments Solution

- Conical brass instruments solve this problem by inserting short lengths of tubular tuning slides; so no “gap” is created in the cone.
- Theoretically, the change from conical to tubular back to conical should create anomalies, but in practice, the length of the tubular section is so short in relationship to the overall length of the instrument, it is a mild effect.
- Also, remember that those anomalies affect the 1st overtone above the fundamental so the notes most affected for brass instruments are near the bottom of the practical range.

Saxophone Most Elegant Solution?

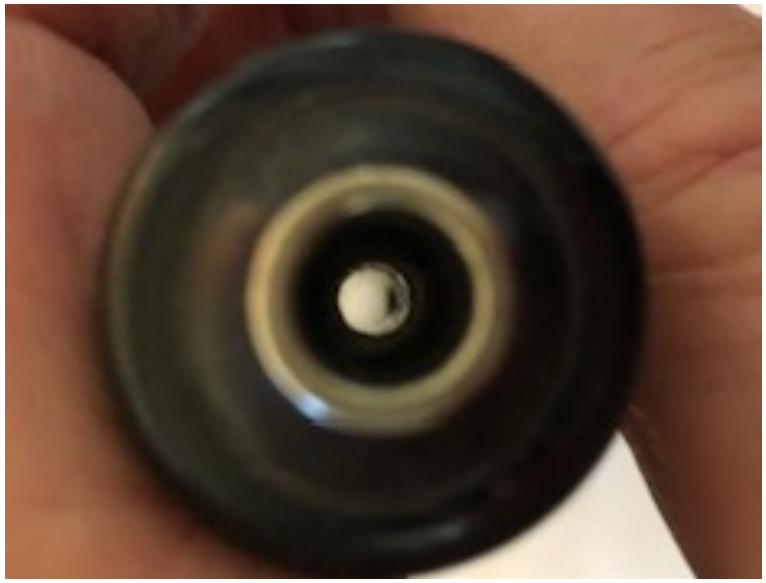
- Adolph Sax, *the creator of the euphonium*, designed an elegant solution for the saxophone.
- The cone of the saxophone starts at the tip of the neck, the mouthpiece bore is tubular.
- No matter how little or how much the saxophone is inserted into the mouthpiece, the length of the cone is never altered, making tuning the overall length of the saxophone simple and effective.

…. Now on to the problem children …. Oboe & Bassoon

- Unfortunately, the way that the oboe reed and the bassoon bocal are attached gives the false impression that the overall pitch of a double reed instrument can be adjusted the same way as other wind instruments are adjusted, by altering the length of the instrument.

- The act of pulling out the reed or bocal converts the bore from conical to tubular, and also introduces a dramatic change in the size of bore, almost 50% larger. This internal change, which is hidden from the eye, introduces dramatic tuning abnormalities, as noted before, most noticeability at the 1st octave above a fundamental pitch.

Oboe Socket, Bore and Reed



You can see the area that the cork normally fills up.

!Shorter + Closer = Trouble!

- All woodwind instruments operate by changing the length of the bore. Each time you pick up a finger, the instrument gets shorter.
- For our discussion, this means that the closer the nearest open hole on the instrument gets to the area of instability, which is the reed/bocal socket, the more radical that instability will be.
- This is bad news, but also a predictable action, which makes it preventable.

Bassoon Bocal and Wild Notes

- The conical bore of all bassoons start at the tip of the bocal. Bocals have precise expansion rates, which are apparent to the eye.
- The good news here is that bocals do come in differing lengths, the lower the number, the shorter the length; #1 the shortest, #5 the longest.
- If your bassoon is always sharp, no matter what the reed is, using a longer bocal will solve that issue.
- Bassoons are usually shipped with #1 and #2 bocals. These are the shortest/sharpest and for the most part, unusable, bocals.
- It is desirable to use a #3 bocal, which gives more stability to the throat (short) notes and still works with most commercial reeds.
- For the bassoon, the wild notes are from Bb2 (2^{nd} Bb below middle C) until open F below middle C. Being the shortest notes on the bassoon, these notes are not very stable to begin with, and are in a very popular compositional range, so adding fuel to that fire is not advised.

