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## An Overview of Pedagogical Techniques of Vibrato for the Flute

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AN OVERVIEW OF PEDAGICAL TECHNIQUES  
VIBRATO FOR THE FLUTE

Deborah R. Ribelin





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AN OVERVIEW OF PEDAGICAL TECHNIQUES

VIBRATO FOR THE FLUTE

BY

DEBORAH R. RIBELIN

B.M., University of Denver, 1983

HYPOTHESES:

Through a study of flute vibrato, including the historical and pedagogical aspects, and advanced level flute teacher will acquire the necessary knowledge to direct students in developing their own individual vibrato.

THESIS

Submitted in partial fulfilment of the requirements for the degree of Masters of Music Education in the Graduate School of Columbus College, Columbus, Georgia, 1987.

COLUMBUS COLLEGE  
THE GRADUATE SCHOOL OF MUSIC

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WE HEREBY RECOMMEND THAT THE THESIS BY

DEBORAH R. RIBELIN

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ENTITLED AN OVERVIEW OF PEDAGOGICAL TECHNIQUES OF VIBRATO FOR  
THE FLUTE

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BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE  
DEGREE OF MASTER OF MUSIC EDUCATION

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## Chapter 1

## NEED FOR THE STUDY

The usual method for teaching flute vibrato is the teacher drawing on his past experience and how he was taught vibrato. Since this method has allowed the teacher to produce an effective vibrato, the student's results should be the same or at least similar to his teacher's vibrato. It would be valuable for the experienced teacher to be aware of the different types of vibrato, its history, the used of vibrato, and the physical process involved in vibrato. The student would then receive a complete understanding and knowledge of the practices and teaching of vibrato, rather than only imitating his teacher's vibrato.

There are a limited number of compiled studies on flute vibrato that include a thorough evaluation of both pedagogical technique and the physical process. Since vibrato is a major component of a flutist tone, it is necessary to acquire as much knowledge as possible before attempting to teach flute vibrato. The creates a need for this study.

Purpose of the Study

This paper is a historical and pedagogical study of flute vibrato. After reviewing the concepts and sources of this research, the advanced flute teacher will be more knowledgeable in advising his student on developing their own individual vibrato techniques.



### Organization of Study

This paper consists of eight chapters. Chapter 1 is the Introduction which states the need for the study and its purpose, organization, definition, and limitations.

Chapter 2 presents the History of Vibrato on the flute. The history begins with vibrato as an ornament, progressing to the vibrato used on the early wooden flutes, and concluding with vibrato in the 20th century.

Chapter 3 deals with stylistic practices of flute vibrato in Baroque, Classical, and Avant-Garde Music.

Chapter 4 summarizes A Scientific Approach to Vibrato, by Dr. Jochen Gartner. Dr. Gartner conducted physical tests and experiments on a European flutist. Gartner's book is the only source in which extensive experimental testing on flute vibrato has been conducted.

Chapter 5 deals with vibrato production and pedagogy. Most of this chapter is focused on the pedagogical aspects of flute vibrato. The three main types of flute vibrato reviewed for pedagogical application are: diaphragm vibrato, throat vibrato, and combination vibrato.

Chapter 6 is a comparison study of selected vibrato. The three types of vibrato selected are: vocal vibrato, violin vibrato, and French horn vibrato. Each type of vibrato is discussed from the following perspectives: the development of vibrato, the uses of vibrato, vibrato in the different era of music, soloist versus ensemble, and finally the transfer of concepts to flute.

Chapter 8 presents the summary and conclusions. This chapter also suggests that further research is needed in this area.

#### Limitations of the Study

This paper does not attempt present any conclusions based on an experimental study. It is based completely on historical research. Therefore, it is not possible to know what the actual results would be from a student who received vibrato instruction from this type of research.

This study does not consider every type of instrumental vibrato that could possibly be applicable to the flute. However, the study does cover three types of vibrato that relate to the production or the teaching to flute vibrato.

## Chapter II

### THE HISTORY OF VIBRATO

The techniques of vibrato production may include one or more of the following variables of vibrato. These three basic variables are pitch, intensity, timbre or tone.

The variation of pitch or pitch vibrato was probably one of the earliest types of vibrato, beginning around 1707 (Hotteterre, 1968, p. 29). It was produced by rolling the flute in and out while playing a single note. The pitch variance was believed to be both above and below the basic tone.

Intensity vibrato probably was first used in the Baroque era as a type of crescendo and diminuendo on a single note. Today this procedure is commonly known as a swell. The basic component of intensity vibrato is air pressure (Toff, 1985, p. 106). The flutist would start with a small amount of air pressure and then crescendo on the same note without taking a breath.

Some 19th century sources discuss timbre in relationship to vibrato. Timbre or tone vibrato evolves from intensity vibrato. The intensity and timbre vibrato are very dependent upon the material from which the flute is made. The wooden flute is much thicker than the modern silver flute, thus making the tone less intense. The wooden flute tends to absorb the vibration while the silver flute repels the vibrations to a much greater extent. The wooden flute affects the timbre or tone vibrato in much the same way. In pitch vibrato (the rolling in and out of the flute)

and timbre vibrato, the wooden flute absorbs the sound and does not project it the way the silver flute does. Timbre vibrato as we know it today is much more effective on the silver than the early wooden flutes.

Vibrato as Wind Player`s Ornament

In studying the concept of flute vibrato, it is be necessary to understand the origin of vibrato which is included in the history section of this thesis. The use of vibrato began with the wind players in the sixteenth century. By the seventeenth century vibrato had become common practice. One of the earliest references that documents the use of vibrato in the sixteenth century is Music Instrumentali Deudsch, by Marit Agricola in 1528. Agricola's book is one of the earliest books published on musical instrument. Agricola's book is really a revised collection of Sebastian Virdun's Music Getutsch of 1511. According to Osborne, "Agricola used Virdun's plates of various instrument but added his own text, which he changed and augmented in subsequent editions of 1530, 1542, and 1545" (Osborne 1962, p. 121).

Agricola's comments on vibrato appear in the 1542 and 1545 editions in a discussion of the Swiff Fife. The Swiff Fife is a cylindrical six-hole instrument which is illustrated in four sizes: descant, alto, tenor, and bass. Agricola states:

When playing the fife bear well in mind to blow it with a trembling wind the way they mostly teach it in the case of the Polish violin, as trembling ornaments the song. Here too it can never be wrong (Osborne, 1962, p. 122).



In 1636, Mersenne writes about vibrato as a type of tremolo in his book "Harmoni Universelle." He compares this vibrato tremolo to the organ tremolo, which has a frequency of about four vibrations per second. Mersenne suggests that the organ vibrato should be a model vibrato for wind players (Lind, 1974, p. 28).

### Vibrato on the Early Wooden Flutes, 1707

#### The Use of Finger Vibrato

In the 18th century vibrato on the early wooden flutes had begun to acquire recognition. One of the first flute method books published with instruction on the 18th century flute vibrato was Principles de la flute taversiere by Hotteterre, le Romain in 1707. Hotteterre devotes one chapter to the discussion of two ornaments relating to vibrato. The first is the battement, and the second is the flattement. The battement is a trill which is produced by covering only the edge of the hole below the note played, or by completely covering the tone-hole immediately below the note played. The flattement was produced by turning the flute backward and forward. This also causes the pitch to be lowered. Hotteterre recommends the battement and flattement vibrato method for the recorder and the oboe (Osborne, 1962, P. 12-125). According to Osborne this type of finger vibrato also appears in the method books by Corrette (1735) and Mahau (1759).

#### The Use of Vibrato Produced by the Force of Air

Vibrato produced by the force of air begins to develop in the 18th century. Quantz mentions in his book a type of vibrato

similar to Hotteterre's flattement vibrato. Quantz defines vibrato as a swelling and diminishing of volume on a single note with a finger flattement on the nearest open hole. In addition, Quantz calls to the flutist's attention that this procedure of vibrato will also lower the pitch. He says the flutist should compensate by adjusting the embouchure (Quantz, 1752, p.165-166). In 1761, Delusse noted a breath vibrato which is used in imitation of the organ tremolo. This means this vibrato was a measured type of expression. The numbers of beats for the breath vibrato were the same as the organ tremolo. Then in 1701 Tromlitz discusses another type of vibrato called the Bebung vibrato, which is basically a finger vibrato style (Toff, 1985, p. 107).

Throughout the 19th century the interest in flute vibrato continued to grow. Toff quotes a British flutist and publisher, N. W. James, from his book, A Word or Two on the Flute (1826).

Vibrations on the flute...when introduced judiciously and sparing...have an exceeding fine effect. The beat of a violin is justly considered one of its chief beauties, and the vibration of the flute, particularly in its lower tone is very similar (Toff, 1985, p. 107).

James, like Quantz, also warned the flutist to be extremely careful to maintain correct pitch when using vibrato.

Great caution should be taken that the beginning of the note shall be neither flatter nor sharper than the middle or ending of it (James, 1826, p. 100).

Although Toff says, "James advocated an intensity vibrato but not a pitch vibrato," (Toff, 1985, p. 109) this writer has

reached different conclusions about James' meaning. James advocated an intensity vibrato as a type of color or nuance. However, James does not state that he is not in favor of a pitch vibrato. Instead he seems to lead toward over the used of tone or timbre vibrato.

Charles Nicholson, a virtuoso flutist and a contemporary of James, used vibrato as an ornament. He called it "vibration," and it was notated . Nicholson described the vibration as an embellishment, with a gradual change in the rate of pulsation. The vibrato or vibration should begin slowly, then increase in pulses as the sound diminished (Toff, 1985, p. 109). The following is Nicholson's explanation on how to produce the vibration.

Breath-by a tremulous motion of the flute, and by the shake. If by the breath, subdue the tone, and on each succeeding pulsation, let the tone be less vigorous. When the vibration becomes too rapid to continue the effect with the breath, a tremulous motion must be given to the flute with the right hand (trill on a key), the lips being perfectly relaxed, and tone subdued to a mere whisper (Nicholson, 1830, p. 71).

Nicholson felt vibration was most effective between e1 and b2 (Toff, 1985, p. 109).

Beginning in the mid 1700s to the mid 1800s, flute vibrato (or vibration) was being compared with voice vibrato. Osborne reveals in his thesis a portion of a letter written by Mozart on June 12, 1778. In this letter Mozart uses the qualities of the human voice to define vibrato.

The human voice trembles by itself, but such, and in a degree which is beautiful---that is

the nature of the solo voice which one imitates, not only on wind instruments, but also on the string instrument, yes, even on the clavichord---but as soon as it passes the limit, it is against nature; it sounds just like an organ when someone pokes the bellows.

From Mozart's letter we can conclude that he approved of the use of vibrato, as long as it occurred in moderation. It appears that there were limitations for the use of vibrato even at this early state in its development.

Victor Coche also believed that flute vibration was very similar to that of the voice vibration. In his writing, he uses the term le chevron notated , to represent flute vibration. It was produced by using a forceful attack of air followed by a less forced sound using less air. The .half note with a chevrón would be played as a series of tied eight notes. The following is an example:



Figure No. 1

Coche's vibrato would definitely fall into the category of vibrato produced by the force of air. This also very similar to Quantz' description of vibrato presented earlier this paper. Today this type of vibrato would tend to be classified more in



the terms of crescendo and diminuendo. In order for this to be classified as a flute vibrato today (20th century), the pulsation would need to have a much wider range and density.

A later reference to vibrato can be found in a method book written by Richard Carte in the mid-nineteenth century. In this method Carte differentiates between tremolo and vibration on the flute. Carte defines tremolo as:

A grace that consists in the wavering of a note. It is produced on the flute either by giving a tremendous impulse of the breath, or by tremulously holding the instrument. It is used in passages of pathos, and is indicated by the word tremolo, or is introduced at the fancy of the performer (Carte, 1880, p. 23).

The tremolo, according to Carate, would then be classified as vibrato that is produced by force of air. However, Carte also mentions that the tremolo can be produced by a small, continuous movement of the flute in the flutist's hand. The interpretation of this aspect is uncertain, although it does seem to imply the use of some type of force.

