Choral Formant
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1. Resonance

*Resonance is the intensification and enriching of a musical tone by supplementary vibration*

- Child on a swing
  - Person pushing = energy input
  - Energy input synchronized with action of swinging child = RESONANT SYSTEM

- Human Voice – Free Resonance
  - Sound source = vibrating vocal folds
  - Energy input = breath

- As sound passes through the vocal tract, it is amplified due to the pattern of compressions and rarefactions (diminution of density) timed with the input of the energy source

2. Formants

a. Source/Filter Theory

- Source = Sound generated by the vibrating vocal folds
- Filter = Vocal Tract
  - “Most of the tuning of the resonator is brought about by the altering of its shape by the tongue, lips, jaw, soft palate, elevation of the larynx up and down, and the narrowing or widening the side walls of the throat just above the larynx.”—

CHART - Graphic equalizer

- Adjustments of the vocal tract reinforce certain partials of the fundamental impact alignment of partials to potential formants
- A formant is simply a resonance of the vocal tract, it is sound potential

b. Vowel Modification

- Different vowels will work for varying voice types
  - [u] and [o] tend to lower the larynx
  - [i] encourages more firm closure
  - [y] may work to establish both (keep the ring in the sound)

- The Vowel Chart
  - “The concepts of resonance, space, and vowel modification, in their most simple forms, are taught by an awareness of the vowel chart. Thinking about how vowels are formed monitors attention to pure vowels and how
to modify the vowel, or not modify. The singer's awareness and ownership of this chart can help them to make informed decisions about how to more easily sing a certain note or passage of the music. Selecting music that helps to build the pure vowels and allows the singers to have success in building a vocal technique is also crucial in this development.”

- The first two formants (F1 and F2) are necessary to produce an identifiable vowel sound.

- Analyzer Pro

- Six Formant Rules:
  1. A constriction in the front of the vocal tract lowers F1 and raises F2
  2. A constriction in the back of the vocal tract raises F1 and lowers F2
  3. All formant frequencies lower uniformly when the vocal tract is lengthened
  4. All formant frequencies rise uniformly when the vocal tract is shortened
  5. All formant frequencies lower uniformly with lip rounding and rise with lip spreading
  6. An increased mouth opening raises F1

  “For resonant singing the fundamental frequency and the vowel resonances must be in harmonic relation to each other so that sympathetic vibration can occur.”

  A "ringing, keen and powerfully penetrating" quality of tone implies "many and powerful upper partials, and the stronger they are, of course the more marked are the differences of the vowels which their own differences condition.”

  — Hermann Helmholtz

c. Singer’s Formant

  Clustering of formants 3-5

  “Superformant” – occurring on average around 3000 Hz
  Allows singer to be heard over an orchestra
  Learning to achieve this requires advanced study
  Exercises that encourage this will place the larynx low and create firm glottal closure

3. Resonance in the Voice Studio

a. Chiaroscurro

  “An extensive terminology exists, in several languages, for the description of variations of vocal timbre found within the several [national] schools. One such term is chiaroscurro, which literally means the bright/dark tone, and which designates that basic timbre of the singing voice in which the laryngeal source and the resonating system appear to interact in such a way as to present a spectrum of harmonics perceived by the conditioned listener as that balanced vocal quality to be desired - the quality the singer calls ‘resonant.’”

• Strength of upper partials related to glottal closure
• Bright vs. dark quality related to laryngeal posture
• Many aesthetic choices a conductor must make regarding tone

b. Frontal Resonance, the Mask, and Nasality
   Remembered sensation
   Resonant tone often said to include sensation in the
   “mask” or front of the head/face
   Does resonance actually occur in these areas?
   Scientific research shows that air is not actually traveling through
   the nasopharynx. Sensation in the nose, face, and head is still
   often felt by many singers due to the vast amount of acoustical
   energy being produced in the vocal tract, although not by all
   “There are teachers of singing who insist on distinguishing between 'nasal
   resonance' and nasality. They are convinced that when the harmonic
   spectrum is in good balance-having strong first and third formants
   (chiaroscuro timbre)- it is because some degree of nasality is always
   present. Most probably this perception on the part of singers is due not to
   nasality but to frontal vibratory sensations that are conveyed from the
   buccopharyngeal resonator by means of the hard palate and by the bony
   structures of the head. Such sympathetic vibration registers subjectively
   as 'mask brilliance' associated with 'forward placement' concepts.”
   Miller, Richard. "The Velopharyngeal (Palatopharyngeal) Port During

