The Application of Vocal Tract Resonance in Achieving Optimum Tone Quality in Woodwind and Brass Players

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The Voice and the Clarinet

The Mezzo-Soprano and the Clarinet have been paired for centuries!

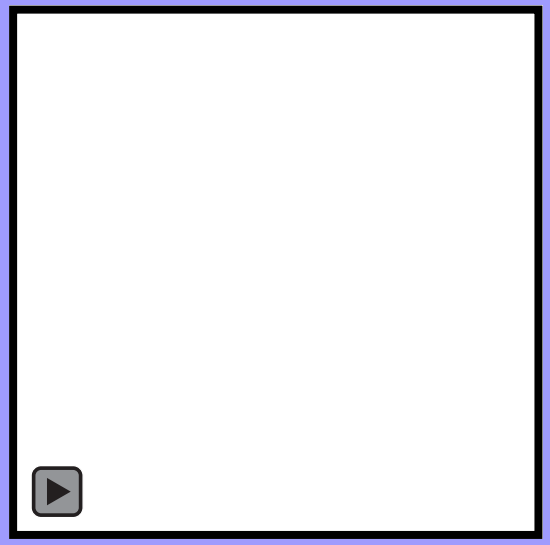
Parto, Parto (Sesto)
La Clemenza di Tito
Wolfgang A. Mozart (1756-1791)

Cecilia Bartoli, Mezzo-Soprano
Peter Schmidl, Basset Clarinet

Wiener Kammerorchester,
György Fischer, Conductor
London Records D 134783

Track 8

Sound Track for the Voice and the Clarinet



The Voice and The French Horn

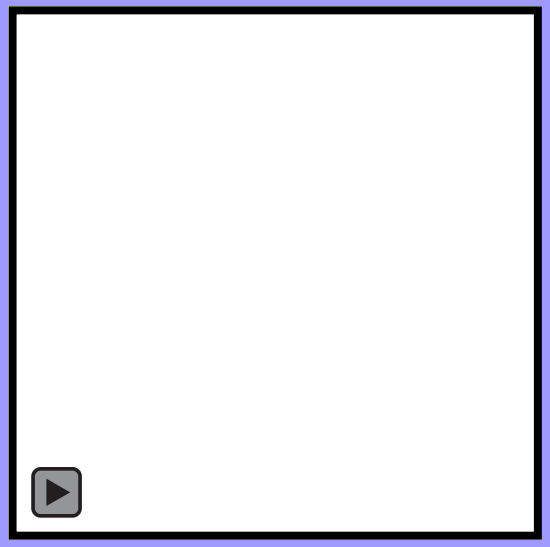
In the Twentieth Century, the Tenor has been paired with the French Horn!

Serenade for Tenor, Horn and Strings
Benjamin Britten (1913-1976)

Philip Langridge, Tenor
Frank Lloyd, French Horn
English Chamber Orchestra,
Steuart Bedford, Conductor
Collins Classics 70372

Track 3

Sound Track for the Voice and the French Horn



The Voice and The Flute

The Soprano has been paired with the Flute for centuries!

The Mad Scene
Lucia di Lammermoor
Act III, Scene 1
Gaetano Donizetti (1797-1848)

Sumi Jo, Coloratura Soprano
Anne Maugue, Flute
Orchestre Philharmonique de Monte-Carlo
Paolo Olmi, Conductor
Erato Records 4509-97239-2

Sound Track for the Voice and the Flute

Please click on the Forward button and then on the Play Button for you to enjoy the Sound Track.

The Voice and Wind Instruments

Are these pairings a coincidence?

Not at all!

The Voice and Wind Instruments

Similarities in Timbre (Tone Color)

Real or Imagined?

Coloratura Soprano - Flute

Mezzo-Soprano - Clarinet

Lyric Tenor - French Horn

The Voice and Wind Instruments

What creates timbre?

Formants

What are *formants*?

Each instrument has a fixed pitch, which through sympathetic resonance will augment whatever partial in the tone is in tune with it. This fixed pitch, and the frequency band in which the exaggerated partials will be found are called the ***formant***!