Carte defines flute vibration as a type of finger vibrato. He states the pulse or beats should be slow on a loud note and fast on a soft note. One possible notation of this vibration is ; however, this sign could also represent a shake. The performer had to determine the interpretation based on the context of the music. According to Carte, most performers followed two basic concepts when deciding on the interpretation of . The shake was generally used in rapid passages, and the vibration was mainly used for sustained notes (Carte 1880, p. 23). According to John Clinton, a colleague of Cartes's,

vibrato on the four lowest notes of the flute (c1 to d1#) was very difficult to produce. Due to the inadequate number of lower holes on the flute, the only way vibration could be produced, on these four notes, was by rolling the head joint in and out (Toff, 1985, p. 110).

### Vibrato of the Late 19th Century and 20th Century

In the late 19th century, in Paris, a vibrato with a continuous pulsation or a type of shimmer in the tone began to emerge. The two main proponents of this vibrato were flutist, Paul Taffanel, and oboist, Ferdinand Gillet. Taffanel and Gaubert wrote a flute method book (1923,) in which they made the following statement concerning vibrato:

There should be no vibrato or any form of quaver, an artifice used by inferior instrumentalists and musicians. It is with the tone that the player conveys the music to the listener. Vibrato distorts the natural character of the instrument and spoils the interpretation, fatiguing quickly the sensitive ear. It is a serious error and shows unpardonable lack of taste to use these vulgar methods to interpret the great composers. The rules for their interpretation are strict. It is only purity of line, by charm, deep feeling and heart felt sincerity that the greatest heights of style may be reached. All true artists should work toward this goal (Taffanel and Gaubert, 1923, p. 27).

The above statement presents a negative attitude or at least a restrictive attitude concerning vibrato. This seems unusual since Taffanel and Gaubert were the instigator of a new type of flute vibrato. Three years after the publication of the Taffanel-Gaubert method book, they appear to have changed their

view point on the usage of vibrato. Toff reveals the following statement by Taffanel is from the "La Flute," Encyclopedie de la Musique et Dictionnaire du Conservatoire, Louis Fleury, 1923.

The search for timbre, the utilization towards this end of a light, almost imperceptible vibrato...all this derives more from an intelligent empiricism (practical experience) than from precise rules. It is very difficult, besides to define with certainty, what to call a beautiful sound. It is easier to describe faults than to avoid them (Taffanel and Fleury, 1926, p. 15-23).

The remarks of one of Taffanel's students, Adolphe Hennebain, give more insight toward understanding Taffanel's apparent inconsistency. Hennebain says, "When he spoke to us of notes with vibrato or expression, he told us with a mysterious air that these notes, forte or piano, seemed to come from within himself. One had the impression that they came directly from the heart of the soul" (Taffanel and Gaubert, 1923, vol. 2. p. 186). Marcel Moyse, another well-known flutist, was a student of Philippe Gaubert. In one of Moyse's articles in *Woodwind Magazine* (1950) he says that Gaubert never really talked about Vibrato, instead spent many hours on musical expression (Moyse, 1950, No. 7, p. 4).

Marcel Moyse, in his article The Unsolvable Problem, Part II, comments on the way vibrato was often misused and performed very poorly in the early 1900s. This appeared to be one of the reasons why vibrato was seldom used in performance. This was also a time when most professional musicians were aiming for a pure, even tone. Most musicians were very skeptical of this wavering of the tone called vibrato. Marcel Moyse in 1950 made

the following statement concerning vibrato. "Vibrato? It was worse than cholera. Young vibrato partisans were referred to as criminals. Judgments were final with no appeal. It was ruthless" (Moyse, 1950, No. 5, p. 12). Moyse also recalls music critics labelling vibrato "cache-miser (literally misery hider, something to hide behind when faced with problems of intonation and tone quality)" (Moyse, 1950, No. 5, p. 12).

Flutists Georges Barrere and Georges Laurent, along with oboist Marcel Tabuteau were the first musicians to bring vibrato to the United States. By 1940, vibrato became an accepted part of American orchestral woodwinds. Shortly after the acceptance of vibrato in America, Moyse arrived in the United States distraught from the excessive use of vibrato in France.

The British and Viennese were probably the last to even contemplate the use of vibrato. Henry Welsh wrote in the British periodical Music and Letters in 1951:

As for the woodwind, I fail to see any aesthetical or technical reason why they should trespass on the noble and intimate qualities which belong so inseparable and essentially to the strings. A plea that vibrato-playing enhances the quality of tone cannot therefore be upheld. Wind instruments should be played with a tone that is as steady as a rock and as pure as crystal (Toff, 1985, p. 112).

Barrere's vibrato became the United States' first true vibrato. His vibrato is said to have been very rapid. Barrere believed vibrato to be an expression, like a "love message." He also likened vibrato and tremolo to the human voice. However, Barrere was very much against the over-use of vibrato. He



believed it was still possible to produce a beautiful, expressive sound on the flute by using pure lines and tone (Toff, 1985, p. 112-113).

John Wummel (solo flutist of the New York Philharmonic) was one of the last students of Barrere. He was also one of the last flutists to play with a fast vibrato, although his vibrato did slow down in later years. William Kincaid was the first flutist to develop the slower vibrato. The vibrato was much smoother and more controlled. Kincaid was also the first flutist to expand the intensity and vary the speed of the controlled vibrato (Toff, 1985, p. 113).

## Chapter III

STYLISTIC PRACTICES OF FLUTE VIBRATO IN BAROQUE, CLASSICAL, AND  
AVANT-GARDE MUSICThe Use of Vibrato in the Music of J.S. Bach

The six flute sonatas and the solo partita by J. S. Bach are a major part of the flute repertoire. Many of the works of Bach that are now performed on flute were originally written for recorder. In Bach's notations, "flauto" or "flute a bec" meant recorder and "flauto traverso" is the wooden, eight-holed, one-keyed cross, or transverse flute. Bach used both the recorder and the transverse flute extensively in his religious music such as the Cantata 120 (Tenor aria, "Erschreke doch," Cantata 113, and in his secular cantatas, the Coffee Cantata and Phoebus and Pan.

Among his orchestral works, the Suite in B minor and the Brandenburg Concerto No. 5 were written for the transverse flute and the second and fourth Brandenburgs feature recorder. In today's performance of the second and fourth Brandenburg concertos, the recorder is usually replaced by the modern transverse flute. Although the modern transverse flute does not produce a wooden baroque sound like the recorder "the total effect really does not suffer" (Schweitzer 1923, Vol. 2, p. 408).

The first three Bach flute sonatas, B minor, E Major, and A Major, were written for harpsichord and transverse flute. The second group of sonatas, C Major, E minor, and E Major were

written for transverse flute and figured bass. "These pieces were composed as duets. There are two integral lines of melody: the flute part and the left-hand part of the keyboard. The right hand of the keyboard fills in the harmonies which are indicated by the figured bass" (Baron, 1950, p. 9). Baron suggests that the flutist should copy out the original figured bass part and make the realization himself.

Due to the changes in musical style and in the construction of the flute since Bach's time, it is likely that modern performances of Bach's works will differ significantly from his intentions. It is necessary then that the performer seek to discern the composer's intentions and any instructions that may be available.

Baron believes that Bach wrote parts for each instrument according to the natural voice and expressive qualities of the instrument. For example:

recorder---gently, plaintive moods  
 flute-----jovial and confident, or playful moods  
 oboe-----mournful sentiments  
 trumpets---powerful and brilliant

Baron describes the recorder as also having a soulful tone quality and pureness of pitch which appealed to Bach. If the simplicity or purity of pitch is what Bach desired from the recorder, then the use of vibrato was probably nonexistent. However, some scholars believe that recorder players used swells or a slight force of air, which could be interpreted as an early type of vibrato. References to vibrato on the early wooden flute were mentioned above in Chapter II.

There are many different ideas and opinions on the use of vibrato in Bach's music on the modern transverse flute. However, there is some common ground on this subject among professional flutists. Robert Willoughby, Professor of Flute at Oberlin Conservatory of Music, comments on the use of vibrato in the first movement of the B minor Sonata by J.S. Bach. Willoughby believes that the use of vibrato should be limited here.

In Baroque music vibrato is to be used as an ornament, not as something you turn on at the beginning of the piece and turn off at the end. Save vibrato for the important notes and peaks of phrases. Use very little vibrato, if any, on the resolution of dissonance, even if it's a long note (Willoughby, 1985, p. 8).

Marcel Moyse addresses this issue in an article, "The Unsolved Problem Considerations on Flute Vibrato" (Moyse, 1950, No. 7, p. 4). In response to a young flutist's questions concerning vibrato, Moyse attempts to show that there is no black and white answer about vibrato. Drawing from personal experience, he recalls a class at the Conservatoire de Paris with the concert artist and violinist, Lucien Capet. During a session in which a violin student was playing an Aria by J.S. Bach, Capet commented to the student that his playing was cold and instructed him to try it again. The second time, the student played it with intensive vibrato, and Capet commented that the second time was even colder than the first: "You want me to hear Bach. I only see and hear you!" (Moyse, 1950, no. 7, p. 4). Capet then entered in a discussion about the technical problems of vibrato. At this point Moyse began to understand the difficulties entailed



in "trying to apply to the flute technique the vibrato for the bowed instruments" (Moyses, 1950, no. 7, p. 4).

Moyses also acknowledged the influence of Paul Taffanel's statements on vibrato. Taffanel states "that in search for timbre one should use an almost imperceptible vibrato" (Taffanel and Gaubert, 1923, p. 186). He also commented that it was "easier to describe faults than to avoid them" (Taffanel and Gaubert, 1923, p. 186). This comment had a great effect on Moyses. Moyses proceeded to study the effect of vibrato in the Baroque and early Classical periods. He began by copying an Aria from Bach plus the Andante from the second and third Sonatas of Handel, which were practiced several times a day without vibrato. To his surprise he did not receive good results at first. Instead his sonority became harsh and his intonation became unstable. It was quite a while before he obtained positive results from this effort. However, through diligent study of other vibrato's, (such as violin and voice vibrato) and continuous practice, Moyses finally obtained a vibrato and tone that was superior to most of the flutists in his time. Moyses reminds us that it is not possible to control the vibrato on the flute to the same degree that one can on a violin. For this reason, there were still a number of excellent instrumentalists in Paris in the 1930s who did not know how to control the vibration. Indeed, some of these musicians chose not to use vibrato at all (Moyses, 1949, p. 12). In the writer's opinion, the only flutist whose vibrato and tone can be considered comparable to Moyses is Julien Baker.

The Use of Vibrato in the Classical Concertos  
of W. A. Mozart

Mozart wrote two concertos for the transverse flute, Concerto No. 1 in G Major (K.313) and Concerto No. 2 in D Major (K.314). These two concertos are a major part of the flutist's repertoire today. They are considered to have more similarities than differences. However, there are some major differences when it comes to interpreting the composer's intentions for these two concertos. It is through knowledge of the style that one can determine the correct use of vibrato. Both the G Major and the D Major concerto were completed in 1778. The two concertos were written about the same time, some scholars and flutists interpret the G Major concert in a Pre-Classical style. Although an equal number interpret the G Major concerto in a Classical style. There appears to be no dispute over the D Major Concerto. Most professional flutists, such as Walfrid Kujala of the Chicago symphony believed the D Major Concerto should be performed in a strictly Classical style. For example, Kujala believes that the trills in the D Major Concerto should be played on the written note and not approached from above as in the Baroque era.

The flute that was used around 1778 was very similar to that Baroque period, except that it had acquired a few additional keys. In 1774, Kusder of London and Tromlitz of Leipzig added three new keys to the flute: they were the F sharp, G sharp, and B flat keys. The bodies of the flutes by Kusder and Tromlitz were still basically made of box wood, or black african wood (Bate, 1969, p. 104). The majority of the flutists were still

playing the wooden, eight-holed, one-keyed flutes of the Baroque period during the early Classical era (Rockstro, 1890, p. 227).