Oboe Bocal and Wild Notes

- The conical bore of all oboes starts with the staple, which is the metal part of the oboe reed, and is hidden by the cane and cork. All staples are manufactured to precise mathematical conical expansion rates, and should be considered the bocal of the oboe.

- Reed makers have experimented with differing lengths, and being able to purchase reeds with differing lengths of staples would be great. Unfortunately, you cannot easily acquire oboe reeds with different length staples, so that is not a viable solution.

- For the oboe, notes most affected are from G4 to C5, and the 2nd octave notes between E5 and C6. That is smack dab in the most composed range of the oboe, and, unfortunately, where they have to tune with flutes 90% of the time. So, this is also not a very smart area to add additional tuning complications.

Neither Push Nor Pull But there is a Solution

- If we can't push anything in or pull anything out, and there aren't tuning slides, how can we we play these instruments in tune?
- The tone generator / double reed itself has a lot in common with the brass instrument tone generator, which is another double reed (lips).
- Buzz a higher / lower pitch on a trumpet, and you will get differing note, another partial.
- Buzz a higher / lower pitch on a double reed, and you will sharpen or flat the note you are playing.
- Force the double reed really high or low, and you might get the next partial, which is usually the octave. (even higher partials on the Bassoon).

?Simple enough?

Practice, Practice, Practice

- The easiest way to learn to control a reed's pitch is to practice on the reed as if it were a musical instrument.
- Gross movements can produce almost an octave of range on the reed alone and assist with achieving control of differing octaves.
- Micro adjustments produce very slight pitch changes (as little as one beat, 440 to 441), allowing for perfect frequency matching

A Few Words About Embouchure

- The embouchure's primary purpose is to create the muscular equivalent of a trumpet mouthpiece cup, by providing a ***minimally*** flexible *CIRCULAR* surround that controls the reed's vibrations. The firmer the lip muscles the better. There is no physical way possible to make the lip muscles too firm or bunched.

- The embouchure places the lips between and slightly forward of the teeth, *NOT BEHIND THE TEETH OR WITHIN THE MOUTH*. To allow enough space for the bunched lip muscles to fit between the teeth the jaw will necessarily be very open, the only limits on this opening is if the lips cannot touch.

- The bunched lip pads are used to *grip* the reed with the corners of the mouth pushing in towards the center, creating an "O". At the same time the lips are thrusting forwards, as if attempting to push the reed out of the mouth, as the reed is attempting to push the lips back into the mouth. This dynamic tension is an important feature of the embouchure.

- ***THERE SHOULD BE NO UNNATURAL EXAGGERATION OF THE OVERBITE ON OBOE OR BASSOON.***

REED PLACEMENT & THE NEUTRAL POSITION

- The *neutral position* is a physically memorized spot in the embouchure that all subsequent range, tone and intonation corrections are derived from.
- Before an embouchure is made, the tip of the TIP of the reed should be located in the center and middle of the bottom lip, on the "wet" line.
- The top lip then closes down on the reed, arriving wherever the overbite dictates.
- During the formation of the embouchure and during playing, the reed should be gripped firmly by the lip muscles, staying onthe same lip location, and not be allowed to ***slide*** past the lips into the mouth.
- Students might occasionally need to dry their lips and reed to keep the reed from slipping out of position.