William Vennard - Vocal Pedagogue
Singing, the Mechanism and the Technic 1967

The Voice and Wind Instruments

***Formants* for Singers:**

- **The vocal folds produce a basic tone that can be varied widely through internal amplification and resonance factors including various cavities of the nose, throat, and mouth - known to singers as the *Vocal Tract.***

- **Some of these factors are not variable and impose several of the characteristics that distinguish one singer from another, male from female, youth from age, and so on.**

- **The best singers spend years learning to control these *formants* for the best possible vocal resonance and tone quality!**

The Voice and Wind Instruments

***Formants* for Wind and Brass Players:**

The *formants* of the wind and brass instruments are created by the shape of the instrument itself, the size of the instrument, the position of the finger holes, the number of holes and keys, etc.

and

In our hypothesis: "*formants* can be created through the variety of shapes which can be obtained within the vocal tract as the instrumentalist plays his/her instrument."

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The Structure of the Human Vocal Tract

The structure of the Vocal Tract as utilized for the singing Process can be noted on the following slide, and includes:

1. The Laryngopharynx
2. The Oropharynx
3. The Nasopharynx
4. The Oro Cavity (the mouth)

Note: The Nasal Cavities are thought to have little to do with the resonation process in singing.

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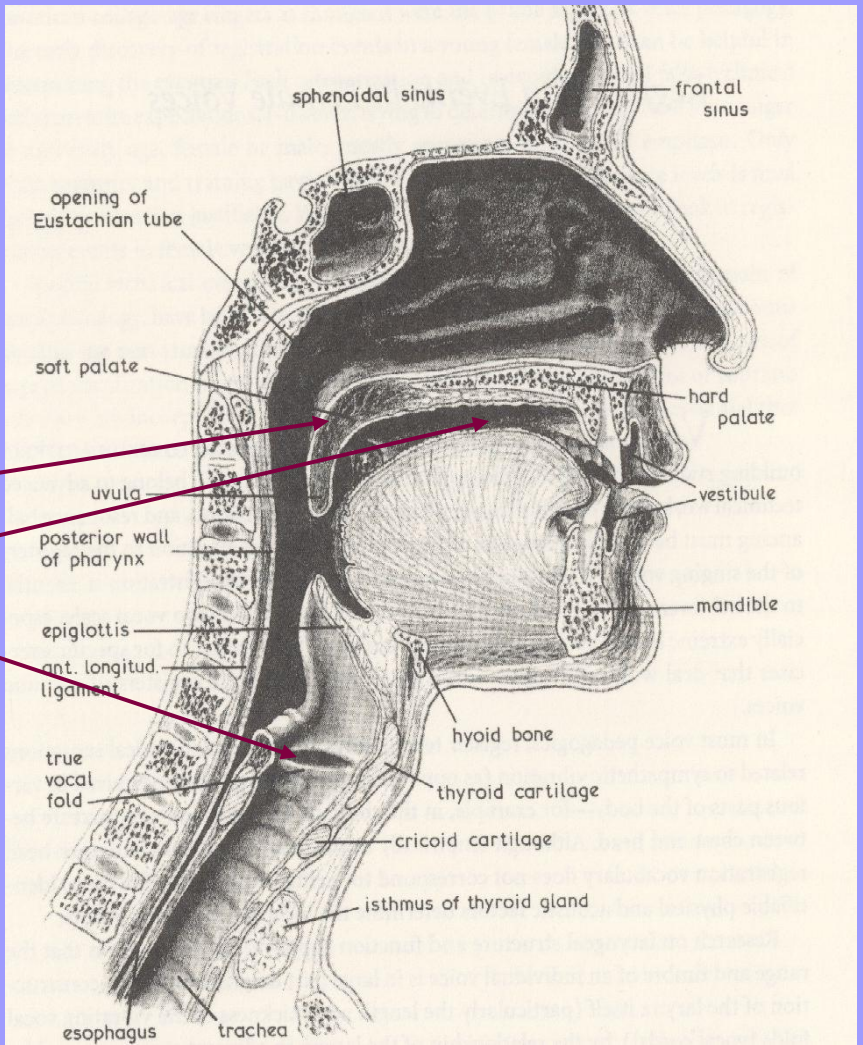
Sagital section of the Vocal Tract

Vocal Tract extends from the **vocal folds** upward to the **soft palate** and into the **mouth** cavity.