As mentioned above, a number of modern performers (Moyses, Kincaid, and Peck) differentiate between the two Mozart concertos on the basis of style. These interpreters regard the first concerto as Pre-Classical. During a master class in Chicago in 1985, Donald Peck, principal flutist of Chicago Symphony, discussed the use of vibrato in the Concerto No. 1 in G Major by Mozart. Peck commented that in general, the tone should sound pure and simple, very much like the allegros in the J.S. Bach Sonatas. In addition, Peck commented that the phrases are very straightforward, and the melodic line must always be moving forward. Likewise, it is the same with the vibrato: light, reserved, and moving with a little intensity toward the climax of the phrase. Peck agrees with the basic approach to Baroque and Pre-Classical vibrato presented earlier by Willoughby, who states, "Save the vibrato for the important notes and peaks of phrases" (Montgomery, 1984, Vol. 4, No. 2, p. 3). Pamela Endsley, principal flutist of Denver Symphony, who studied with Moyses, constantly reminds her students to guard against the over-use of vibrato in the concert. She also cautions students not to use vibrato on the moving sixteenth notes, lest they sound unnatural and unstable rhythm. In the Adagio non Troppo (second movement of the concerto), Endsley would emphasize the use of vibrato by outlining the important notes, in turn building the phrase with intensity to the climax, and then suddenly returning to a simple, pure sound.

During the Classical era the construction of the flute went through lot of modifications. In 1827, D. Pottgeisser equalized all of the holes, which had diameters of 7.9 mm. He also applied the principle of the ring pad to the keys, which prevents leakage of air (Bate, 1969, p. 110). Around 1815, Charles Nicholson increased the size of the finger holes. Since Nicholson had very large hands, enlarging the size of the finger holes did not present a problem for him. Enlarging the finger holes increased the volume and tonal quality of Nicholson's flute (Rockstro, 1890, p. 227).

The major revisions of the flute were done by Theobald Boehm. After several different models had been tried it was Boehm's system of constructing the flute of 1847 that became the standard flute of today. Today the flute is made from metal materials such as silver and gold. Boehm's flute of 1847 still serves as a model for flute manufacturers throughout the world (Boehm, 1908, p. 2).

There were many changes in the design of the flute during the Classical period, there also appears to have been a slight change in the use of vibrato. Flute vibrato during the Classical era was just beginning to be used as a type of timbre vibrato. For example, vibrato was starting to be used to highlight the important notes in a phrase, or to outline melodic lines. The major changes in flute vibrato did not occur until the body of the flute was made of silver or metal materials. The metal materials are much more responsive to the vibrato vibrations than the early wooden flutes. The metal bodied flutes allowed for

greater projection range of the vibrato where the wooden flutes range was extremely limited (Rockstro, 1890, p. 228).

At a master class in July 1985, Walfrid Kujala, Piccoloist and third flutist of the Chicago Symphony and Professor of Flute at Northwestern University in Chicago, Illinois, would often comment that the secondary themes in the D Major Concerto (usually in minor) needed more life and direction to them. He would tell his students 1) to use a little more vibrato sound and 2) at the same time to give life and continuity to the melody through the consistent use of vibrato. Although vibrato (other than the finger vibrato) was not readily accepted when the concerto was written, the use of vibrato is expected in a modern performance. The key concept of vibrato in the Classical period is moderation. The speed and the depth of the vibrato must be controlled and used with great care.

### Solo Works Versus Orchestral Works

#### The Advantages and Limitations of Vibrato in Flute Soloist Works

Vibrato can be used more extensively in solo works. Actually the soloist can use as much vibrato as he pleases since he does not really have to blend with another instrument. William Kincaid (1895-1967), Professor of Flute at the Curtis Institute of Music, established guidelines that he believed every flutist should follow when using vibrato. His thoughts on vibrato (Krell, 1973, p. 16), seem to be an outgrowth of Taffanel's ideas on vibrato. He also points out how vibrato can affect the intensity of a note in a scale; this is very important for both



the solo flutist and the orchestral flutist. The following are his comments on vibrato, notated by John Krell.

Vibrato also has a bearing on relative intensity considerations. The rate of the vibrato pulsation can indicate, to a great degree, the position of the note in the scale. A slower vibrato suggests the relaxation of the low register while a faster rate reinforces the excitement of the top. In other words, the speed of vibrato should be graduated, as we graduate the intensity, through the range of the instrument.

In general, use the vibrato with circumspection. Vibrate on the longer notes and avoid it in running passages; it adds a liquid quality but destroys the line and continuity in the process. Occasionally, a fast quiver of vibrato on a dotted eighth note in a rapid tempo will add to the vitality of the rhythm. A touch of quick vibrato can be used to gently underline the skeletal notes in embellished figurations, or a caressing pulsation can make an accent subtle expressive. In other words, its uses are varied and infinite (Krell, 1973, p. 16).

#### The Advantages and Limitations of Vibrato for an Orchestral Works

In ensemble music it is necessary that the vibrato be carefully coordinated with all the instruments in the ensemble. The reason for this is that some woodwinds use less vibrato than others, and the clarinet uses practically no vibrato. "The orchestral use of flute vibrato must be strictly controlled so that the woodwind choir blends properly" (Toff, 1985, p. 110). She suggests the following restrictions: 1) the speed of vibrato needs to be in relationship to the tempo of the music; in allegros the vibrato should be faster, and in adagios the vibrato

should be slower; 2) the vibrato should also be slower in the low register and faster in the high register (Toff, 1985, p. 110).

In view of these guidelines for vibrato, Kincaid's opinion on orchestral vibrato would seem to have great relevance for flutists.

Ideally there should be consensus of vibrato style in each selection of an orchestral or ensemble; it takes only one instrument with a machine-gun or heart-throb vibrato to destroy the blend of an entire section and disconcert the tuning (Kreu, 1973, p. 17).

In addition, Moyse commented in his 1950 article about an orchestral performance where each musician believed his vibrato was the best and would not blend with the other members of the orchestra. He said that he was so distracted by the different styles of vibrato that he could not concentrate on the composition (Moyse, 1950, p. 4). As Moyse has revealed to us, there must be constant communication within the orchestra as to what type of vibrato should be used. Communication also means listening very carefully. Moreover, in an orchestra, no one performer is totally right or wrong in his approach to vibrato. Instead, there must be cooperation, or rather a combination of styles that need to be discussed in advance and not left to chance.

The following examples of symphonic literature require the use of an effective vibrato. In the last movement of the Brahms First Symphony, the first flute must cut through the whole orchestra, which calls for a slightly faster and wider vibrato. However, since it is necessary that the woodwinds blend as an



In Mendelssohn's Fingal's Cave Overture, it is necessary to slow down, and narrow the vibrato in the final cadence.

The image displays a page of a musical score for Mendelssohn's Fingal's Cave Overture, specifically the final cadence. The score is arranged in a standard orchestral format with ten staves. From top to bottom, the staves are labeled: Fl. (Flute), Ob. (Oboe), Cl. (Clarinet), Fg. (Bassoon), Cor. (C) (Trumpet in C), Trbn. (C) (Trumpet in C), Timp. (Timpani), VI. (Violin I and II), Vla. (Viola), and Vc. & Cb. (Violoncello and Double Bass). The music is in 3/4 time and features a key signature of one flat. The final cadence is marked with a first ending bracket and includes dynamic markings such as *dim.* (diminuendo) and *pp* (pianissimo). The string parts are marked with *pizz.* (pizzicato) and *pp*. The woodwind parts also feature *pp* markings. The score concludes with a final cadence in the key of F major.

Figure No. 3







These are just few orchestral examples revealing the different types of vibrato that are necessary in orchestral playing.

Vibrato, Pitch, and Tone Color of the Modern Boehm Flute

The modern Boehm flute is usually made of a silver or silver-based material, produces basically an intensity vibrato. The pitch fluctuations are very small, about "five cent maximum on either side of the pitch center and usually less" (Howell, 1974, p. 10). This is usually caused from the manipulation of intensity that causes the pitch to fluctuate during the rising of the intensity to its peak, and the falling of the intensity to its valleys. During this process the timbre of the flute also changes. It has a different quality on the sharp side of the focus. However, it is the crossing between the sharp and flat side that enables the flutist to produce a marvelous shimmering sound, which is characteristic of an especially fine flute sound.

In order to hear the complete range of the flute tone color one must listen to a highly skilled performer playing on a fine instrument. The flutist must be able to produce changing speeds and intensities of vibrato in combination with a brighter or darker tone color. The bright one is usually obtained by playing with the embouchure hole open, directing the air stream downward to compensate for the sharpening of pitch that would result. The darkness is produced by rolling the flute in and blowing up to correct the flattening of pitch. "The flute varies greatly in its response to the two extreme approaches, with all manner of shades of gray between; the vibrato emphasizes these differences" (Howell, 1974, p. 11). The instrument also plays a major part of the tone color. Some flutes will respond best with a bright color while others with a dark color. No two flutes respond the same.

No two flutists will hone the same embouchure formation, nor have the same taste in tone color.

### Types of Avant-Garde Vibrato

It is possible to produce a spread vibrato (out of focus) but in tune. This type of vibrato will accent the stuffy timbre that is produced. This timbre comes from the lack of reinforcement within the tube. The full intensity of the flute timbre cannot be obtained with a straight tone. However, there are some exceptions; flute exceptions seem to occur in the extreme high register of the flute, from a3 and above. On the piccolo, the exceptions begin around d3..

Some avant-garde composers tend to take advantage of the flutist's ability for varying the speed and/or intensity of vibrato production. The composers are after a desired effect through the use or non-use of flute vibrato. Roger Reynolds, who wrote Four Etudes for flute quartet and Mosaic for flute and piano, uses the terms NV (non vibrato), V (normal vibrato) and SV (stressed vibrato). Harby Gaber, who wrote Chimyaku for solo flute or alto flute, is more specific in his vibrato instructions by using a sliding scale from zero to ten. However, Gaber eventually changes his strict interpretation into an intensity scale from non-vibrato to maximal intensity, which should not be confused with the dynamics. Gaber changed his vibrato scale because the vibrato speed on flute has a very unpredictable relationship to its perceived intensity. A great deal of emphasis is placed on the individual instrument and the flutist

concerning the vibrato speed. The flutist has almost complete control over the placement of the pitch, and the depth or width of the vibrato. However, some flute's do change pitch more easily than others. Therefore,

"the use of overly specific instructions can cause unpredictable results unless not to be recommended, unless one has a specific player in mind and can experiment with him--and unless the need for controls is real and apparent"  
(Howell, 1974, p. 12).

## Chapter IV

## A SCIENTIFIC APPROACH TO VIBRATO - DR. GARTNER'S BOOK

Dr. Gartner began his experiments focusing his attention on four main conflicting theories of vibrato production. They are as follows:

- 1) Vibrato is produced primarily in the throat
- 2) Vibrato is produced exclusively in the diaphragm
- 3) Vibrato is produced in both the throat and the diaphragm
- 4) Vibrato is produced mainly in the abdominal muscles.

The following is a short summarization of the conclusions reached by Gartner as a result of his experiments concerning vibrato production.

Vibrato is produced by the interaction of two separate muscle systems. The contractions and relaxations of the muscles in the diaphragm (in the abdominal area) will produce a vibrato at a slower speed. The diaphragm contractions are located in the abdomen below the ribs and beneath the sternum. As the vibrato is being produced, the vocal cords (which are located in the larynx) open and close sympathetically the same speed as the contractions and relaxations of the abdominal muscles. When the vibrato speed increases, the abdominal muscles become less involved while the larynx becomes more involved. During the fast vibrato speeds (commonly known as the throat vibrato) the larynx is used exclusively over the abdominal muscles. However, the diaphragm abdominal muscles do maintain a constant support during the larynx or throat vibrato.



### Anatomy and Background Information

Wind players generally hold that it is necessary to master the fundamental techniques of breathing and support in order to produce a successful vibrato. Gartner supports the previous statement and goes into great detail defining both the breathing and the support techniques. The following is a brief summary of Gartner's breathing and support techniques.