   “Suggesting to a student singer that when his or her voice is well produced
   he or she may feel resonance in the vicinity of the nasal passages is very
different from telling him or her to actually let the sound go through the
   nose.”
   Austin, Stephen F. "Movement of the Velum During Speech and Singing

c. Nasopharyngeal port
   The discovery of the sensation of acoustical energy in the front parts of the
   head can be a positive step toward finding efficient resonance.
   “Nasals tend to have acoustic strength in regions of the harmonic spectrum
   that are similar in distribution to the harmonic-partial distribution
   (overtones) found in the well-balanced spectrum of the singing voice.”
   Miller, Richard. "The Velopharyngeal (Palatopharyngeal) Port During

d. Voicing a choir using Formant Tuning

e. Seating a choir using Formant Tuning

4. Concept of Choral Unification
   Each of the singers must be encouraged to produce their own most vibrant, colorful, and
   beautiful sound. Singers take that sound and place it within the resonance of the group
"With young singers I have always tried to encourage them to place their voices forward and to achieve volume through focus rather than sheer noise. The concept of sending the voice forward through the sleeve of the sound is one to which I refer constantly." — Simon Carrington

a. A Place to Begin
   • Minimize overtones
     “It is the fundamental pitch minus the high, strident overtones of a poorly produced tone that will produce a beautiful blend.”
     Jones, Arnold. "Choral Tone Quality and Blend," *The School Musician Director and Teacher* 49, no. 2 (1977): 64-65
   • Soft singing
     “Interestingly, these acoustical changes (including a reduction in the proportionate strength of the upper partials) were the ones most often employed by the singers in this study as they attempted to blend with the ensemble.”
   • Vowel matching

b. Problems
   • Studies limited to certain aesthetic ideals
   • Getting rid of upper partials
     “In an effort to promote the elusive ‘blend’, directors sometimes subscribe to reducing their singers’ sound to the level of the least resonant voice in the group.”
     Jones, Arnold. "Choral Tone Quality and Blend," *The School Musician Director and Teacher* 49, no. 2 (1977): 64-65
     “There is no reason to have a Stradivarius sound like a cigar-box violin so that both will sound the same. Instead of removing the resonance from voices that have it, one should try to establish the formant in all voices of the choir in which it is lacking.”

c. Vowel matching
   Vowel modification may be helpful in finding unity of pitch. Vowel matching without regard to individual production can be problematic
   “Most members of the choral profession have believed that the most important factor in the achievement of choral blend is unification of vowel sounds. According to what has been learned in recent years about the acoustics of vowels, however, uniform production by all members of a vocal ensemble for any given vowel is not always desirable. Specifically, the ideal of uniform vowel production for a group of singers often conflicts with the principles of vowel modification and optimum resonance.”
5. Collective Resonance – Choral Blend Concepts of Today
   a. Collective Resonance
      Efficiency of vocal production
      Better intonation
      Improved vocal technique and health of singers
      Blend based on the collective finding of overtones
      Trend in more international choirs, moving toward American

      "The rich sound these women produce resonates as if energized by the
universe itself."
      -Review of Kitka for the San Francisco Bay Times

