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Achieving choral blend through vowel uniformity

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ACHIEVING CHORAL BLEND THROUGH VOWEL UNIFORMITY

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ABSTRACT

ACHIEVING CHORAL BLEND THROUGH VOWEL UNIFORMITY

by Granville Murl Oldham, Jr.

This project addresses the topic, achieving choral blend through vowel uniformity among choral singers. It proposes that the unification of vowels among choral singers is the most significant element in the acquisition of choral blend.

Research reveals that pure resonant vowels are produced in and achieved through the use of the vocal tract and that choral singing can enhance fundamental frequencies as a result of blending but may decrease the partial and the overall individual intensity of the tone.

TABLE OF CONTENTS

Title page i
Copyright page ii
Signature page iii
UMI abstract iv
Table of Contents v
Introduction vi

The Vowel

Part I Physical Production of the Vowel 1-6

1.1 Pharynx
1.2 Mouth
1.3 Tongue

Part II The Vowel and Resonance 7-10

Part III Five Cardinal Vowels 11-15

3.1 [a]
3.2 [o]
3.3 [e]
3.4 [i]
3.5 [u]
3.6 Blend Study

Part IV High Pitch Vowels and Endemic Spreading 16

Conclusion 17-18

Bibliography 19-20

Appendix A: Vowel Modification Chart 21
Appendix B: Vowel Modification Diagram 22
Appendix C: Additional Reference Material List 23-24

Introduction

The conscientious choral director is constantly striving to achieve unification of the many individual sounds his choral singers produce. This process of achieving "blend" is a major objective for the director. Among choral "experts" there are several theories on how to achieve this basic goal. Two prominent approaches require singers to sing with a straight tone or to sing softer, the latter usually resulting in a tone with considerably less resonance. These methodologies have caused controversy among voice instructors, singers, and choral directors. However, there is a vocal element that the choral director can address in the choral environment that enhances ensemble singing and should not interfere with any particular voice student's private instruction.

A correctly produced vowel, formed in the region of the pharynx/vocal tract, can be the significant element addressed in rehearsals that may lead to choral blend. When singers focus on vowels and their correct formations within the vocal tract, the individual singer can enhance not only "choral singing" but basic good singing.

To successfully implement vowel instruction the choral conductor must be knowledgeable concerning the physical production of the vowel, how the vowel resonates, the formation of the five cardinal vowels and the endemic spreading of vowels in the highest pitch range of certain voice types.

PART ONE:
The Vowel

The Physical Production of the Vowel

Knowledge and application of the physical process involved in producing a tone is the solution to the choral ensemble's need to produce a choral blend. "While tone is the basis for all singing, we produce tone through the medium of the vowel."[1] The ability of a group of singers to collectively produce a vowel that has quality that can express various affects, e.g. sorrow, joy... is undeniably necessary. This ability can be most readily acquired by a thorough understanding of the physical production of musical tone.[2] When the choral conductor and singers become aware of the fundamentals of voice production limitless timbres can be experienced by the ensemble.

The physical production of the vowel involves primarily the pharynx and to a lesser degree, the mouth and the tongue. Observance of the pharynx reveals that it is divided into three separate cavities: 1) the laryngeal pharynx (the top of the throat); 2) the oral pharynx (the back of the mouth); 3) the nasal pharynx (the cavity behind the soft palate).

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[1] Van A. Christy, Expressive Singing, 3rd ed. (Dubuque, Iowa: W.C. Brown, 1974-1975), 64.

[2] Amy D. Clivington, "Choral Tone in a Children's Choir: Its Description and Development," The Choral Journal 29 (March 1989): 38.

The laryngeal pharynx is a rather long extended tube that starts at the larynx and ends at the opening of the mouth. It has the ability to "elongate, shorten, curve, break into a right angle, and maintain various other forms."[3] As many configurations as the laryngeal cavity can create determines the number of vowel/timbre possibilities.

There are differing opinions and some misunderstanding regarding the relaxing of the throat. Douglas clarifies how the phonation process works in the throat.