The two large muscle systems of the abdomen to a large extent serve the function of breathing:

- I. A. The diaphragm (Figure 5) and
- B. The Anterior and lateral abdominal musculature (Figure 6-8), including the following muscles: rectus abdominus, external oblique muscles, internal oblique muscles, and the transverse abdominal muscles.
- II. The major thoracic muscles also are involved in breathing (Figures 6 & 7): external intercostal muscles, the subcostal muscles, the transverse thoracic muscles, and the serratus posterior, superior, and inferior muscles. In addition, the external oblique muscles of the abdomen originate to a large extent from the outer surface of the chest--namely from the fifth through the twelfth ribs (Gartner, p. 63).

The diaphragm is considered the most important muscle in regard to breathing. When one inhales, the diaphragm contracts, which causes the muscle to flatten out and move lower in the body. Due to the lower position of the diaphragm, it exerts pressure on the abdominal organs (located just below the diaphragm). This causes the abdominal organs to move downward and outward creating a balloon-like appearance in the abdominal area. As the diaphragm drops even lower, the air rushes in and fills the space within the lungs, causing them to expand. The expansion of the lungs causes the rib cage to expand upward, and

while the diaphragm contracts, a supporting group of muscles referred to as the inhaling muscles also contracts. Another group of abdominal muscles known as exhaling muscles are in a state of relaxation during inhalation.

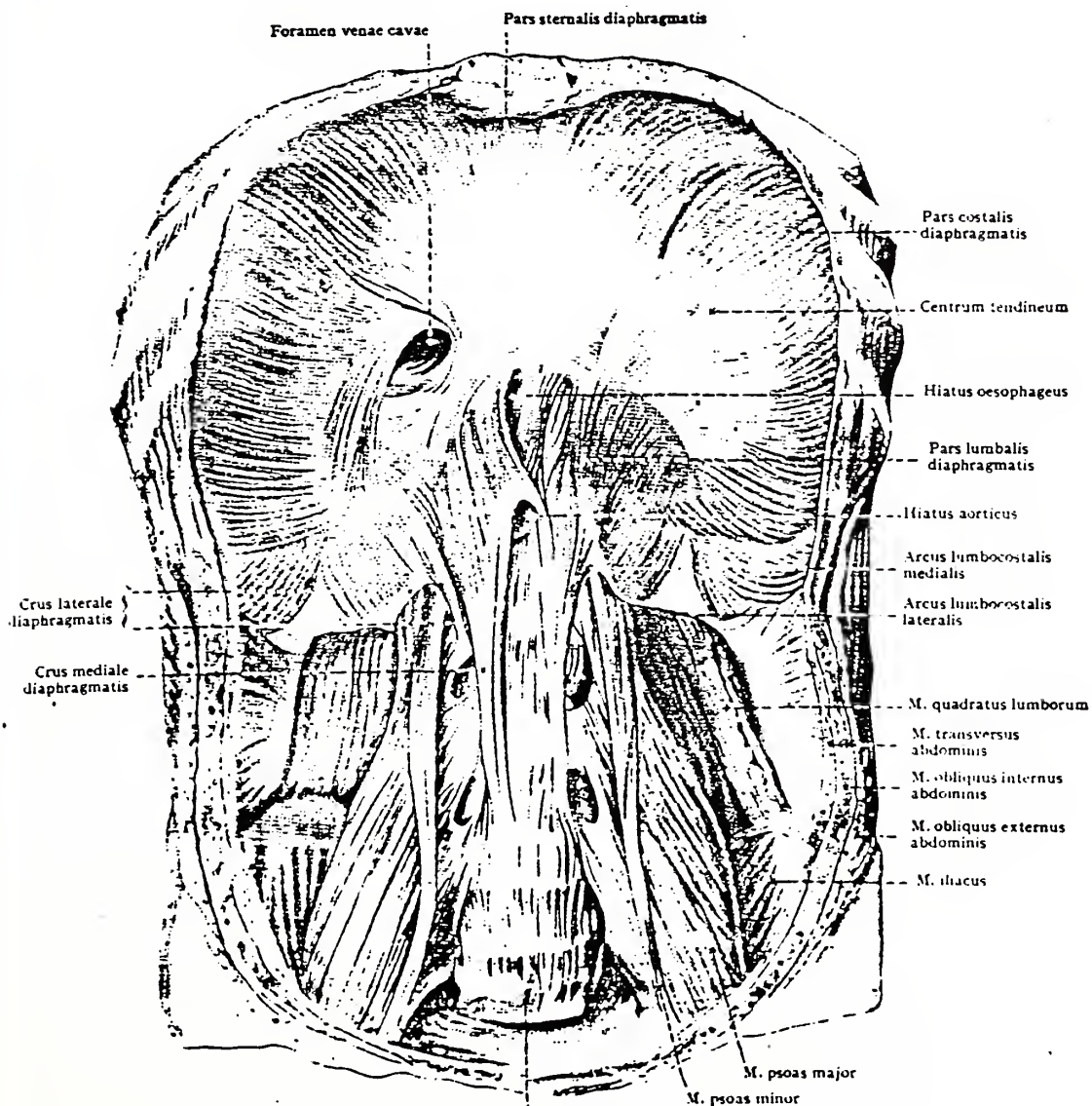


Figure 21 (from Spalteholz) Corpus vertebrae lumbalis V.

The diaphragm as seen from the abdominal cavity.

The single bundles of muscle fibers can clearly be seen; as they contract, the bundles shorten and the diaphragm moves downward.

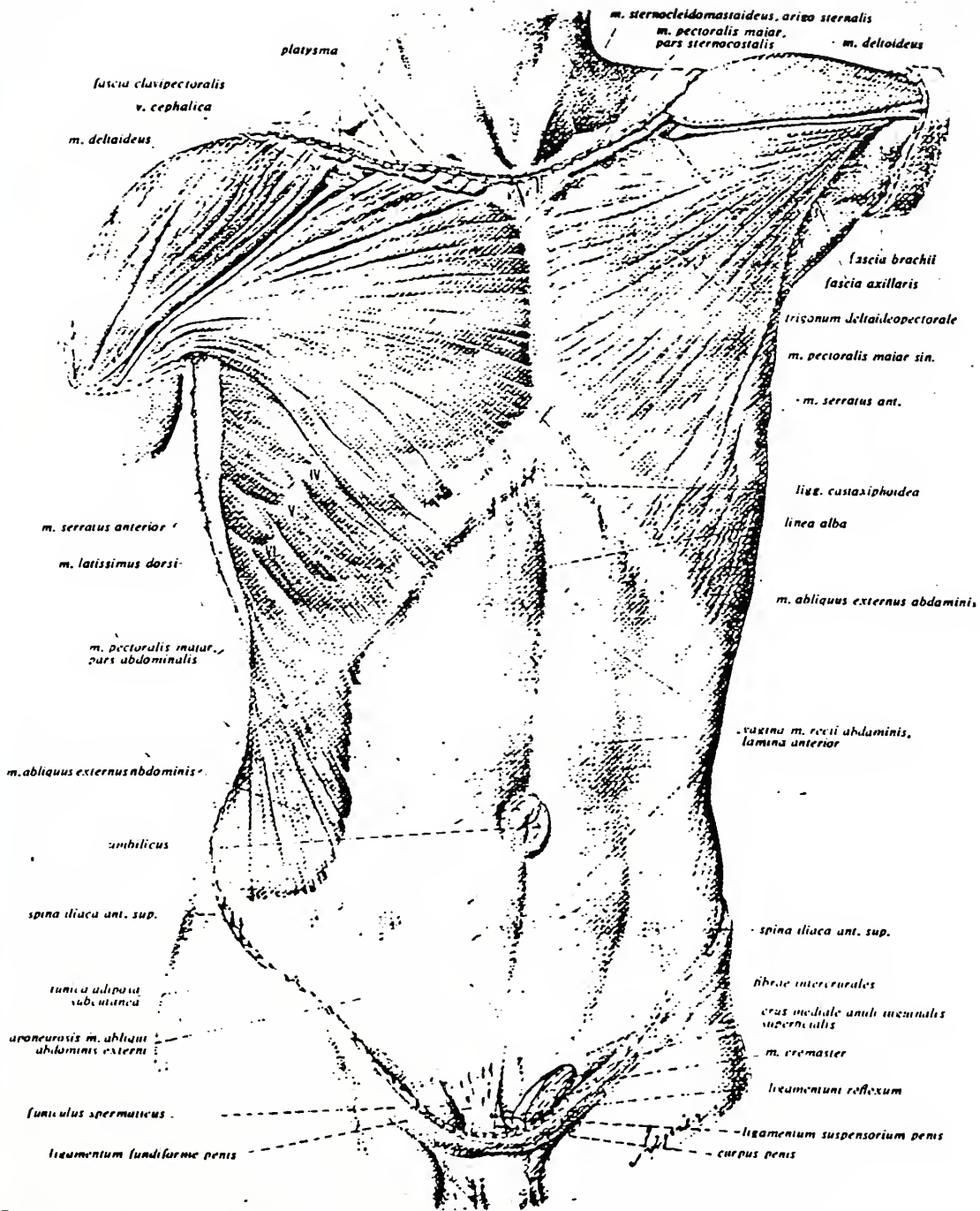


Figure 22 (from Sobotta-Becher)  
The superficial layer of the chest and abdominal muscles

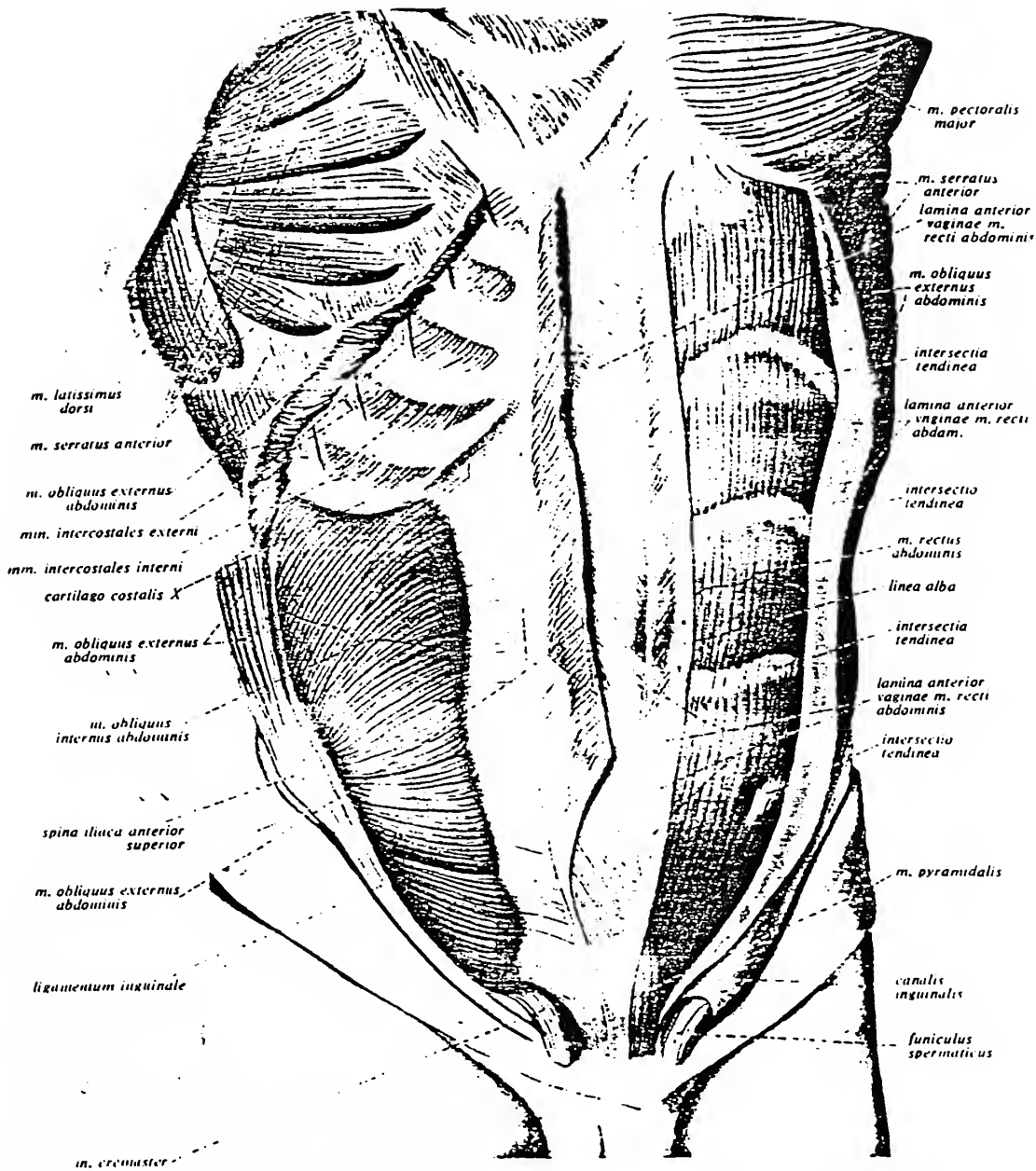


Figure 23 (from Sobotta-Becher)

The middle layer of the chest and abdominal musculature.

