Wind Instruments

A Comparison Between Brass and Woodwind Instruments

Presented by

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Wind Instruments

- Musical instruments that contain some type of resonator in which a column of air is set into vibration by the player blowing into or on a mouthpiece that is at the far end of the resonator.
  - mouthpiece
  - resonator
  - bell
- All wind instruments are dependent upon the entry of air into a flow-controlled valve
- How does air expelled into the instrument get transformed into something musical?

Two Families

Brass Instruments

Trombone, Trumpet, Horn

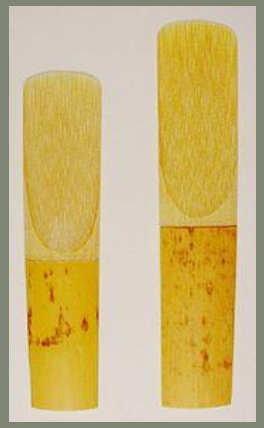
- “Lip-vibrated instruments”
- Player's lips vibrate, causing the air within the instrument to vibrate
- Producing different pitches results from alteration of the player's lip tension (embouchure) and altering air flow.

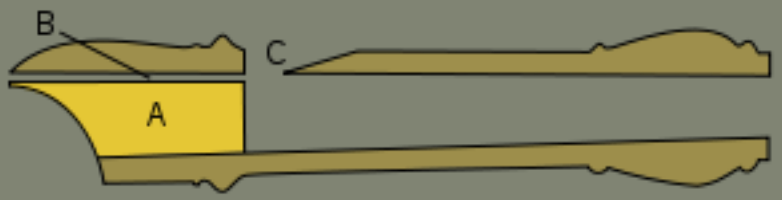
Woodwind Instruments

Saxophone, Flute, Clarinet

- Player blows against a sharp edge or through a reed to cause air within the resonator to vibrate
- External synthetic piece vibrates to produce sound

Woodwind Instruments

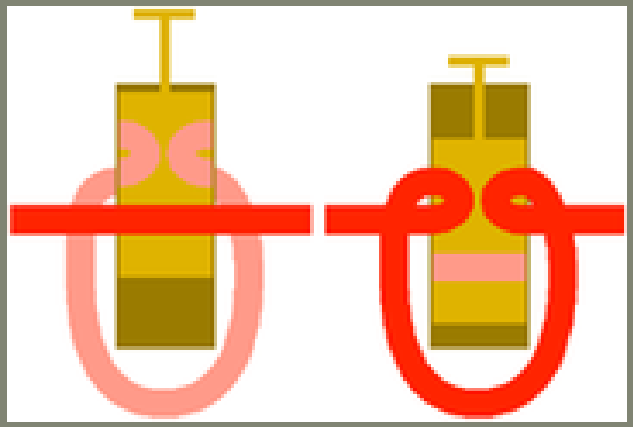




- Flute - blows on an edge
- Reed instruments, both double and single
- **Fipple**, where air is compressed when entering the instrument and then projected against a bladed edge
- The air flowing over the voicing mouth creates a flow-controlled valve, or "air reed."
- Interaction between the air reed and the air column in the body of the instrument produces oscillation in the flow of air at the windway

Brass Instruments

Valves and Slides



INCREASING THE OVERRALL TUBING LOWERS FUNDAMENTAL PITCH

Slides change the length of tubing, but produces less quick and less accurate jumps in one note to another.

Valves change pitch, which means the bell needs to be a size that works well for many different lengths and creates imperfections in tuning corrected by lip-and-breath control, mechanical assistance, or positions of the stopping hand inside the bell.

Brass Instruments

Natural and Keyed/Fingered

Natural brass instruments can only play notes in the instruments harmonic series.

Keyed of fingered bras instruments have holes along the body covered by fingers of finger operated pads to get a wider array of sound frequencies.

Brass Instruments

Cylindrical and Conical Bores

- Cylindrical bore brass instruments are generally perceived as having a brighter, more penetrating tone quality compared to conical bore brass instruments.
- Conical bore instruments are generally perceived as having a more mellow tone quality than the cylindrical bore brass instruments

Radiation Efficiency

- 100% if a traveling wave keeps going once leaving the bell
- Small opening and low frequencies produce low radiation efficiency

  -100% for wavelengths shorter than twice the whole diameter
- Large holes let more sound out and reach 100% efficiency at lower frequencies
- Lowest harmonics come out mainly through the first open hole and higher harmonics penetrate farther down the tube
- Dependence on listening location
- Can insert mutes into the bells to cut down total sound output and alter timbre, and thus reduce radiation efficiency while enhancing the playability of higher notes