> ...When the walls of the laryngeal pharynx are at rest they are in a relatively closed posture. Thus the constrictor muscles will be in a relatively high state of tone. The application of the conscious nerve impulse for the initiation of the act of phonation will then tend to increase the reflex tone in these constrictor muscles. The throat will then be held constricted. The idea of relaxing the throat and at the same time opening it, is a direct contradiction in terms, since the only way in which it can be held open during the act of phonation is by tensing the extensor or opening muscles, thus inhibiting the action of the antagonistic constrictor muscles. It is physiologically impossible for the pharyngeal muscles to be relaxed during the act of phonation. There must be tension on either the extensor or the constrictor group.[4]

The oral pharynx (oropharynx) and the nasal pharynx (nasopharynx) operate in conjunction with the laryngeal pharynx (laryngopharynx). "The oropharynx is primarily employed for resonance of tones."[5] Klein emphasizes that for both male and female voices, "tones above one octave above middle c (c^2) require more and more

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[3] Manuel Garcia, A Complete Treatise on the Art of Singing, trans. Donald V. Paschke (New York: DaCapo Press, 1984): 28.

[4] Douglas Stanley, The Science of Voice (New York: C. Fischer, 1929), 62.

[5] Joseph J. Klein and Ole A. Schjeide, Singing Technique: How to Avoid Trcuble (California: National Music Publishers, 1981), 43.

nasopharyngeal or nasal resonance." [6] These two cavities will be discussed in more depth under Part Two.

Vocal pedagogues and other voice authorities do not agree (as to) whether the mouth should be employed to form the vowels. Some specialists believe that vowels should be formed where they have their place of origin, the pharynx.[7] Stanley and Klein agree, and state emphatically that the mouth receives far too much attention as a resonating chamber and it should never be "set" for the vowel.[8] The mouth cavity is important but the pharyngeal cavity greatly influences the variety of timbres available for any particular vowel.[9] However, this does not change the fact that there is an agreement between the vowel and a mouth position.[10]

Magnetic Resonance Imaging Technology (MRIT), a science which allows photographs to be taken in the laryngopharynx area during singing, reveals the need for the mouth to work in conjunction with the tongue. Since the vocal tract is the place of origin of the vowel, those parts of the mouth that help shape the vocal tract need to

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[6] Klein and Schjeide, 44.

[7] Klein and Schjeide, 46.

[8] Stanley, 27.

[9] Ann Alderson, "Positioning the Velum," Journal of Research in Singing and Applied vocal Pedagogy 26 (June 1993): 26.

[10] Cornelius Reid, "The Nature of Natural Singing," Journal of Research in Singing and Applied Vocal Pedagogy 11 (June 1988): 13.

function coordinately. Some of the parts of the mouth that shape the vocal tract include the lips, tongue and jaw, hard and soft palate, velum, and the cheeks which line the sides.

The tongue is a most significant member of the physical mechanism involved in producing the vowel. The tongue, a large muscle attached to the jaw and suspended from the hard palate by the muscles of the anterior and posterior pillars, needs to retain a sense of freedom.[11] Henderson believes that the misuse of the tongue can affect the soft and hard palate, base of the skull, pharynx, larynx, and swallowing tube and if improperly aligned, can "constrict the tone and make optimum resonance of the voice impossible."[12] Klein agrees that the tongue, if incorrectly positioned, can actually close the pharynx, thereby reducing the "reinforcement of a vibrating column" and reduce the quality and formation of a pure vowel.[13] The tongue must be in the correct position to create the space/cavity needed to form the correct vowel and achieve maximum resonance.

What is the correct position of the tongue? The two approaches most taught include the 1) concave position and the 2) free position. The concave position approach advocates the flattening of the tongue to the point of creating a concave position, which creates a larger space in the mouth, allowing the voice to have more resonance. Titta

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[11] Lara Browning Henderson, How to Train Singers, 2nd ed. (New York: Parker Publishing, 1991), 18.

[12] Henderson, 18.

[13] Klein and Schjeide, 48.