On the left side of the picture (right side of the body) the internal oblique muscle has been exposed and the external oblique muscle folded back. On the right side of the picture (left side of the body) the rectus abdominis muscle has been exposed by removing the superficial fascial layer (fibrous covering) of the muscle.



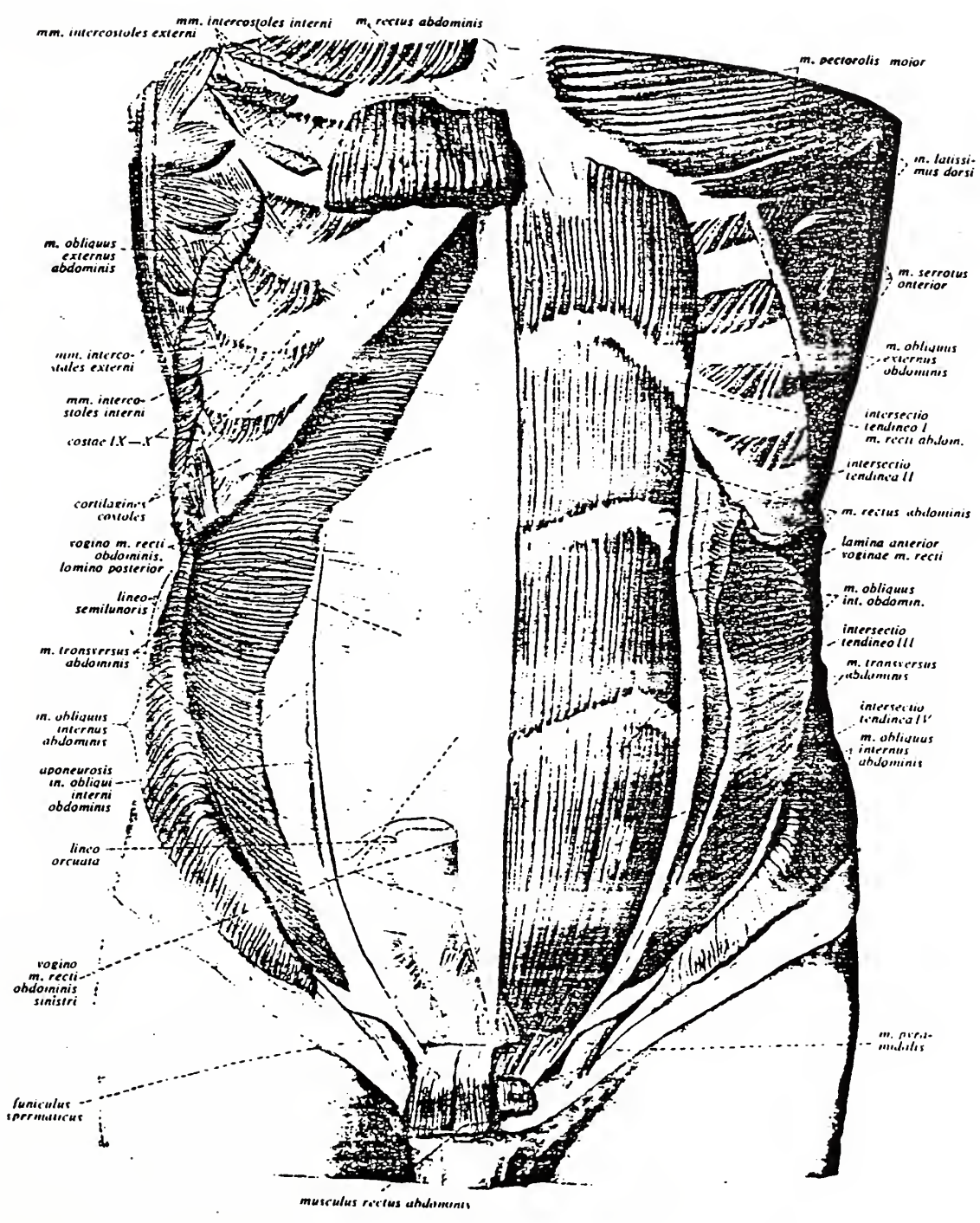


Figure 24 (from Sobotta-Becher)  
 The deep layer of the abdominal muscles: the transversus abdominis

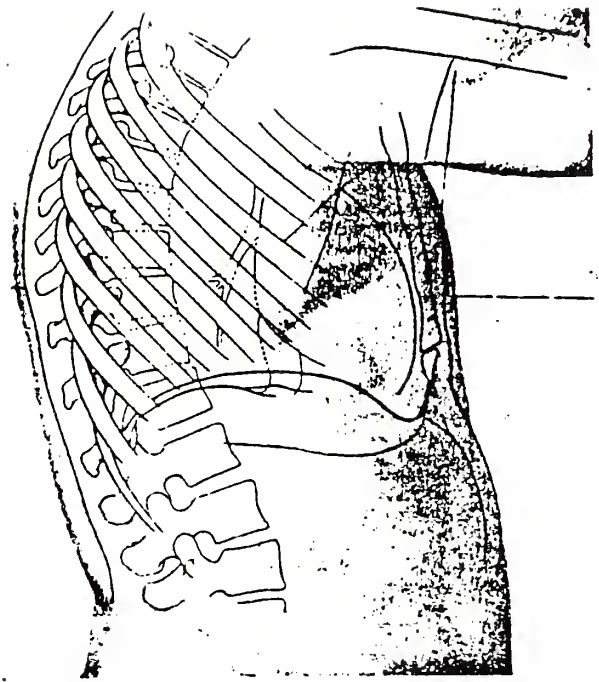
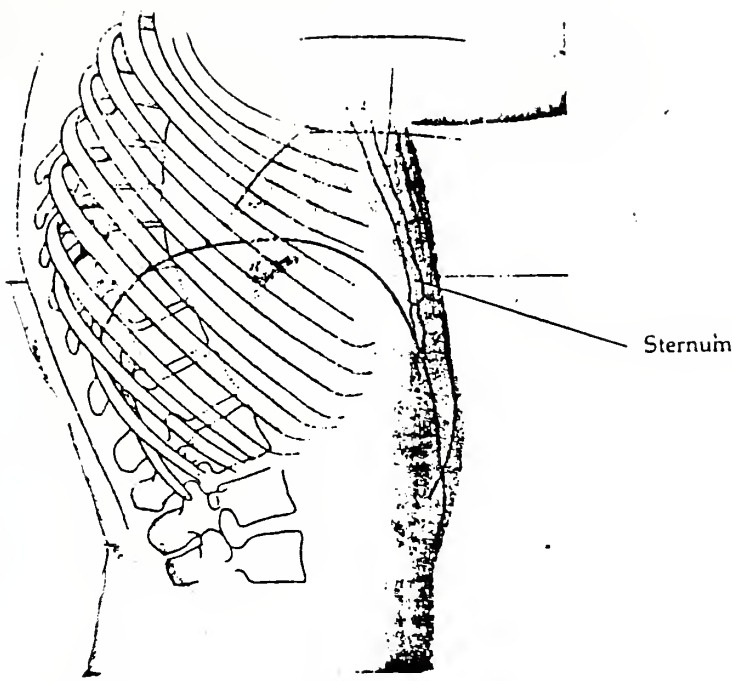


### Support

The proper use of support is a fundamental prerequisite for good tone, whether with or without vibrato. Gartner compares the term "support" with the activity of "bearing down," which, for instance, occurs during a bowel movement or childbirth. In these two natural activities, the first step is a deep breath followed by the closing of the glottis or (throat) which actually brings the vocal cords together. In the second step, the muscles of the chest and diaphragm contract, developing a pressure directed downward toward the abdomen. At the same time, the abdominal muscles are contracting and develop an opposing pressure. The end result is an increase of air pressure in the chest cavity and abdominal cavity, each which balances the other in total intake of air. The only difference in the natural "bearing down" process and the "support" process for a singer or wind player is the opening of the glottis. A singer or wind player must keep the glottis open, for that is what releases the air from the lung and allows it to pass through the mouth. Gartner summarizes the definition of support in the following words:

The support is a type of light "bearing down" activity with an open glottis and air stream directed upwards, which regulates among other things - breath control, breath economy, breath guidance, and breath pressure (Gartner, p. 73).

During the process of "support" that a singer or wind player uses, a certain tension is created in the area directly below the ribs. This tension is known as isometric tension, which is when a group of muscles are flexed in opposition to another set of muscles or in opposition to a solid surface. When the inhaling



A) Expiration (Breathing out)  
 Sternum and ribs lowered; diaphragm relaxed and standing in a high position; abdominal wall pulled in

B) "Diaphragmatic" Breathing  
 Inspiration (Breathing in)  
 Sternum and ribs in nearly the same position; diaphragm flattened out (cf. 25a); abdominal wall protruding

Figure No. 11

Experimental Techniques

Dr. Gartner chose the technique of electromyography to complete most of his research. Electromyography seemed best suited for the scientifically exact investigation of muscles actions synchronous with vibrato" (Gartner, p. 84). This technique measures the minute voltages generated by electrochemical muscular contractions. Every active muscle sends out a voltage which indicates the contraction occurring in the muscle, even if the contraction is too small to be seen by the human eye. The voltage of these electrical currents (even the lowest Page 11 voltage) is first trapped and measured by special electrodes. Then the electrodes are amplified and recorded by the appropriate electronic devices.

Twelve flutists were used in Dr. Gartner's electromyograph technique. Ten men and two women European flutists (including Aurele Nicolet and Kurt Redel) were used as subjects in the experiments. Each of the flutists performed the following five exercises:

- 1) Diaphragm thrusts
- 2) A straight tone
- 3) Diaphragm thrust increasing in speed until they finally become a vibrato
- 4) Vibrato with varying speeds (changes in the air speed)
- 5) Billy-goat vibrato, then a normal vibrato with a transition to a billy-goat vibrato.

These five exercises were performed while playing the following notes on the flute:

- Low register "A" (first octave on flute) (a1)
- Middle register "A" (second octave on flute) (a2)
- High register "G" (third octave on flute) (g3)

Each flutist also played three specific orchestral passages to compare the use of vibrato in musical selections with the vibrato used in the isolated note exercises. The recordings and tracings began only after the flutists were comfortable with the experimental equipment. The orchestral exercises chosen were:

- 1) Brahms's, First Symphony (fourth movement - piu andante)
- 2) Bizet, Carmen - Entr'acte
- 3) Debussy Prelude to the Afternoon of a Faun

the use of the orchestral exercises, seemed to minimize some tensions which had occurred in the previous single note tests. In fact, in three of the flutists, the laryngeal activity was documented at a very high rate of accuracy.

Dr. Gartner grouped the flutists into four classes on the basis of the number of vibrato oscillations per second. He began

with the lowest frequency and ended with the highest frequency. The following table reveals the groups into which Gartner divided the flutists and what percent of the total group they represent.