Dynamics of the Singing Voice
Meribeth Bunch,
1982 Vienna: Springer-Verlag

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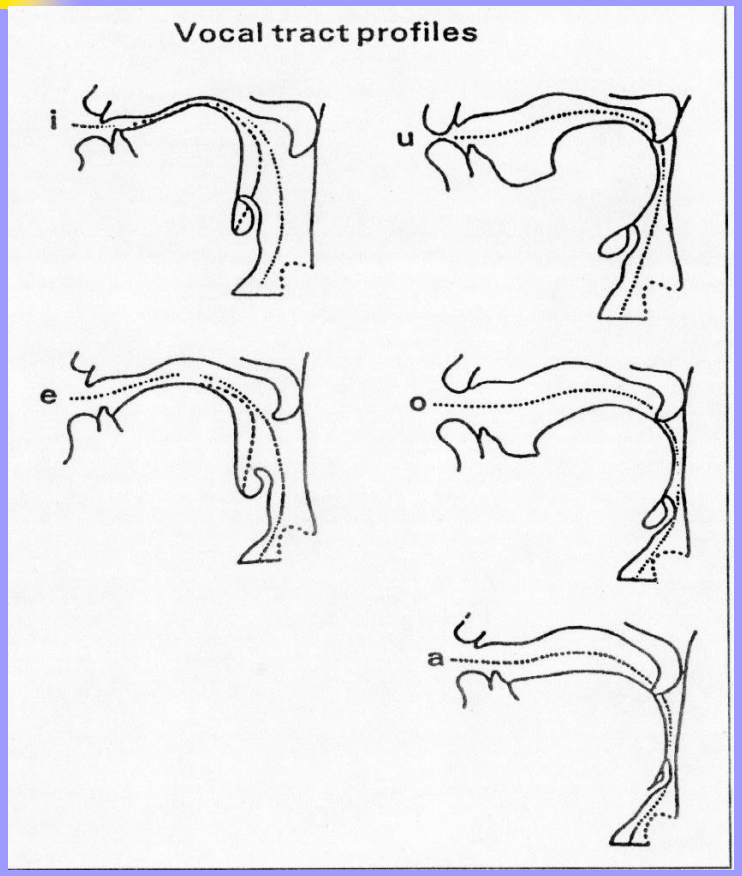

In Singing:

- Changing the vowel changes the shape of the vocal tract . . .
- Changing the shape of the vocal tract changes the formant . . .
- Changing the formant changes the resonance produced by the singer.

Vocal Health and Pedagogy, Robert Thayer Sataloff, M.D., D.M.A.
1998 Singular Publishing Group, Inc.