Ruffo, a world famous baritone, used this method and believed the mediocre singer could achieve remarkable results by positioning the tongue in a concave, cradle like position. Enrico Caruso, the world famous tenor, also believed that the tongue should be relaxed on the floor of the mouth and in a concave position to create a larger cavity in the mouth.[14] The free position approach is in direct apposition to the concaving ideology. Klein and Stanley are proponents of this approach and state "that a grooved (concaved) tongue closes the pharynx and cause the mylohyoid to pull the hyoid bone below chin level."[15] Although both approaches have been executed by singers who have gone on to achieve world-class status in singing, Reid condones the method that would embrace the "concept of 'natural' as it pertains to singing and vocal training that includes procedures which restore and/or preserve organic health."[16]

Regardless of which approach is chosen, it is apparent that the tongue is invaluable in producing vowels and affecting resonance. The tongue must work to create a changing vocal tract which "imparts to the tones which pass through it the variable characteristics of the timbres."[17]

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[14] Mario P. Marafioti, Caruso's Method of Voice Production: The Scientific Culture of the Voice (New York 1981), 112.

[15] Klein and Schjeide, 23.

[16] Cornelius L. Reid, "The Nature of Resonance," The Journal of Research in Singing and Applied Vocal Pedagogy 14 (Dec. 1990): 3.

[17] Garcia, 28.

Producing a vowel requires a multitude of physiological parts to function coordinately. The laryngeal pharynx must be the central cavity where the vowel is produced. The oropharynx and the nasopharynx must be utilized to resonate that which was produced in the laryngeal pharynx. The mouth works tangentially with the pharynx and allows itself to become shaped into a megaphone, thusly increasing the amplitude. Finally, the tongue is the most flexible mechanism that allows the laryngeal pharynx to be malleable. Understanding these basic functions is one portion of knowledge needed to acquire blend through a pure vowel.

PART TWO
The Vowel and Resonance

Resonance literally means to sound again. It occurs when a cavity vibrates sympathetically with the vibrations of the vocal cords.[18] The resonating cavity is obviously a non-primary vibrator and needs the energy from another source. Resonance, therefore, is not created, made, forced, or produced but is "the product of a functional condition."[19]

Sympathetic resonance is the type that concerns the singer. The vocal cavity augments the harmonics (overtones or partials). This relationship of the fundamental frequency to certain bands of harmonics is what define the vowel sounds/voice quality. "It is generally agreed that voice quality in singing is mainly characterized by the two or three formants, accumulation of harmonies in a region of great energy, whose frequencies are just above the vowel formants.[20]

There are two conditions of singing voice quality, 1) the source and 2) the resonance. The source: When producing vowels the singing voice must produce a richer set of overtones than the speaking voice. Houston's article, "Attainment of the Intensity

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18 D.A. Clippinger, The Clippinger Class-Method of Voice Culture (Pennsylvania: Theodore Presser, 1932), 23.

19 Reid, "The Nature of Natural Singing," 1.

20 Pierre Delattre, Contributions of Voice Research to Singing: Vowel Color and Voice Quality (Texas: College-Hill Press, 1980), 377.

Requirement" reveals:

> The oscilloscope image of this richer tone is a narrower spike wave; the spectrographic image, a higher pile of harmonics decreasing more slowly in intensity from low to high. Physiologically, this richer tone is produced by a longer closure and shorter opening of the glottis in each cycle, thanks to stronger musculation and a wider contact of the vocal cords resisting to stronger breath pressure.[21]

<u>The resonance:</u> In producing sung vowels, the tongue and lip strictures must have more space given them. This space must be significantly more than the spoken vowels, otherwise the overtones needed to characterize a particular pitch and quality cannot flow through the pharyngeal cavity or vocal tract. The production of this space is achieved by the changing contour of the tongue and by dropping the jaw.

Listed below are the vowel frequencies of specific vowels as produced by average voices that had no vocal training. I.B. Crandall in "The Bell System Technical Journal"[22] of January 1927 states:

ah as in father	825 and 1202	vibrations per second
aw as in fort	602 and 955	vibrations per second
ay as in mate	540 and 2108	vibrations per second
oo as in you	407 and 793	vibrations per second
e as in meet	381 and 2435	vibrations per second

Pierre Delattre states, that, for a man, the frequency of voice quality formants lie between 2400 cycles per second to 4000 cycles per second.[23] Some modern choral conductors

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[21] Delattre, 378.