Table 6 (ES = experimental subject)

<p>Group I f=5</p> <p>ES 2 } ES 3 } 17% of total subjects</p>	<p>Group III f=6</p> <p>ES 6 } ES 8 } 33% of total subjects ES 9 } ES 11 }</p>
<p>Group II f=5-6</p> <p>ES 4 } ES 7 } 33% of total subjects ES 10 } ES 12 }</p>	<p>Group IV f=6-7</p> <p>ES 1 } ES 5 } 17% of total subjects</p>

Figure No. 12 (Gartner p. 92)

The voltages produced in certain muscle groups were recorded and studied (while the flutist played the flute) to determine the varying degree of muscular contractions. The four muscle groups that Dr. Gartner was particularly interested in examining by electromyography were:

1. The Abdomen
2. The Chest Area (Thorax)
3. The Diaphragm
4. The Larynx

The abdomen muscles were first studied through the use of needle electrodes. This procedure proved to be an accurate measurement of the rectus abdominous muscles. Unfortunately, this procedure was also painful. During the first preliminary experiments, two experimental subjects fainted from a reflex circulatory dysregulation due to the irritation of the vagus nerve by the needle electrodes. The injurious effects of the

needle electrodes gave preference to the use of skin electrodes in the final experiment that was tabulated.

The skin electrodes were in the chest and abdominal regions. They consist of flat metal plates applied to the skin within an adhesive substance. The electrical connections were then fixed directly to the metal portion of the electrodes. In some cases a stimulant medication known as Novadrol was given to the flutist to prevent any irritation of the vagus nerve.

To study the activity of the diaphragm, a probe was constructed with an electrode attached to the interior end. A rubber balloon was used to insulate the connections of the electrode. The probe was passed through the mouth and the esophagus (the area of the throat used for swallowing) and then placed directly against the diaphragm.

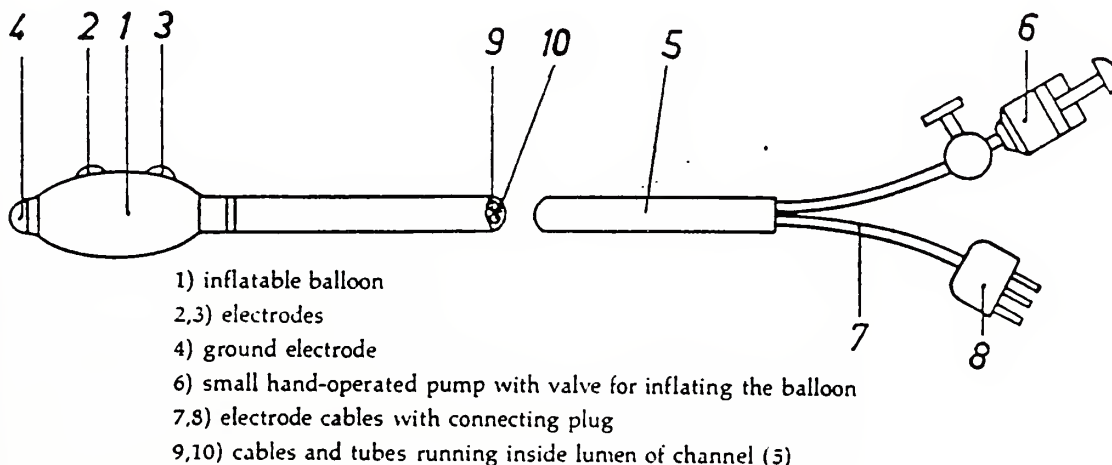
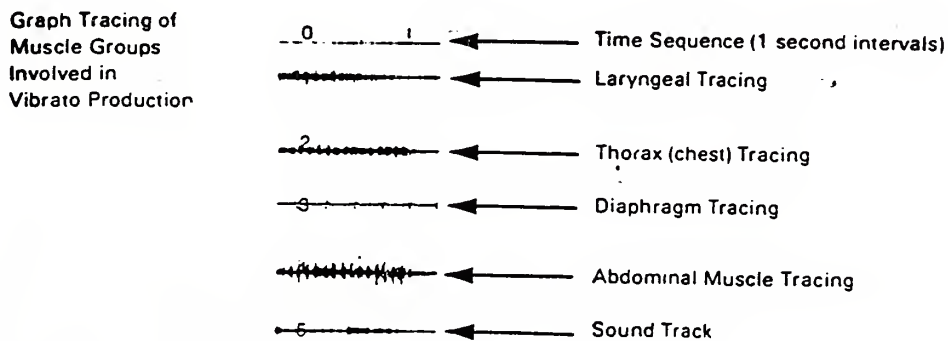


Figure No. 13

Skin electrodes were also placed on the larynx, thorax, and abdominal areas. The ground cables were attached to the wrist and upper abdomen while a microphone recorded the musical sounds the flutist produced.

Through the use of a myograph it was possible for Gartner to monitor the activity of the larynx. Gartner was able to conclude that the activity of the cricothyroid muscle during the vibrato occurred simultaneously with that of the laryngeal muscles.

Through the use of X-ray sound films, Gartner was able to verify the previously stated muscle activity. A clearly seen movement of the vocal cords synchronous with the vibrato was noted in all vibrato types in these films. In other words, there is movement in the vocal cords in all types of vibrato, including the diaphragm vibrato. In addition, Gartner also made graph tracings which simultaneously showed the muscle activity of the four areas (larynx, thorax, diaphragm, abdomen) and the sound of the player's vibrato.



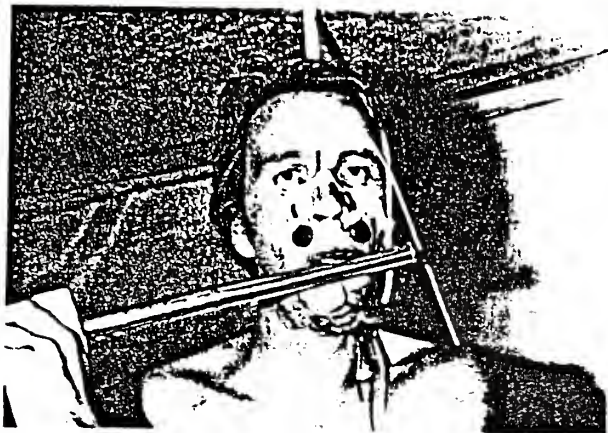
(Gartner p. 94-95)

Figure No. 14

Gartner now faced the question: Is there a connecting between vibrato, support, and the use of embouchure muscles? In search of the answer, he used skin electrodes on the face to determine the movement of the muscles around the embouchure.



## Plate Electrodes Placed on the Embouchure Muscles



(Gartner p.78)

Figure No. 15

Dr. Gartner's results revealed that there was no connection between vibrato, support, and the use of the embouchure muscles. He concluded this study by producing X-ray sound films to document the movement of the diaphragm and the larynx.

## Chapter V

## VIBRATO PRODUCTION AND PEDAGOGY

There are two basic types of vibrato used on the flute, diaphragm vibrato and throat vibrato. Most teachers emphasize the diaphragm vibrato over the throat vibrato for the beginning flute student. It is best for the flute student to master the diaphragm vibrato before attempting throat vibrato. Therefore, in this chapter a majority of the material and practice techniques will be focused on diaphragm vibrato.

Diaphragm Vibrato

Diaphragm vibrato is produced by a set of muscles (which for simplicity's sake will be called the diaphragm) that controls one's breathing. These muscles are the same muscles that allow use to blow a steady stream of air in the production of vibrato, in fact a series of pulsations that are imposed upon a steady stream (Weisberg, 1975, p. 59). The term diaphragm vibrato is actually misnamed, because the vibrato involves both the diaphragm and the abdominal wall muscles. The series of pulsations in the diaphragm vibrato are actually produced "by the isometric action of the abdominal muscles and diaphragm pushing against each other. As the pressure increases it raises the pitch and dynamic level. Diaphragm vibrato has the effect of 'rapid, unarticulated accents'" (Toff, 1985, p. 108). One exaggerated example of the vibrato is the blowing out of a match. In order to blow out a match, a large and sudden burst of air

must be produced. This burst of air increases to its maximum very quickly and then decreases just as quickly as it began. The following Figure 2 is taken from Weisberg, 1975, p. 59. This figure shows the increase and decrease in the air from blowing out the match.

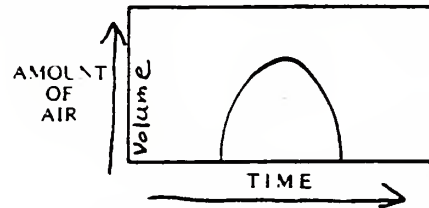


Figure No. 16

The previous comments taken from Weisberg and Toff are generally believed by many professional flutists to be standard diaphragm vibrato theories. However, the following comments on diaphragm vibrato were taken from a thesis written by Osborne, who seems to have a new approach to diaphragm vibrato.

The so-called diaphragm vibrato is not actually a diaphragmatically produced sound. It is a pulsation produced by the rib, or intercostal muscles. This is a statement which conflicts with the opinions of many teachers, performers, and writers (Osborne, 1962, p. 125).

Osborne came to these conclusions with the aid of a physician and other flute students after conducting experimental studies using a fluoroscope. The fluoroscope is a machine which is used to examine the internal structures, such as muscles, tissue, and small organs. The shadows of the internal structures are cast onto a fluoroscope screen by objects or parts through which X-rays are directed. The shadows will vary with the intensity of the objects or parts (Osborne, 1962, p. 125).

The fluoroscope is a machine for examining internal structures by viewing the shadows cast on a fluoroscope screen by objects or parts through which X-rays are directed. The

shadows vary with the intensity of the objects or parts (Osborne, 1962, p. 125).

From the fluoroscope screen it was obvious that the diaphragm did not cause the vibrating sound that most flutists believed it had produced. The intercostal or rib muscles were responsible for the production of the vibrato pulsations. The diaphragm did not actually pulsate; it simply moved upward in a slow, steady fashion.

Osborne's theory about vibrato is very similar to the scientific study by Dr. Gartner presented in Chapter IV. Both studies are based on medical experiments, conducted with a fluoroscope. Since Osborne's and Gartner's theories are the most recent and conclusive in the development of flute vibrato, this writer believes that teachers should give more consideration to their theories.

### Elements of Production

#### Control of Speed

One of the basic techniques of vibrato is controlling its speed. Weisberg refers to the speed of vibrato as its "slope," meaning the rate of change of amplitude, or volume (Weisberg, 1975, p. 59). He states that it is possible to control the rate of change in the vibrato. However, it is important to realize that the "vibrato pulse does not come from zero, nor does it return to zero, because zero represents silence" (Weisberg, 1975 p. 59). Vibrato is the pulsation of air placed on a pre-existing column of air. Figure 3 from Weisberg represents a single pulsation.

The straight line represents the note at a steady mp level, and upward curving line represents an increase in volume, followed by a similar decrease in volume.

### Control of Amplitude

The second major component of vibrato is control of the amplitude. Weisberg defines amplitude as the difference between the minimum and maximum dynamic level in a continuously varying curve. Weisberg's illustration of this curve follows: (Weisberg, 1975, p. 60)

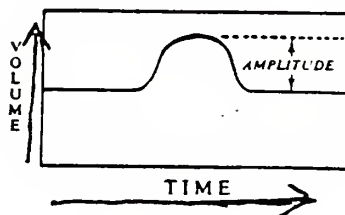


Figure No. 17

Weisberg cautions the flutist to carefully watch the pitch when working on control of the amplitude. If the flutist changes the air without also adjusting the embouchure, this will cause the pitch to be distorted. However, some variation of pitch is necessary because it is one of the major elements of vibrato. The pulsations of the vibrato are sudden bursts of air, and the embouchure is not being adjusted for each pulsation. They are meant to be fairly rapid and even, but not metered. The pulses should be quick enough so that they do not sound like a crescendo or a diminuendo. The speed and amplitude makes it possible for the flutist to control his or her vibrato, instead of the vibrato controlling the flutist. Once the flutist has a working knowledge of these two concepts of vibrato, the next stage is the

method of teaching diaphragm vibrato.

### Teaching Diaphragm Vibrato

Since many teachers such as Osborne use only the so-called diaphragm vibrato, we shall examine separately how to teach diaphragm vibrato and throat vibrato.

There are several different methods for teaching diaphragm vibrato. However, two methods seem to stand out the most. They are methods by Gartner and Osborne. Weisberg has some interesting general information on wind teaching, but the Gartner and Osborne methods are more detailed on the subject of flute vibrato.