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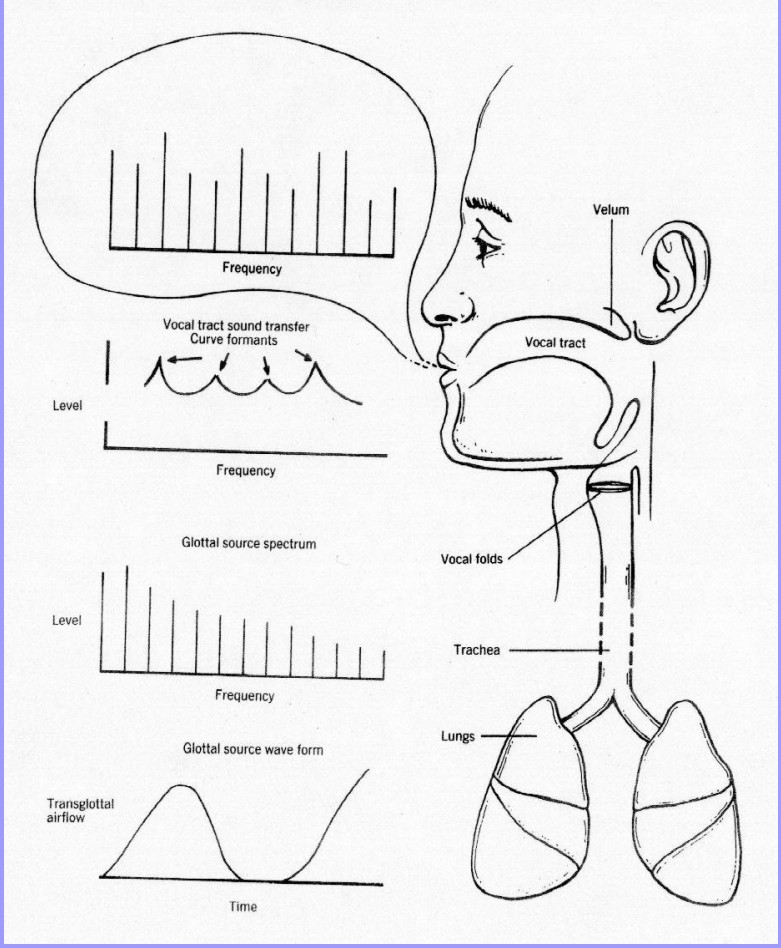
Tone Production for both the singer and the woodwind or brass player includes the well-developed application of breath energy.



The Voice and Wind Instruments

Hypothesis:

A woodwind or brass instrumentalist (Flutist, Clarinetist, French Horn Player, etc.) uses his/her instrument as an extension of the human vocal tract in order to produce tones which are pleasant for both the listener and the player.

Therefore, teaching these instrumentalists how to utilize appropriate vocal posture, diaphragmatic-costal breathing, and resonating techniques should **improve the overall tone quality** of the instrumentalist by **adding appropriate formants** to the tone produced.

The Voice and Wind Instruments

Diaphragmatic-Costal Breathing Process

1. **Correct Posture:** Lengthened spinal column to open and lift the rib cage; enabling diaphragmatic freedom and maximum control of the inhalation/exhalation process.

- **Correct inhalation enables the opening of the pharynx**
- **Correct inhalation lowers the position of the larynx; opening the laryngopharynx for maximum resonance**
- **Correct inhalation opens the nasopharynx and oropharynx for use as resonance chambers**

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Vocal Tract Resonance

- In-depth study has taken place regarding singers in regard to the enhancement of tone quality through appropriate laryngeal, pharyngeal, and tongue position in order to promote optimum resonance in the singing voice.

- The application of this knowledge to the production of woodwind and brass tone production will yield more resonance in the tone quality!

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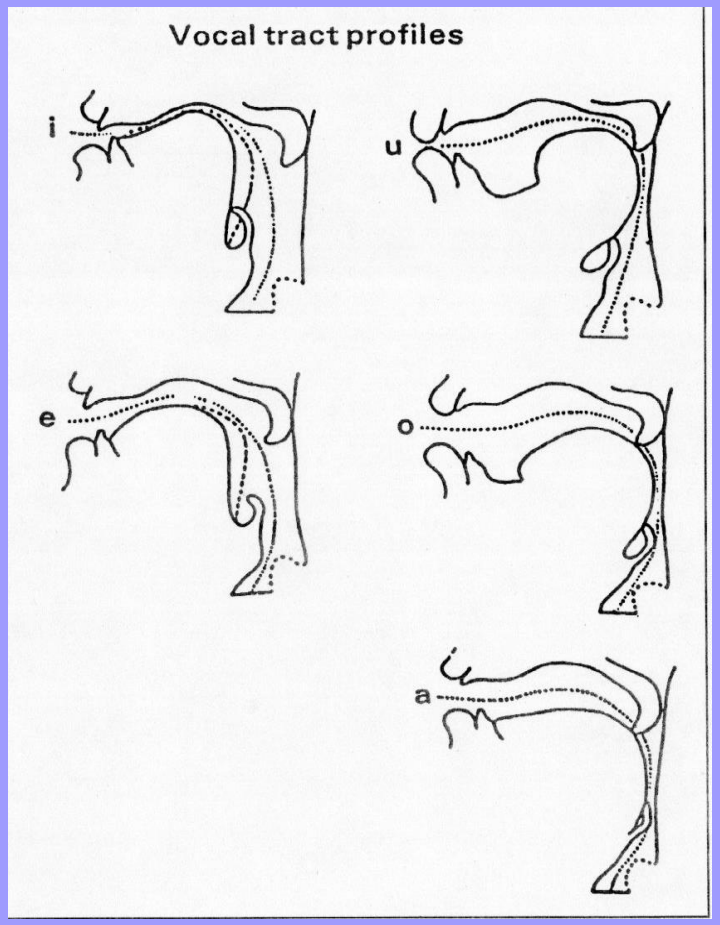
Achieving Vocal Tract Resonance