[22] Stanley, 25-26.

[23] Delattre, 377.

refer to this as "ping 2400." "This research agrees with spectrograms we have made and with the 28 pages of spectrograms found in 'Visible Speech' (New York, Van Nostrand, 1947, pp. 376-404), sampling the voices of known singers from Caruso to Bing Crosby."[24]

Different vowels have various resonance frequencies. The varying frequencies are a by-product of the fundamental frequency (Fo) of the voice. Fo is the "physical correlate of vocal pitch."[25] However, vowel timbres are characterized by formant frequency. It is important to realize the character of the basic sounds and how they relate to the resonating cavities.

The [u] = oo, [a] = ah, and [i] = ee have varying resonance frequencies. Of the five cardinal vowels the [u] is "concentrated in the lower part of the treble clef and is difficult to 'vitalize' in the lower part of the treble clef because of its weak second formant and the position of its first formant."[26] Unlike the [u], the [a] vowel's first formant is well above high c (c^3), and tends to have brilliance and clarity and is commonly preferred by singers and teachers. Contrary to both these vowels the [i] vowel

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[24] Delattre, 377.

[25] R.J. Baken and Robert F. Orlikoff, "The Effect of Articulation on Fundamental Frequency in Singers and Speakers," Journal of Voice 1 (1987): 68.

[26] Reid, "The Nature of Resonance," 3.

is characterized by the lowest and highest of all formant frequencies and infusion of clarity and brilliance is harder to achieve which causes the vowel to be "difficult to resonate without constricting the throat."[27] The various resonance frequencies of vowels give specific characteristics germane to that vowel.

The choral conductor can use this information in various ways. He can resolve faulty tone production of the strident [i] vowel by having his singers resonate in a cavity where the [i] vowel vibrations are introduced, e.g. nasal pharyngeal resonance. The choral conductor can also examine the slight altering of the [u] vowel's first formant by modifying the vowel slightly. Magnetic Resonance Imaging Technology emphasizes that the singer can control the parts of singing because the movement of the various parts are guided by: desired sound, feel, mental imagery, experimentation and avoiding tension. The choral director should allow this information to assist him and his singers in a natural achievement of choral blend. Edmund J. Mayer writes:

> Nature is the great teacher and not man. Man, when he bases his teaching upon his own ideas of voice, is artificial; hence, artificiality. Witness the many ridiculous things singers are now taught to do. With such the effort is to *make* the voice, to compel it, instead of *allow* it. The voice is in nature, and by a study of nature and nature's laws the voice is allowed to develop; is allowed or induced to reveal itself instead of being made, compelled or forced.[28]

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27 Reid, "The Nature of Resonance," 3.

28 Reid, "The Nature of Natural Singing," 6.

PART THREE
The Five Cardinal Vowels

Five primary vowel sounds exist from which all others are formed. These five cardinal Italian vowels are: [a] = ah, [o] = oh, [e] =ay, [i] = ee, and [u] = oo.[29] Although these five cardinal vowels are represented in the English language there are as many as fifty vowel sounds, produced with slight alterations of the tongue, each of which can be absolutely pure.[30] The formation of these vowels, regarding the jaw, velum and tongue, will be discussed. In addition, a study comparing thirty sopranos and the acoustical observation of individual voices in choral blend will be reviewed.

[a]

The [a] vowel, when analyzed on an acoustical vowel chart, is considered an open vowel.[31] Amy Clivington cautions that the jaw should not be forced down but should drop gently and retract slightly.[32] Dr. Marafioti confirms that the mouth should be opened the widest for this vowel and emphasizes a spontaneous unforced movement similar to the "opening of the mouth in eating."[33] The [a] vowel generally has a naturally high arched velum (soft palate). The tongue is generally relaxed but some

[29] Christy, 44.

[30] Christy, 44.

[31] Alderson, 28.

[32] Clivington, 40.