Gartner states that there are three basic approaches to teaching vibrato. They are: 1) A rote physical approach, 2) an intellectual approach and, 3) a combination of the two. Gartner believes that the third method will have a better chance of success if the student has an intellectual understanding of the physiological processes. He also suggests that a student master proper breathing and support skills before beginning any vibrato exercises.

### Breathing and Support and Techniques

A flutist must have a good concept of breath and breath technique, as well as the ability to perform these techniques, before attempting to produce a vibrato of any kind.

The better the breath technique the more control can be brought to bear on the vibrato and the more effective its use. In fact, vibrato demands good breath support and control, especially in the diaphragm region. An inadequate breath support will result in



an uneven vibrato with faulty intonation (Maxym, 1952, p. 20).

Maxym believes that breathing for a wind player is acquired in three stages. They are: the diaphragm breath, the chest breath, and the reserve breath or residual air. Maxym suggests exercises in developing each phase of breathing individually. Then he suggests other exercises that will bring about the ultimate goal of these three phases working together as one breathing technique (Maxym, 1952, p. 5-8). It is this writer's opinion that the following exercises by Toff are much more practical in teaching a student breath support: 1) "The Thinker" - for flutists who play seated, 2) "The Balloon" or "The Accordion" for flutists who play standing, 3) Kincaid's pull-backs, 4) The Hiss - to stimulate flute playing, 5) Kincaid's candle exercise - for embouchure shaping, and finally, 6) long tones between C and A - for developing tone quality (Toff, 1985, p. 84-85).

Although Toff's exercises appear to be more useful to this writer in teaching breath support, both Toff and Maxym present the same basic principles in teaching breath support for the flutist. Maxym's exercises are of a more explanatory nature for the flute teacher or advanced flute students.

The first objective in teaching diaphragm vibrato is to have the student physically experience the function of the intercostal muscles. While it is not possible to actually feel the intercostal muscles. However, it is much easier to instruct a student to try and manipulate the rib muscles than the diaphragm muscle. A student is able to see and feel the entire rib cage

expand. Osborne believes that his method of teaching diaphragm vibrato is logical and that the desired results are acquired much more quickly by this method than by using the old diaphragm theory (Osborne, 1962, p. 125).

Gartner begins by having the student perform a series of diaphragm thrusts and exaggerate the dynamics, through the use of rapid crescendos, diminuendos, and abrupt sforzandos. The following examples are the type of exercises Gartner recommends

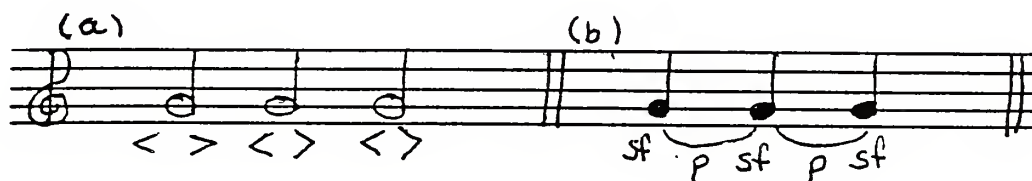


Figure No. 13

During this exercise the vocal cords should remain relaxed, which will allow for the throat to remain open. The words relaxed, open, hollow, or the phrase no pressure in the throat often aid the student in acquiring a relaxed throat. Once the throat remains relaxed or open then a true diaphragm vibrato may be accomplished. Extreme caution must also be taken with vibrato between the notes so that silence does not occur between the notes; rather, the vibrato should be continuous from note to note. The next step is to increase the speed of the pulse. This can be accomplished by setting the metronome at various speeds between = 40 and = 90. The following exercises, (variations of the original exercises (a) and (b) will aid the

student in making the transition from the slower pulsation to the faster pulsation. The transition should be achieved smoothly and the metronome should be set at = 60 (Gartner, 1981, p. 151-152).

The figure displays six musical exercises (a-f) for diaphragm vibrato practice. Exercises a, b, and c are on the left, while d, e, and f are on the right. Each exercise consists of a series of notes with dynamic markings and accents, often grouped by a slur. Exercises a, b, and c are marked with *sf* (sforzando) and include accents (>). Exercises d, e, and f are marked with accents (>). Exercises a, b, and c are marked with *sf* and include accents (>). Exercises d, e, and f are marked with accents (>).

Repeat with variations:

Figure No. 19

Osborne's method of teaching diaphragm vibrato is similar in several ways to Gartner's method. However, there are a few notable differences. Osborne, like Gartner, believes that the first step is to have the student practice moving the rib muscles back and forth. However, Osborne insists on a great deal of exaggerated practice without the use of the flute. Osborne seems to emphasize the mastery of each concept in more detail than Gartner. For example, after commenting on moving the rib muscles back and forth, Osborne states that "this motion must be done in a regular rhythm. The student must be quickly brought to the

realization that this is the basis of teaching and learning the vibrato" (Osborne, 1962, p. 126).

This writer agrees that regular movement of the rib muscles important, however, she questions the overemphasis on a strict rhythmic approach with the beginning student. A majority of students who receive the first instructions in vibrato are between the ages of 13 and 17. A strict rhythmic approach to a totally new concept tends to overwhelm a young student. Often, if a young student feels a new concept is too difficult, the student will avoid learning the concept all together. Learning to produce a vibrato is often very disillusioning to a young student and should be approached with caution and with more flexibility by the teacher. This writer does not mean to imply that Osborne's or Gartner's concepts are not important, but modification of the procedure may be necessary for some students. No two students learn vibrato in exactly the same manner, or in the same amount of time. Osborne, like Gartner, comments that the rib motion is also connected with the abdomen moving in and out in strict rhythm. The student accomplishes the movement of the abdomen by executing rhythmic inhalation and exhalation of air. Osborne believes that only through this type of strictly controlled abdomen movement is it possible to create a controlled vibrato sound.

Osborne's next step is to scale down both the exaggerated movement of the abdomen and the pulsation of the air. After this has been accomplished, the inhalation and exhalation of air produced will be keen and smooth. "Now and only now should the

student put the flute to his lips and start the vibrato by saying with his breath, and voice, ha, ha" (Osborne, 1962, p. 127). Osborne follows up this step by having the student set the metronome at sixty beats per minute with one pulsation per beat. Over a period of time the pulsations are increased to six vibrations per beat. This step is almost identical to that of Gartner's.

When the student can control his vibrato, both Osborne and Gartner have the student practice going from note to note without stopping the tone or the vibrato. Gartner writes out a set of exercises for the student to practice, while Osborne goes one step further and suggest the student work on very simple melodies. Osborne recommends the slow movements from the flute sonatas of J.S. Bach and G.F. Handel. For the younger student, Osborne suggests practicing popular tunes that the student may be able to play by ear. Many flute teachers try to teach the concept of diaphragm and throat vibrato through the use of scales. Scales have often been thought of as the foundation of all concepts of playing the flute, such as technique, tone, and vibrato. The following statements by Osborne express his opinion of the teaching of vibrato through the use of scales.

The use of scales in the development of the vibrato leaves much to be desired. It is true that scale practice is an aid in securing a smooth vibrato through the step-by-step production of tones. In addition to this experience the student needs practice in developing the smooth vibrato while playing large interval. Experience of this sort may be secured by working of the tone book of M. Moyse, Of the Sonorousness (Osborne, 1962, p. 128).

Since the Moyse method places fewer technical demands upon the student, this writer recommends that the scale method be reserved for the older flute student, such as the college student. Some students may possibly be ready for this method by their junior or senior years in high school.

Weisberg presents a condensed summary of exercises for the practicing vibrato at the beginning, intermediate, and advanced level of the student. The breakdown of the exercises for the three different levels could be used as a guideline for a young teacher lacking experience in teaching vibrato.

#### Beginning Vibrato

Begin at a pulse speed of . - 60 (Figure 59). Gradually increase over a period of six months to a year to a pulse speed of from four to seven per second, depending on the instrument and the musical passage. Seven is extreme and does not apply to the bassoon. Four is also extreme and does not apply to the flute or oboe. From five to six per second is the normal pulse range.

#### Intermediate Vibrato

Up to this point it has been necessary to count pulses with each note. However, when the vibrato is well under control, but not yet at the proper rate of speed, we must begin to eliminate the counting process. This is not as easy as it sounds. With our first attempt, we find that evenness disappears or the amplitude has become very narrow. Do not try to overcome this too hurriedly; this is a necessary phase to go through. Try to play scales slowly and range the notes at random. In this way we can begin to separate the pulses from the rhythm of the notes. Another technique to master at this point is the ability to begin notes with the vibrato coinciding with the start of the note. Think of the note



starting at the top of the first vibrato pulse.

### Advanced Vibrato

At this stage we should be able:

1. To start notes with and without vibrato.
2. To change the speed of the pulses while playing.
3. To use vibrato at extreme dynamics.
4. To change the amplitude while playing.

### Throat Vibrato

The throat is executed with the back of the tongue against the throat, while the throat becomes more restricted when the pulsations of the vibrato increase in speed. The vocal cords within the larynx are a type of muscle within the throat surrounding the vocal cords. "The vocal cords are elastic membranes which open and close in varying degrees producing the vibrations which constitute our voice" (Gartner, 1981, p. 76). Gartner illustrate the larynx and the vocal cords in Figure 19 shown below.

Larynx Seen From the Inside With the Vocal Cords

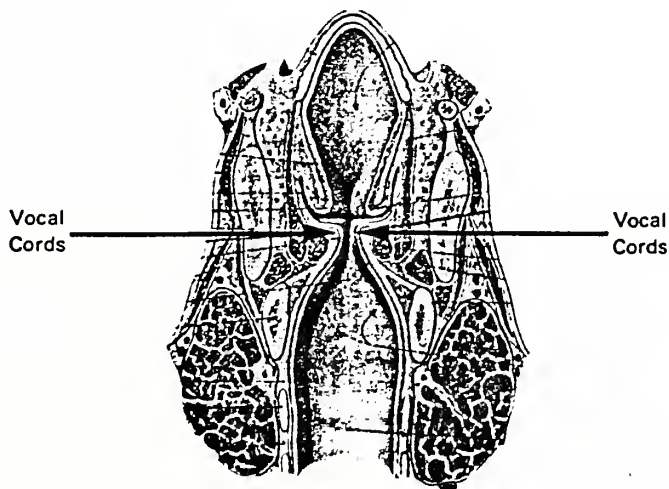


Figure No. 20

The flutist can permit more air to pass through the throat by relaxing and opening the vocal cords.

#### Elements of Production

The throat vibrato is produced by slightly opening and closing the vocal cords. In order to maintain a desirable vibrato sound, the opening in the vocal cords must remain small. When the opening and closing of the vocal cords becomes too rapid and large the undesirable "billy-goat" type of vibrato is produced. A high level of tension is also produced in the "billy-goat" vibrato due to the extremely small closure of the throat with each contraction (Gartner, 1981, p. 76).

The breath support must remain steady and continuous while the vocal cords become progressively more involved. As the throat vibrato is progressively increasing the diaphragm vibrato is progressively decreasing. Throat vibrato is exclusively used at the faster vibrato speeds, however, a small amount of activity does occur simultaneously in the diaphragm area. The diaphragm vibrato is so minimal at this point that it is strongly overpowered by the throat vibrato (Gartner, 1981, p. 85).

The control of speed and amplitude in regard to the throat vibrato is approached in almost the same manner presented earlier with the diaphragm vibrato. However, the pulsations are now mainly produced from the opening and closing of the vocal cords, instead of the diaphragm muscles.

### Teaching Throat Vibrato

Most professional flutists agree that the teaching of the throat vibrato must be approached with extreme caution. This is not a method for a young flutist. If throat vibrato occurs naturally in a student of an early age, it is best for the teacher to avoid discussing it altogether. The student needs to have acquired a certain level of personal and musical maturity before this method is taught. The actual level of maturity is different in every student, therefore the teacher must assess each student's needs and abilities on a continuous basis.