Neutral Position, Continued

- The angle that the reed protrudes from the student's mouth should follow the natural overbite.
- If a student has no over-bite the reed will come straight out of the mouth, if the student has a pronounced over-bite, the reed will project downward, like a clarinet, and if the student has an under-bite, the reed will project upwards.
- Most students are somewhere in the middle, with an average downward projection of 30 to 40 degrees below the horizon.
- A simple test to see if the embouchure is providing the necessary tension and grip is to gently push the reed 1/4" inward, and then release it suddenly. The reed and lips should spring back to the *neutral position*. If the reed slips through the lips, the lips are too wet and should be dried off. This dryness will provide the necessary friction. If the reed does not spring back, the lips are stretched too thinly over the teeth, and the teeth are too close together, with every probability that the student is biting on the reed rather than gripping it.

!52 Spots on a Bassoon Reed 52!

- In theory, there is an exact spot on the reed for each note the oboe or bassoon plays (that would be 52+ spots on a bassoon reed!!).

- In practice, each ½ step on the reed corresponds roughly to 4 or 5 notes on the instrument. In general, the higher (or lower) one plays on the instrument, the higher (or lower) one should play on the reed.

Oboe Reed Range

- The range of the oboe reed should vary from F4 to D5 (above middle C4) with A4 (440) being the primary pitch created at the *neutral position*, which is a memorized starting position on the reed.

Oboe Reed Alone

Bassoon Reed Range

- The bassoon reed range is almost an octave, from middle C4 up to Bb4 or possibly even a C5, with F4 being the primary pitch created at the *neutral position*.

Bassoon
Reed
Alone

Tone, Tone, Too?

- You can also practice tone as you practice pitch.
- Tone is easy (sort of). You are looking for a pure sound, not fuzzy/ airy or split pitch – especially the ***"Crow"***.
- If the reed slips through the lips, the usual result is the ***"Crow"***.
- GIGO is the operational principle with Tone.
- If the reed sounds good, so will the instrument.

Remember, Garbage In, Garbage Out

Tuning With Another Instrument

- Tuning is a technique that must be practiced from the very beginning with the double reeds. I teach this concept to beginners without issue.
- To match pitch, the double reed must be very flexible at moving the reed around, as the reed is in constant motion. We move for octaves, we move for micro-pitch adjustments.

A Flute
and
Oboe
tuning

Tendency Tones

- If the circular “O” embouchure is used, the throat tones on double reeds will be predictably flat.
- (A – C, both octaves on oboe, D – open F on bassoon).
- Typically, the higher you finger a pitch in the throat area, the flatter that pitch will be without any adjustment. That is good, as it is predictable.
- The solution is to “roll in” fractionally (raising the pitch) on the reed note by note for throat tones.
- For higher octaves you might have to move in as much as 1 whole step on the reed above the 1st octave position.

NOTE:

- *Be aware that if a student is consistently sharp on these notes, they are biting on the reed.*

Always a Soloist, Never a Section.

- Double reeds are rare enough that they are almost always a solo instrument. Even if you have 2 oboes, and they play perfectly in tune, and at concert pitch, they will sound out of tune to a bigger section that is not as perfect!

- So they have to be the instruments to adjust. Learning that individual voices have to match the greater ensemble is an import lesson, and should be stressed early on.

Tuned at the Factory?

- Each differing double reed instrument, no matter if it is a student level or pro, has inconsistencies in the bore, and those differences are there from one serial number to the very next.
- Those inconsistencies can be mapped, and although each new reed is a slightly different “mouthpiece”, the tendencies remain the same.
- Once a student learns their own inconsistencies, they can then apply the solutions at any pitch level the flutes (or anyone else) might impose.

Conclusions:
Confusing? Bad News Or Good?

- By now it should be apparent that the double reed has to be in consent motion within the embouchure, both for tuning and range considerations.
- If this seems complicated, it is. However, it is no more complicated than learning to play many notes on a single valve, or holding 3 mallets in each hand and aligning those mallets for differing chords.
- We musicians do this stuff every day. I ask 6th graders to do this within that first, most critical year, and they do it.
- The good news is that the problems are predictable, and as such, once your students are armed with the solutions, they can be anticipated and practiced.

…… Finally ……

…Call me…

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