[33] Marafioti, 232.

authorities like Dr. Klein believe there is a need to keep the back of the tongue lifted so as to increase the space in the pharyngeal cavity. He believes the back of the tongue needs to be in an [e] position for the [a] for maximum resonance.[34]

[o]

There is a similarity between the [a] and the [o] vowels. The [o] vowel requires the same basic production as the [a] vowel but the lips play a decisive part by "converging into a rounded form," almost closing the mouth.[35] There needs to be a sense of space when forming this vowel. The soft palate is automatically in a high, raised position when producing the [o] vowel.[36] The tongue remains relaxed but raised high enough to increase the space in the oropharyngeal cavity.

[e]

The closed vowel [e] evolves from the [a] vowel. It requires that the position inside the mouth be half as large as the [a] vowel but that the jaw be equally as relaxed.[37] This vowel must remain round and full. The velum is naturally lower in position for the [e] vowel than for the [a] vowel. If the [e] vowel becomes too spread or bright the singer can learn to create more pharyngeal space by training the velum to

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[34] Klein and Schjeide, 52.

[35] Marafioti, 235.

[36] Alderson, 29.

[37] Marafioti, 233.

respond to the effect of a more open vowel.[38] The tongue is slightly raised during phonation of this vowel.

[i]

The [i] vowel requires the smallest space in the oral cavity of all the vowels. The lower and upper jaw are as close in proximity as possible but without tension. "There should be the same feeling of depth and the same amount of space in the back of the mouth" as the [u] vowel except a few teeth are exposed.[39] Alderson states that the soft palate is in a lower position than the [a] or [o] vowels; however, to avoid the overly bright [i] the velum may be raised by producing a more open vowel like [y]. The tongue is raised upward with just a minute amount of tension.[40]

[u]

The [u] is akin to the [o]. The [u] requires that the lips protrude forward as if preparing to whistle but should be done, however, without squeezing them.[41] There should be a feeling of depth in the mouth when producing this vowel.[42] The velum tends to be in a high position for the [a], [o] and [u]; however, if a hooty or swallowed

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38 Alderson, 25.

39 Harry Robert Wilson, Artistic Choral Singing (New York: G. Schirmer, 1959), 180.

40 Marafioti, 234.

41 Marafioti, 236.

42 Wilson, 180.

timbre is achieved the singer is encouraged to add the color of an open vowel by lowering the velum.[43] The back of the tongue would be relaxed but relatively high. Dr. Marafioti states that "care must be taken not to retract the tongue backward in prolonging the sound of the [u]."[44]

Allen Goodwin conducted a study which investigated choral blending and solo singing among thirty sopranos. The thirty sopranos sang three different pitches that encompassed different vocal registers; c^1(261 Hz), a^1 (440 Hz) and f^2(698 Hz).[45] They proceeded by producing sustained sounds of the vowels [a], [o], [e], [i], and [u] at mezzo forte in a soloistic manner. Next, they attempted choral blend with a pre-recorded tape of soprano voices. This was the basic scope of the study.

The results of Goodwin's investigation are evident. The blended tones first formants were stronger than the solo singing tones but on partials above first formant were considerably fewer and weaker than the solo singing tones. Also the volume of the tones produced in the blending situation "had proportionately lower levels of intensity than were present in the solo singing."[46] However, the formant frequencies were

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43 Alderson, 29.

44 Marafioti, 236.

45 Allen W. Goodwin, "An Acoustical Study of Individual Voices in Choral Blend," Journal of Research in Music Education 28, (1980): 29.

46 Goodwin, 30.

synonymous for both solo singing and choral blending situations. In the solo singing paradigm the dynamic level was consistently high. This was in contrast to the overall reduced intensity in the dynamic levels from the blending situation. Goodwin summarizes his findings:

> In contrast to solo singing, those sounds produced in blend tended to have slightly stronger fundamental frequencies in combination with weaker second and third formants. The results may explain in part how certain commonly used choral techniques take advantage of particular traits of the aural perception mechanism to produce ensemble blend.[47]

Goodwin notes that his findings are consistent with those of Grumn 1960, Vennard 1967; Peterson and Peterson 1948, Fletcher 1941 and Beradе 1976. These various research projects address the choral conductors' use of vowel modifications, dynamics and vocal vibrato as techniques used to achieve choral blend.

