

THE PHYSICS OF TUNING FOR ALL WIND INSTRUMENTS (aerophones)

Heat-makes all aerophones sharp (opposite for piano and string instruments and metal percussion)

Excessive heat and/or open windows in hot weather will have negative affect.

Cold-makes all aerophones flat (opposite for piano and string instruments and metal percussion)

Excessive air conditioning and/or open windows in cold weather will have a negative affect.

All instruments are built to be pulled out (otherwise you can't tune in colder atmosphere), therefore, in normal weather conditions, all aerophones should be pulled out to be at B flat = 466 cps (cycles per second)

All wind instruments can lip pitches up by tightening the embouchure and lip pitches down by loosening.

All wind instruments can lip notes down to a greater degree than they can lip notes up. (less taxing on embouchure.)

Ideal air temperature = 68 degrees. Air from lungs = 98.6 degrees. Freezing is 32 degrees, note differences.

Instruments are designed to reach its true pitch after warming up for at least 5 minutes.

The more metal an instrument has, the longer it takes to warm-up.

Lip muscles also have to be warmed-up and stretched out, otherwise the muscles will be tight, causing sharpness.

All wind instruments are pulled out to lower pitch and pushed in to raise pitch.

The harder the reed the sharper it is and conversely the softer the reed the flatter it is. A reed placed too high will lean sharp and too low will lean flat.

Reed charts - are considered a general guideline because of the perception of reed strength. (mouth pieces and embouchure strength will also affect perception of reed strength)

No two instruments are alike, including same exact models due to condition (extra solder not seen inside, etc.)

Straight and Harmon brass mutes typically make an instrument go sharp to very sharp. Cup mute will make the instrument go flat. Playing with a straight/harmon mute when the temperature is high makes brass playing very difficult.

Humidity has a negative affect on wooden instruments over a long period of time. A dry environment will cause a wooden instrument (wood piccolos, clarinets, marimbas) to shrink.

All instruments have some notes that can use a "tuning fingering" or alternate fingering to assist in controlling pitch tendencies. These alternate fingerings are different for every player due to their: instrument, mouthpiece, embouchure, reed, reed strength, ligature, airstream, and breathing/blowing prowess.

All key heights (lower/upper stacks and palm) on woodwind instruments control intonation and tone. The more open the venting is increased, the more open the tone (less resistance), but the sharper the pitch. Conversely, the more closed the venting is the more closed the tone (due to more resistance) and the flatter the pitch. Creative bending woodwind keys to repair leaks may help properly close the tone holes, but it will typically change the pitch of several notes and put the entire instrument out of adjustment.

Temperatures increases during concerts makes pitch rise on wind instruments due to body heat and lighting.

Conversely, string instrument go flat, therefore, a full orchestra has an opposite tuning affect between sections of the orchestra. Good orchestras tune after each song because of this.

A compounded problem occurs when saxophonists and clarinetists with too much cork grease or loose corks shorten their instrument due to playing and handling it which makes the pitch rise even more. Also, if brass players only tune their main tuning slide (usually pulled out, unless cold), then the sharp fingering combinations (all 2 and 3 valve combinations) become even sharper. This, of course, overtaxes the embouchure from continuous lipping down which makes the tone quality sound more and more spread and unfocused.