

## LIST OF FACTORS THAT AFFECT INTONATION

1. **LENGTH**- this is the most influential of all factors. Remember that **SH**orter is **SH**arper! The shorter the tube, the higher the pitch, and conversely, longer is flatter. Think of your instruments- a piccolo's length compared to a tuba's length and the type of sound each of them make!
2. **WIND VELOCITY**-
  - a. **Dynamics**- louder dynamics affect initial pitch, especially at the point of the attack, and probably throughout sustain of the note.
    - Single reeds- loud dynamics **FLATTEN** notes.
    - Double reeds, brasses, flutes- loud dynamics **SHARPEN** notes.
  - b. **Attacks**- marcato, marcatissimo, secco, some staccato cause the same effect as "loud dynamic" levels listed above, especially at the point of attack of the note(s) in question.
  - c. **Tessitura/range**- higher wind velocity required to play higher tessitura notes cause the same pitch tendencies as listed above under "louder dynamics".
  - d. **Sustain**- variations in the air stream while a note is sustained affect intonation greatly. These fluctuations in the air column may be due to any number of things: embouchure firmness, unsteady outward flow of air from the lungs and diaphragm muscles, vibrato, throat tension, head angle, body position, leaks in the instrument, bad reed vibration, etc. (this list could be hundreds of items long....)
3. **TEMPERATURE**- warmer ambient temperature inside the column of air of an instrument produces **SHARPER** pitch. This is because hot air molecules are further apart, due to their increased excited state caused by higher temperature, and thus are more easily moved (vibrated by blowing) at higher velocities causing a **SHARP** pitch tendency.  
Colder air, conversely, is more dense (air molecules are closer together), not as easily vibrated, thus the same amount of energy will not produce as rapid a vibration- resulting in **FLAT** pitch.  
Remember: **SHARP**-hot, **FLAT**-cold. (Note: the opposite is true of definite-pitched percussion instruments, i.e. xylophone, chimes, marimba, etc.)  
The **IDEAL** temperature for playing an instrument is 72 degrees Fahrenheit.

4. **CONTEXT**- how your pitch relates to others being sounded.
  - a. **Harmonic**- due to properties of the nature of the human ear/brain and its perception of pitch, and tempered tuning, certain chord tones have been found to be "perceived" as in tune when humored either flat or sharp, depending upon their harmonic function. Example:

MAJOR CHORD: F major

C- most often judged as in tune or not by relationship to tonic (F) (+2)  
A- 3<sup>rd</sup> needs to be pulled down about 14 cents  
F

MINOR CHORD: f minor

C- a Major 3<sup>rd</sup> interval exists between Ab and C, so the 5<sup>th</sup> is favored sharp. (+2)  
Ab- 3<sup>rd</sup> needs to be raised about 16 cents  
F

This accounts for the differences between "enharmonic equivalents," i.e. G# and Ab, (G# contextually is a leading tone (seventh scale degree) to A, for instance, so it's pitch will often be humored to the sharp side in that context, as opposed to Ab as tonic pitch).

- b. **Melodic**- function of a pitch in the context of a melody, either as primary or tonic-related pitch, or as a passing tone, upper/lower neighbor tone, etc. All notes should be examined as to their "direction" melodically to help with pitch tendency.
5. **DESIGN OF YOUR INSTRUMENT/PHYSICS OF SOUND**: instruments are designed according to physical laws that govern all sound production. Brass instruments, for example, are built with compensating mechanisms in place to account for the inaccurate length of tubing inherent with 1-3 or 1-2-3 valve combinations. Flutes have no real "E-above-the-staff" fingering; the one used is actually an overblowing at the 5<sup>th</sup> of the "A-above-the-staff" fingering, with fingers 4 and 5 of the right hand added for intonation purposes. Clarinet vent holes in the infamous throat-tone register (open G- through Bb above that) are built too high up on the instrument, thus are very sharp (tube length is too short).