Goodwin's research proved that the technique of vowel modification changes the strength of a formant, usually weakening it, rather than changing the formant frequency. Also, singers avoided "sticking out" by decreasing their dynamic level which Scott (1960) found to reduce the upper partials in soprano tones. Lastly, the vibrato was only reduced slightly or not at all when the singers attempted to blend. Because of the characteristics of the individual voices and relative upper partials, suggesting *carte blanche* vibrato modifications may not be advantageous for certain singers.[48]

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[47] Goodwin, 25.

[48] Allen W. Goodwin, "An Acoustical Study of Individual Voices," Journal of Applied Research in Singing 8, no. 1 (Dec. 1989): 25-30.

PART FOUR
High Pitch Vowels and "Endemic Spreading"[49]

Since studies have proven that vowels above the staff (f4/698 Hz) and higher are unintelligible, how does one go about blending unintelligible vowels? Smith and Scott (1992) confirm that isolated vowels above the staff are largely unintelligible; however, there are various ways to improve the intelligibility of the vowel.[50]

The ways to improve the intelligibility of the vowel include raising the larynx, singing the vowel within the context of consonants, and a combination of the two.[51] The raising of the larynx would, however, decrease the length of the pharynx, resulting in constricted voice quality, but singing the vowel within the context of consonants would greatly enhance the intelligibility of the vowel. Reid discusses the need to not overly dramatize the consonants in an attempt to create intelligibility, for the sacrifice of organic production creates yet another vocal problem.[52] Endemic spreading of vowels occurs when there is a wider opening of the mouth for open and closed vowels above the staff; however, lowering the larynx and opening the vowel to an agreed upon vowel is yet another solution. "Lowering the larynx has a significant effect on the energy peaks, or

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[49] Reid, "The Nature of Natural Singing," 13.

[50] Lloyd A. Smith and Brian L. Scott. "Increasing the Intelligibility of Sung Vowels," The Journal of Research in Singing and Applied Pedagogy 15 (June 1992): 17.

[51] Smith and Scott, 17.

[52] Reid, "The Nature of Natural Singing," 13.

formants which are resonated by the vocal tract."[53] Some choral directors even use a vowel modification chart while others merely inform the singers to sing a vowel that has more resonance space at that pitch level (see Appendices A and B). This agrees with Gottfried and Crew (1992) who found that singers altered the shape of their vocal tracts so as to produce phonemically ambiguous, but aesthetically pleasing, vowel sounds.[54] The consonants greatly assisted in the intelligibility of the text.

CONCLUSION

Leon Thurman wrote about his limited exposure to vocal pedagogy. His college education or lack thereof caused him to create problems with his students' voices which ultimately caused him to study vocal production. He writes: "My experience with choirs and conductors nationwide leads me to believe my story is very typical. The training of choral conductors gives very minimal attention to healthy vocal technique and great emphasis to musical performance techniques."[55]

Blend is something almost every conductor pursues with passion. The process by which the goal can easily be fulfilled is through the uniformity of vowels. However, it

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[53] James A. Stark, "Garcia in Perspective: His Traite after 150 Years," The Journal of Research in Singing and Applied Voice Pedagogy 15 (Dec. 1991): 25.

[54] Terry L. Gottfried and Stephen L. Crew, "Intelligibility of Vowels Sung by a Counter Tenor," Journal of Applied Research in Singing 16 (Dec. 1993): 23.

[55] Leon Thurman, "Voices," The Choral Journal (Oct. 1979): 10-11.

is not just enough to demonstrate a vowel. Knowledge of the voice culture and physical mechanisms at work need to be revealed and taught to singers so that each one may develop "his/her" voice. Blend will happen as a result of correct space in the laryngeal pharynx, resonance in the correct chamber(s), appropriate use of the mouth as an amplification system, and the use of the tongue to form the vowels that transmit the timbres that move the audiences.