1. The more open the Oro (or mouth) cavity, the warmer, and/or darker the resonance properties of the tone will be.

   Thus, inhaling while forming the [u], [o], or [ɑ] vowels will create a darker, richer tone quality. Note diagram



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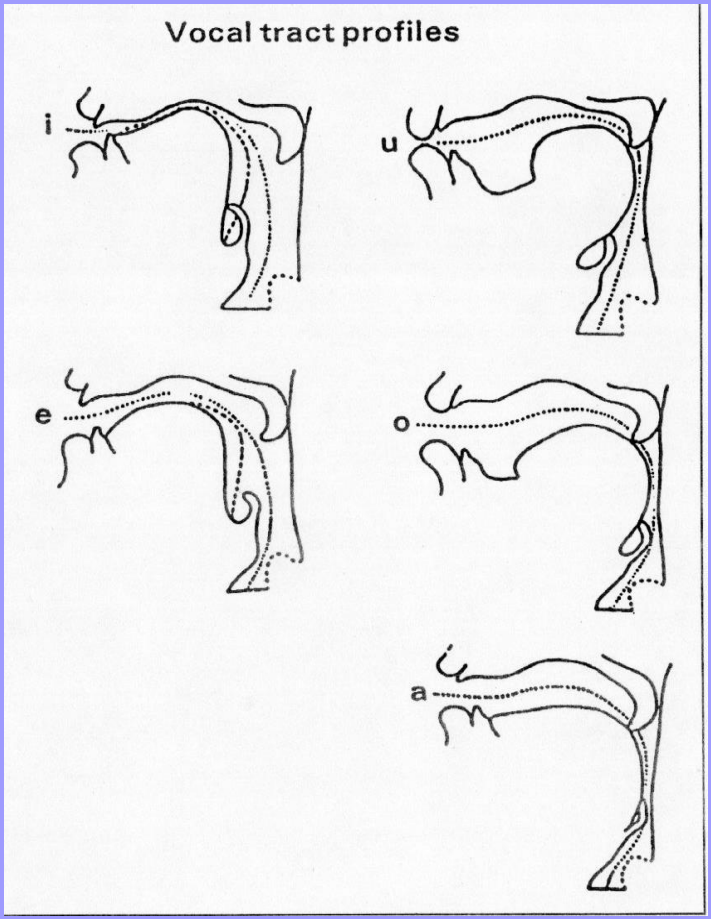
Achieving Vocal Tract Resonance

2. The more open the Pharynx cavity, the more brilliant or bright the resonance properties of the tone will be.

   Thus, inhaling while forming the [i], or [e] vowels will create a brighter tone quality. Note diagram.