**YOU** have a duty and responsibility to learn about such irregularities of your instrument, and further, **LEARN HOW TO CORRECT THEM WHEN PLAYING!!!**

## FROM THE SHELLY JAGOW BOOK: Developing the Complete Band Program

**Tone-** produced by a vibrating air column for wind instruments, a vibrating string for string instruments, or a vibrating membrane, metal, wood, etc. for percussion instruments.

The *pitch of a tone* is determined by the rate of speed of vibrations (called the frequency), which is measured in cycles per second. A higher pitch will have faster vibrations (therefore more cycles per second) and a lower pitch will have slower vibrations (therefore fewer cycles per second). i.e. "A" is 440 mhz.

By adjusting embouchure or any of the various ways to change the pitch on an instrument, the student should be able to bring their sound to match either the pitch given by a tuner or any other instrument. If a student has to PINCH or FIRM the embouchure, then their pitch is FLAT to the other tone. If it is FLAT, they must SHORTEN their instrument. If the student must LOOSEN or RELAX the embouchure, then their pitch is SHARP to the other tone, and they must LENGTHEN their instrument. A "beat-less" sound indicates the vibrations are operating at the same frequency.

**REMEMBER:** *The slower the beats sound the closer they are to matching pitch; and the faster the beats sound the further away they are from matching pitch.*

### FIVE PROPERTIES OF SOUND:

- 1) Pitch- the frequency of the note you are attempting to play/produce.
- 2) Intensity- volume, placement within the chord structure.
- 3) Timbre- the sound quality- think of the difference between a brass and reed instrument.
- 4) Duration- length of the note.
- 5) Direction- where is the note heading- think of the melodic phrase.

### LISTENING- What are you supposed to listen for?

- 1) Listen for the lowest voice (in band, typically the lowest wind instruments) and be able to balance all the upper voices relative to this lower pitch or fundamental pitch. This is called LISTENING DOWN for the pitch. Students on first part should listen down to the 2<sup>nd</sup> and 3<sup>rd</sup> part players. Each player must perform louder than those playing higher notes and perform softer than those playing lower notes.
- 2) AS THE BASS PLAYS, SO PLAYS THE BAND- if the Tuba or lowest instrument is out of tune, so to will the band be!

### TUNING- AN ONGOING PROCESS

- 1) Tuning is not just something to be done at the beginning of rehearsal. Tuning is an ongoing process. The corrective use of air speed, embouchure adjustment, alternate fingerings, rolling of head joint (flute), covering extra holes (clarinet), etc. must be used to adjust pitch! Tuning is not event. It is an ongoing process.

### FACTORS AFFECTING PITCH

- 1) Air
- 2) Posture
- 3) Embouchure
- 4) Amount of mouthpiece
- 5) Angle of mouthpiece
- 6) Lay of mouthpiece
- 7) Barrel and Bocal length
- 8) Horn Hand Position
- 9) Reed Condition
- 10) Equipment
- 11) Dynamics
- 12) Pitch Concept
- 13) Balance
- 14) Timpani Pitch
- 15) Temperature