There are numerous theories and methodologies choral conductors may implement in the choral environment to achieve choral blend. Additional reading materials that discuss these various theories and methodologies are listed in Appendix C. Methods such as decreasing loudness of individuals, physical manipulation of vocal mechanisms to achieve timbre uniformity, and elimination of vibrato all have dramatic repercussions on the individual's voice. However, blend through a uniformity of pure resonant vowels is the most significant element in the acquisition of choral blend. This process would not ask the students to deviate from their vocal instruction and would allow a professional and amiable environment for the student, voice instructor and choral conductor.

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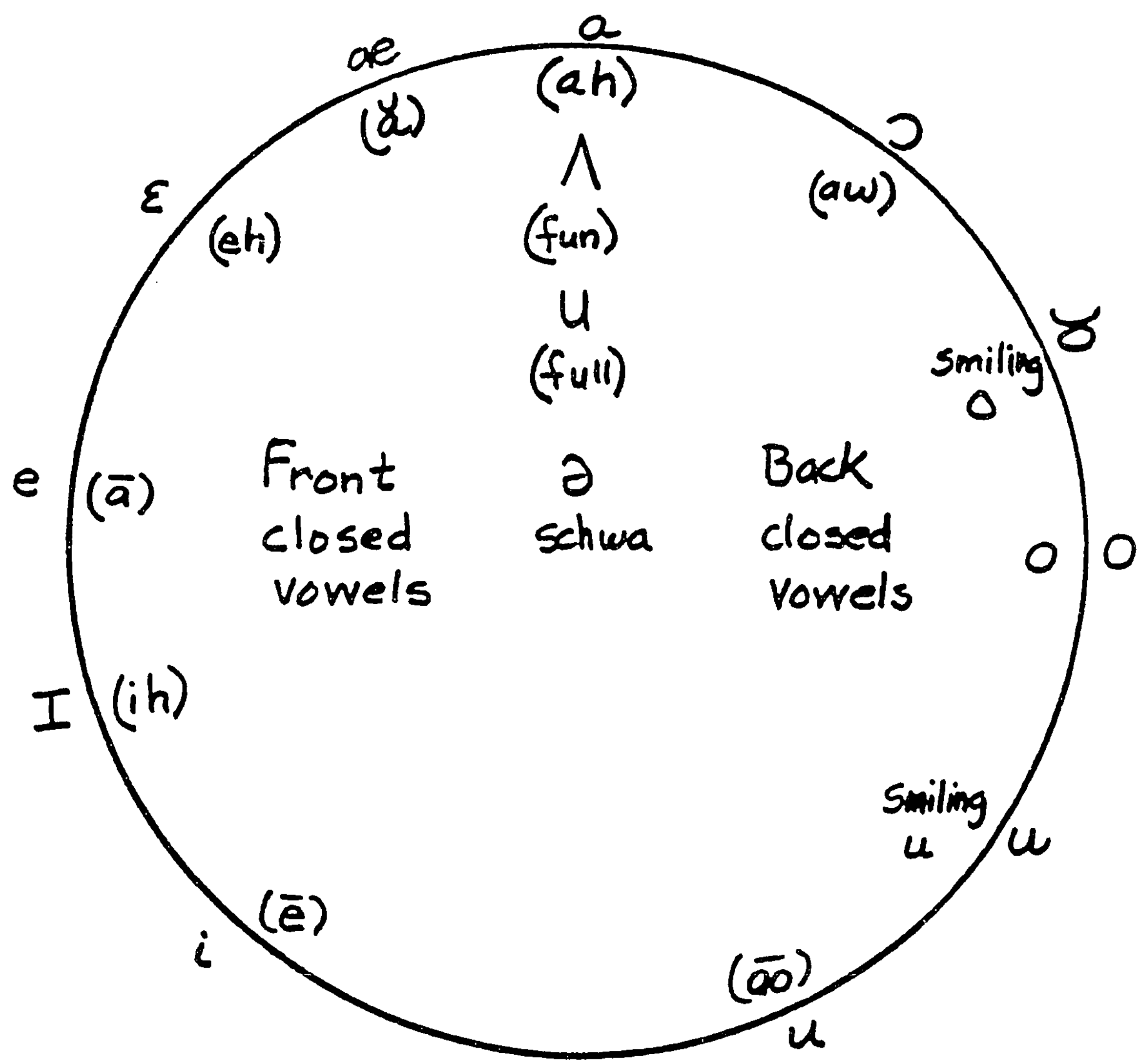
Appendix A
Vowel Modification Chart