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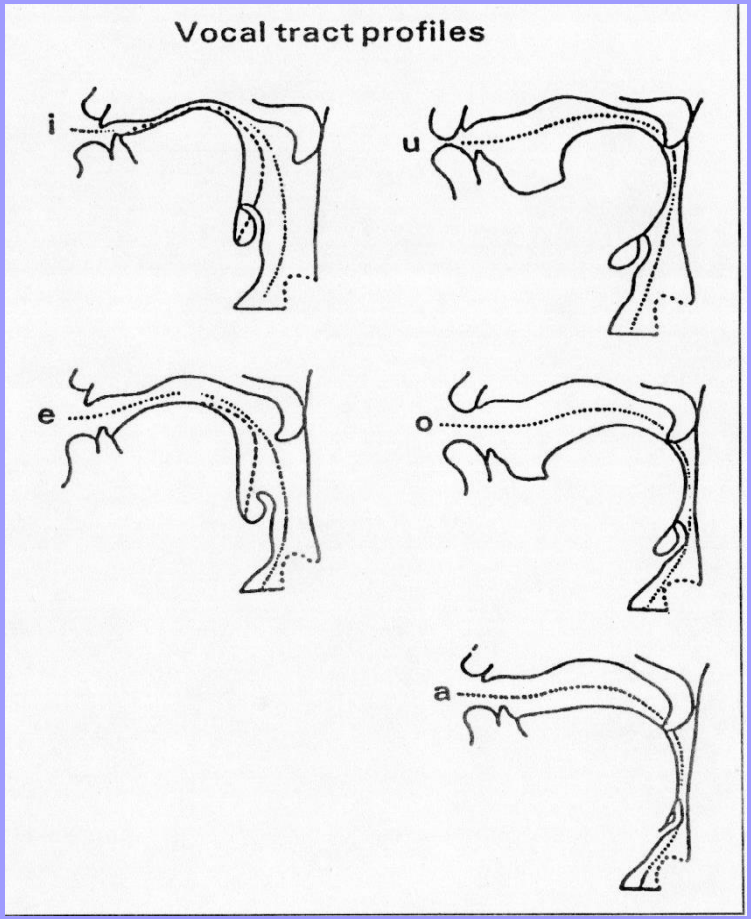
Achieving Vocal Tract Resonance

3. Learning to balance the bright ([i] & [e]) and dark ([u], [o] & [ɑ]) vowel spaces/resonance areas through the use of a combination of changes in the vocal tract will produce a well-balanced tone quality - known in singing as

Chiaro-Scuro (Light-Dark) Quality



The Voice and Wind Instruments

Other Known Studies of this type

Wind Instrument Tone Depends Upon the Glottic Aperture

Susumu Mukai, M.D., Soichi Menegishi, chikako Mukai, M.D. - Yamato, Japan

Study: 72 Beginners to Experts (average age 30) were observed, through the use of fiberoptic laryngoscope, during the playing of their instruments (flute, recorder, shakuhachi, clarinet, oboe, saxophone, bassoon, trumpet, trombone, tuba, horn, and harmonica) in order to observe the adduction of the vocal folds during the production of tone.

Outcome: **The larynx regulates airflow using information from laryngo-lip-auditory feedback.**

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Other Known Studies of This Type

The Dynamics of Breathing

A Discussion with Arnold Jacobs and David Cugell, M.D.

Study: Discussion regarding the use of the air stream in the production of tone in wind players. It should be noted that Arnold Jacobs was principal tubist with the Chicago Symphony Orchestra, and David Cugell, M.D. is Bazley Professor of Pulmonary Diseases at the Northwestern University Medical School in Chicago.

Outcome: Jacobs believes that the wind player must "get out of the way and allow the body to function for you."

The Voice and Wind Instruments

Other Known Studies of This Type

A Comprehensive Overview of Articulation Possibilities

Karl S. Barton

Study: Discussion regarding the vowel, voiced, and unvoiced consonants in relationship to the initial attack of tone on the flute. Also, discusses the psychological process of articulation as related to the anatomical structure and function of the vocal tract. Karl Barton, D.M., Florida State University, taught Flute at Thomas College in Thomasville, GA at the time of the printing of the article in 1996.

Outcome: Initiation of tone in the flutist must go beyond the generally acknowledged conventional methods.

The Voice and Wind Instruments

Initial findings **support the hypothesis** that the application of vocal tract resonance enhances the tone quality and timbre in, woodwind and brass players.

We worked with student musicians on the campus of Saint Xavier University and in the surrounding community as well as with sixty Boston College Instrumental Ensemble members and have found that the study of vocal resonance production, even in the short term, does indeed enhance the instrumental tone of wind and brass players.

We greatly appreciate the support of the Center for Educational Practice, the administration, faculty, and students of Saint Xavier University in our continuing research!

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