### BRASS PITCH AND THE HARMONIC SERIES

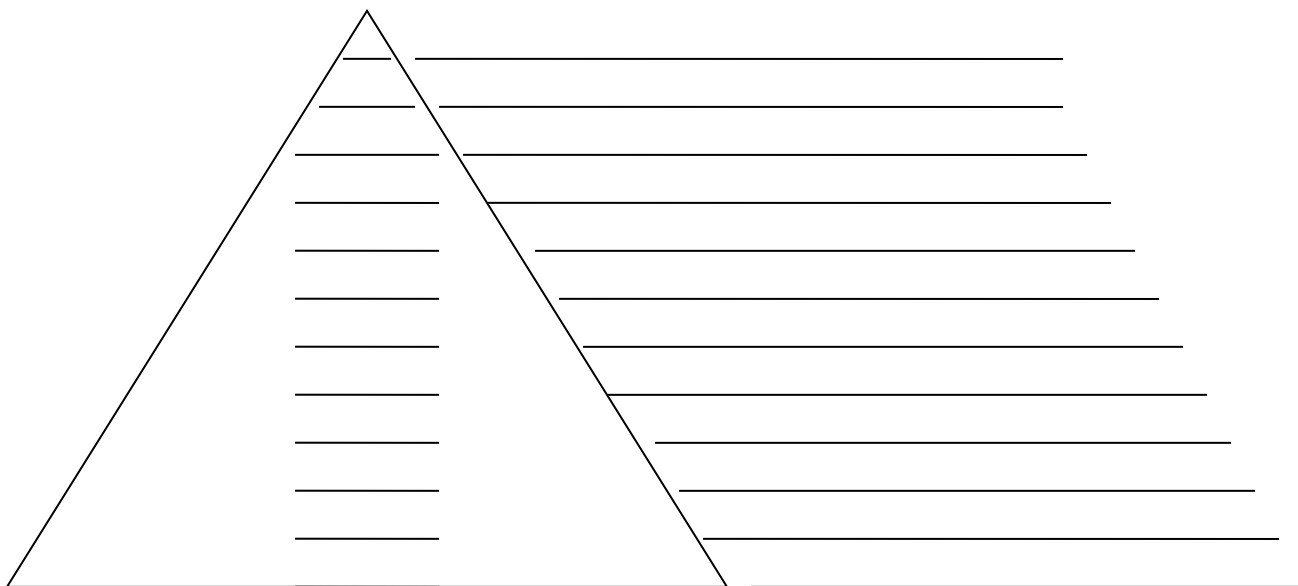
It is known that only 7 combinations are available on 3-valved instruments, but by over-blowing air, you can produce a multitude of notes, *with the same fingering!* The same is true with trombones and their seven positions on the slide. The invention of the valve helped with many problems, but there are some inherent issues with the valve combinations.

Open notes- generally in tune  
2<sup>nd</sup> valve- generally in tune  
1<sup>st</sup> valve- generally in tune  
1<sup>st</sup> and 2<sup>nd</sup> valves- slightly sharp  
2<sup>nd</sup> and 3<sup>rd</sup> valves- slightly flat  
1<sup>st</sup> and 3<sup>rd</sup> valves- slightly sharp  
All 3 valves- very sharp

## FROM THE FRANCIS McBETH BOOK: EFFECTIVE PERFORMANCE OF BAND MUSIC

Pitch is a direct result of balance.

Balance is a result of the triangle of balance.



The reason that the brass or woodwind pyramids will create good balance is that the higher the pitch, the less volume is needed for it to be heard distinctly. When the balance is correct, each individual player in the band is louder than each player playing notes higher than his, and is softer than every player playing notes lower than his. It is very difficult for anyone to play in pitch with notes higher, but it is not hard to play in pitch with notes lower. (LISTENING DOWN CONCEPT!)

## FROM THE SCOTT RUSH BOOK: HABITS OF A SUCCESSFUL BAND DIRECTOR

Suggestions to help with TONE PRODUCTION- anyone can play technically, but if they sound nasty, do you want to listen to them? We listen to music because of the sound, not how fast or technical something is, right?

Flute: Use warm air and make sure that the air is properly directed down into the flute.

Oboe: Make sure there is not too much reed in the mouth; keep teeth open and round corners

Clarinet: Play with firm (solid) corners and a flat chin; throat should be open.

Saxophone: Use a more rounded embouchure and allow the corners to cushion the mouthpiece.

Bass Clarinet: Use a softer reed than your woodwind counterparts

Bassoon: Use "OH" for oral cavity syllable: chin should be down and back but not as pointed as the clarinet.

Brasses: Use warm air and be aware of oral cavity issues: use "OH" for basic tone production.

Percussion: Wrist and arm tension are your worst enemy/when applicable, pull the sound out of the instrument- don't bang!

LISTEN TO RECORDINGS OF FAMOUS PERFORMERS ON YOUR INSTRUMENT- NOT THE PERSON SITTING AHEAD OF YOU!

Three parts of playing a note: ATTACK, SUSTAIN, and RELEASE!