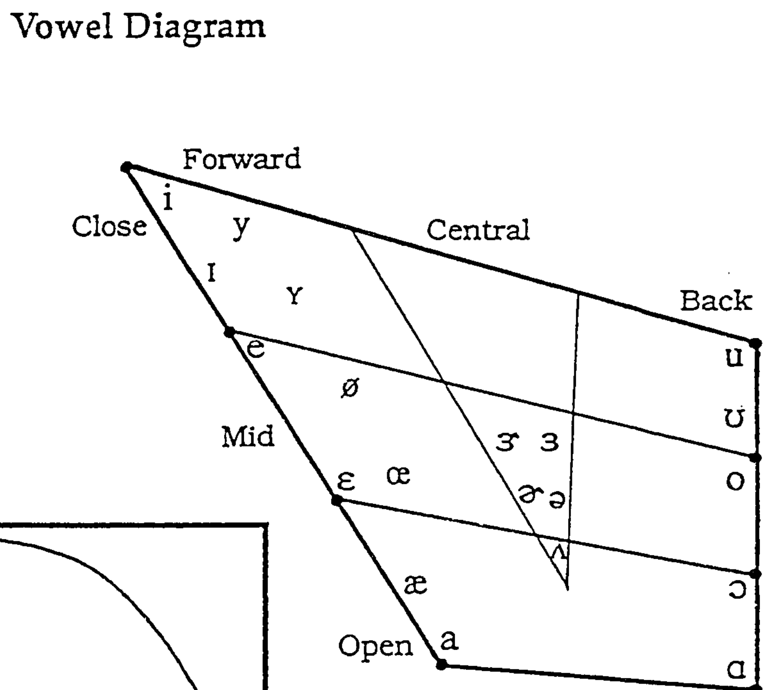
Vowel Modification Chart[56]

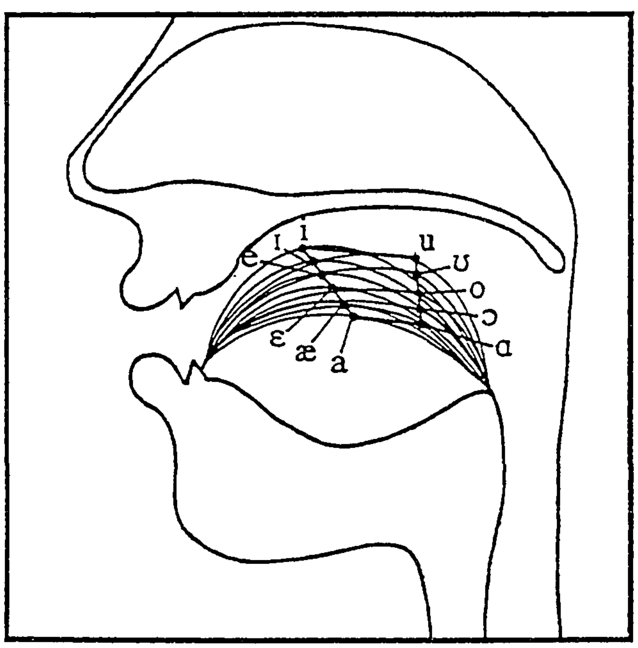


[56] Lloyd Hansen, "Vowel Modification Chart," Northern Arizona University of Flagstaff, 1987.

Appendix B
Vowel Modification Diagram

In your vocal studies, you will investigate pure vowel production for good diction and you will also encounter vowel modification to govern tonal quality and vocal freedom. Vowel modification is the deliberate altering of a vowel sound by slightly opening or closing your mouth, rounding or unrounding your lips, or moving the body of your tongue more forward or back in your mouth. Learning to use modified vowels is an important and necessary part of your training that takes place in the vocal studio. [57]





[57] Joan Wall et al., Diction for Singers (Texas: Pst...Inc., 1990), 4.

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