      "There are dynamic extremes, too: extraordinary chords hit with a force
that seemed doubly overwhelming Thursday because of the palpably dead-
on accuracy of the tuning. The volume was almost physically
intimidating. It seemed impossible that so much sound could come out of
such a small group of people and yet not sound in the least like shouting."
      -Review of Rias Kammerchor for the San Francisco Classical Voice

   b. Dynamic Capabilities
      Large amateur choir vs. small professional ensemble
      “The principles governing amplitude/volume state that the greater the
number of singers, the smaller the dynamic increase.”
      Formant Tuning/Singer’s Formant

   c. Teaching Collective Resonance Concepts in the Rehearsal
      When defining the core of the sound, resonance is being addressed. Visualized in
concentric circles. The inner circle defines the core and the outer circle defines
the space. Some singers will need to begin by finding the space of the sound
(pharyngeal, oral) and others will need to define the center circle, frontal
resonance, or “ring” in the tone. As a conductor, you listen for the overall initial
sound. If the sound is spread, you must work to expand the space vertically. If
the sound is swallowed, you must work to define the core resonance while
maintaining space.

      As a singer or ensemble develops, the teacher works to further define the clarity
of these concepts. The strong area of acoustical energy (in the center of the
circles) are formants, and possibly the Singer's Formant. Listen for this energy or
ease. A Choral Formant, or perhaps an area of “supercharged” acoustical energy,
allows an ensemble to sing a wide divisi or a cantabile line with great ease. It also
allows for the color of the vowel or language to be heard.

      When the Choral Formant is engaged, the overtone series is strengthened and the
harmony is clarified.”

      Example: Weelkes: When David Heard
- Modeling
  Efficient way to demonstrate desired sound
  Encourage singers to follow the concept
  Effects can be positive or negative

- Resonance and Intonation
  Strong vocal presence creates overtones that are easier to hear and align
  Exercises that encourage open fifths and octaves
  Beats
  Tuning fork vs. piano

- Laryngeal level - [i]- highest closed quotient
  Exercises
  1. Begin building resonance in the mid range. Use “ming”, French “bain”, “yeah”, in a descending pattern to define nasal and/or frontal resonance. Don’t be afraid of “ugly” sounds, but be very cautious or high larynx and ease of production.
  2. Rehearse without text on a vowel that will encourage successful formant tuning. Use closed vowels to build strong resonance and clear pitch: [i] or [u]
     “The vowel /i/ aids this movement of the organ (glottal closure). The Italian /i/ being the most ringing vowel, the same (glottal closure) which gives it its brilliancy may be employed to give brilliancy to the other vowels.” 14 – Manuel Garcia
  3. Rehearse on the five primary vowels, but use [a] with caution
  4. Have an awareness of the ease of the sound. Don’t stay on a single vowel too long. Remember the teeter totter.

4. Vibrato
  Debates about the use of vibrato
  a. Theories
     "the vibrato corresponds to pulsations in the neural control signals going to the various laryngeal muscles, [specifically] those associated both with fundamental frequency control and with closing the glottis. The cause of the neurological pulsations is uncertain, although the tremor in the laryngeal musculature is similar to the tremor or pulsating contraction of other muscles that occurs after an extended period of constant contraction.” 23

     the physiological control of vocal vibrato as a combination of the laryngeal and respiratory mechanism, with the laryngeal musculature predominating 24

     "The physiological and neurological origins of the vocal vibrato are not yet fully understood.” 25

b. Changing Views

Color
Device of expression
Changing perception of rate and pitch fluctuation
Slower and wider now than in the past. May be due to preference for darker tone quality on the operatic stage. 26


“Vibrato, being an art and stage question, is not easily defined scientifically and, therefore, there are no common criteria for what is normal or abnormal. Different singing styles usually have their own 'standards' for the range of the vibrato rate, frequency (pitch), intensity (volume), and color (timbre).” 27


6. The Importance of Listening
Critical for choral ensembles
Producing a resonant tone without listening will not create blend
As the choir learns to listen and establish a collective resonance, unification will be achieved
Choirs that employ resonance in their singing tend to produce tone with better intonation, blend, dynamic and expressive capabilities.

Ensemble members should be encouraged to sing with their own best sound while maintaining an awareness of the sound around them

Pedagogical tools used in the voice studio can be used in the choral rehearsal
With richer resonance creating an increased color palate, a choir can approach choral music of almost any era and style with greater confidence, and their performance will have the opportunity to make a great impact on the soul of the listener and ensemble member.