Most professional flutists teach throat vibrato by using the spoken "ah." Gartner states the following in reference to teaching throat vibrato:

A long spoken "ah" should be sustained and then abruptly stopped by suddenly closing the vocal cords. Gradually the length of the sustained "ah" should be shortened and the abruptness of the vocal cord closure should be shortened and the abruptness of the vocal cord closure should be practiced until the "ahs" and the abrupt stops meld together in an uninterrupted undulating sound (Gartner, 1981 p. 153).

Gartner's explanation of teaching throat vibrato is the most complete and thorough approach available. However, one should emphasize that this approach is not for young students. This method of Gartner's may even need simplification for some college freshman flute students.

## Combination Vibrato

### Controversy Over Combination Vibrato

The topic of combination vibrato causes a lot of controversy due to the fact that many professionals believe that there is only one preferred type of vibrato. Weisberg is a good example of this school of thought. He makes the following statements in his book on vibrato.

Experience has proved to the author that the diaphragm vibrato is far superior to any of the other types. Such a preference, however, cannot be sustained with scientific proof, it is a matter of personal preferences. At this time, this belief is very strongly held, and to the author represent a "truth." For that reason, diaphragm vibrato will be the only type to be discussed (Weisberg, 1975, p. 59).

Toff, has a similar opinion about vibrato. She questions the actual feasibility of teaching vibrato, due to the tension and other problems that seem to take place during the instruction of vibrato. However, Toff does tend to lean more to the diaphragm vibrato than the throat vibrato. She does not mention or imply any possibility of a combination vibrato. Toff strongly criticizes throat vibrato:

A potentially dangerous technique because it is a major cause of tension in the throat. And tension is something to be avoided at all cost because it usually results in a smaller sound (Toff, 1985, p. 108).

Osborne also appears to believe that the diaphragm vibrato is the only vibrato, since he mentions no other type. Weisberg, Toff, and Osborne are all highly accredited professionals; however, it is from Garner that we receive the most up-to-date and highly scientific approach to vibrato.

### Connection of Throat and Diaphragm Vibrato

Gartner states that there is a combination vibrato. The combination vibrato is when the flutist learns to move smoothly between the diaphragm and throat vibrato. It is necessary for the flutist to have the diaphragm and throat vibrato at his command. This will enable the flutist to have a range of flexibility in his/her vibrato. Without a smooth switch to the throat vibrato it would not be possible to create the fast shimmering vibrato often required of flutists today. This fast vibrato is helpful in projecting the flute tone through the large orchestras of today, as well as for tonal intensity. Control and flexibility of the vibrato also can permit an immediate change in the mood and color of the composition.

### Exercise for the Combination Vibrato

The following exercises by Gartner will help the flutist to develop "an evenly modulated vibrato and a smooth transition between the two vibrato types" (Gartner, 1981, p. 156-157). The student should begin by setting the metronome on = 60 and then perform the exaggerate diaphragm thrust exercises with one thrust to each beat. These exercises should be steadily increased until the = 208. Then move the metronome setting back to = 104 and continue the diaphragm thrusts at the same speed as when the metronome was set on = 208 except now performing two thrusts per metronome beat. The student should continue to advance the speed of the metronome until = 160. The transition from the diaphragm vibrato to the throat vibrato



begins to take place at about = 120, (this is still with two thrusts per metronome beat). The amplitude and degree of the thrusts should be gradually decreased as the student becomes accomplished at the exercise (Gartner, 1981, p. 156-157).

This exercise appears to be a very thorough and systematic approach to teaching student to combine the two types of vibrato. Starting at the slow metronome speed of = 60 and gradually progressing will prevent the student from losing support from the diaphragm when shifting to the throat vibrato.

## Chapter VI

A COMPARISON STUDY OF VIOLIN VIBRATO AND VOCAL VIBRATO,  
IN REGARD TO FLUTE VIBRATO

The writer has chosen to do a comparison study of the violin and vocal vibrato to flute vibrato due to the maturity of the vibrato of most professional violinists and vocalists. If flutists wish to improve their vibrato, it is best to look at other couple of instrumentalists who have stabilized and somewhat perfected their vibrato. The following is not meant to be a completely detailed comparison but rather a comparison that presents material that could be beneficial to the flute teacher and student.

Violin Vibrato in Relation to Flute Vibrato

The actual physical application of violin vibrato is very different from flute vibrato; however, the following definitions, history, and teaching theories of violin vibrato could also be applied to flute vibrato. The majority of violin and flute teachers are in agreement that vibrato is an important part of the performers tone. Hann, violinist and teacher (1923), wrote the following concerning violin vibrato. "Violin playing without vibrato is like a day without sun--dismal and gray. The vibrato gives to the playing the pulsations of life, the cheer, and the beauty" (Hong, 1985, p.76).

Vibrato is believed to be one of the hardest elements to analyze in a performer's technique. Even though violin vibrato

contains a lot of physically mechanical motion, it is full of individual character. Every violinist seems to have his or her own unique vibrato. "By paying strict attention to the vibrato it is possible to identify the violinist. Therefore, it is said that vibrato is the soul of a violinist performance" (Hong, 1985, p.76). It is also possible to identify most professional flutists by their vibrato.

#### The History of Violin Vibrato

According to Alvina May Olsteade, a violinist by the name of Werner Hauck (professor at the Musical Academy in Kassel, West Germany) has researched extensively into the early origins of vibrato. Hauck believed that the term vibrato did not even exist for the violinist until the middle of the nineteenth century. He states that the vibrato techniques existed well before the 1850's, however they were given different names which applied to the techniques. For example, the term tremelo meant vibrato from about 1719-1859. This was during the lifetimes of Leopold Mozart and Louis Spohr. Hauck also believes that the idea of imitating the human voice occurred as early as the ninth and tenth centuries (Olstead, 1979 p.4).

Around 1759, Leopold Mozart (1719-1787) father of Wolfgang Amadeus Mozart, wrote a comprehensive source on violin playing titled Violinschule, A Treatise on the Fundamental Principles of Violin Playing. In this book, Mozart instructs the violinist to imitate the natural sound of the human voice in regard to vibrato (Mozart, 1959, p.203).

Mozart states that performers should not use vibrato continuously. "There were performers who tremble (movement of the fingers) consistently on each note as if they had palsy" (Mozart, 1959, p.203). He also suggests that the performer apply the tremolo or vibrato at the end of a piece or on a long note at a cadence. Mozart divided the vibrato into three types according to speed: the vibrato, the increasing vibrato and the rapid vibrato (Mozart, 1959, p.204).

Leopold Auer, (1845-1930), violinist and teacher, offers another definition of vibrato. He believes that the purpose of vibrato is to add beauty to a phrase of special importance. Auer also believes that continuous vibrato should be avoided. However, his reasons are somewhat different than Mozart's. Auer is concerned about vibrato being used to cover up for inaccurate pitch or inadequate tone production. He found this to be a common problem among students and some young professional violinists. Auer also cautions the violinist against over-using vibrato to express the emotion of music. Too much vibrato would dull the listeners' ears, causing their attention to wander. Auer, like Mozart, suggests that the violinist should control the vibrato, using it sparingly and mainly on long sustained notes (Auer, 1923, p.58).

Another violin performer and teacher had a more positive outlook on the use of vibrato. Carl Flesch wrote his book, Problems of Tone Production in Violin Playing, some eleven years later than Auer. The following is from Flesch's book: "Vibrato is more a determinative for the intimate spiritual makeup of the

tone than for sound production in the physical sense" (Flesch, 1934, p.12).

It is obvious that Flesch considers vibrato to be an essential part of the violinist tone and not just an embellishment to be added on cadential long notes. Flesch even suggests that due to the intonation of vibrato during the detached passages (rapid notes), the passage is more a part of the music rather than an exercise placed in the middle of the piece (Flesch, 1934, p.12). Then in 1930, Sydney Robjohns, professor of violin at the Royal Academy of Music in London, wrote about the individuality of each performer's vibrato. He said that "every great artist has a vibrato which is spontaneous, individual, and capable of varying shades of meaning and expression" (Robjohns, 1950, p.91).

Robjohns believed that every performer should have his or her own unique style of vibrato; however, he does suggest the performer control the width of the vibrato. The concern of the teacher in the 1930's is no longer a question of whether vibrato should be used any place except at the cadence. Instead the question is how to control the width and frequency of the vibrato and how to teach it to a student. Jaschar Heifetz, a renowned concert violinist of the time, suggested the idea of putting a student with a controlled vibrato next to a student with a vibrato that is too slow or too fast. He recommends placing the students next to each other in a string orchestra. Unfortunately, he only cited one success in his book, With the Artist. This writer would like to note that today Heifetz's



method is used with flute students and is generally successful once one learns to listen very closely to the vibrato.

Vibrato consists of the sharpening and flattening of the pitch on a note and it is this degree of variance that is questioned. Vibrato by itself does not produce intensity. The missing component necessary to produce intensity in a violinist's tone is the frequency of the vibration. "It could be said that to widen the vibration increases the warmth of a note; that to increase the frequency increases its urgency; but that only by using both together can a true emotional intensity be achieved" (Whone, 1973, p.79). It is the combination of frequency and vibration that enables the violinist to produce a vibrato that truly enhances tone. However, when only one of these factors is used the vibrato fails to reach its full potential. This is what usually causes the vibrato to be too wide or too narrow (too slow or too fast). The violinist may achieve different shades of emotion or color by varying the intensity within a group of sustained notes. Whone demonstrates this shading of the vibrato with the following example :

In the simple melody Plaisir d'Amour, four patterns have been indicated, each one producing a different character and feeling. How many more subtleties would be possible with the two factors of width and frequency varied: and how much could be gained by the ability to return to a flat note and to reanimate it by any quality of vibrato at will. It can be seen, too, that the patterns in the example could equally well apply to dynamics so that there would be three factors contributing to the shape of the music. But this does not mean that interest depends upon a loud dynamic. All three factors can be achieved by using the same vibrato at a piano level (Whone, 1973, p.79).

Whone also states that it is impractical to vary the vibrato on individual notes during fast passages, such as the theme from the Mozart D major Concerto.

If one were to vibrate on every note (when there is a natural stress on the appoggiaturas), it would destroy the effect of the stress. Such vibrating would give no sense of phrasing. This technique also applies to the flutist with one slight variation. When the flutist is using vibrato it is necessary that he or she keep the vibrato flowing between notes during slower tempos. However, the flutist also needs to drop the vibrato during rapid passages in order to maintain clarity of notes.

Another violin teaching technique that could prove helpful to a flutist is Leonid Kogan's idea concerning "trembling vibrato." Kogan, a violinist and professor at the Moscow Conservatory, insists that the student with a trembling vibrato play a slow scale without vibrato. This will enable the student to hear a pure sound without vibrato. Then he would instruct the student to gradually return to the vibrato but only to the extent that it could be controlled. Once the student has eliminated the trembling vibrato or any other basic problems with vibrato, Kogan will work on the student's continuous flow of vibrato. Basically this means that the vibrato does not stop between notes.

A majority of the violin concepts previously stated could also be applied to the flute. However, this writer did come across one concept on teaching violin vibrato that is not normally applied to the flute student until a few years later.

Olstead and others believe that if a violin student begins to play in the fifth grade, after about two years of basic study the student should begin to work on his or her vibrato (Olstead, 1979, p.72). The flute student normally would not be ready for the concept of vibrato until after at least three years of basic study including band in the public school and private lessons. This writer believes the reason for the flutist's delay is due to the vibrato resulting from the breath support and the throat, as opposed to the violinist's vibrato in the left hand. A flute student who is taught vibrato before gaining complete control of breath support faces an uphill struggle in correcting poor breath support.

There seem to be two basic approaches when it comes to teaching violin vibrato. Sol Babitz, violinist and teacher, wrote the following concerning these two basic approaches:

Some violin teachers believe in the old idea that vibrato is a natural thing which usually develops spontaneously during the development of the pupil while others are equally certain that it can and should be taught as early as possible.

(Babitz, 1954 )

Most violin teachers who favor the natural development theory also favor not interfering with the vibrato of advanced players. However, those who do favor corrective teaching also believe in teaching with regard to what is called a faulty vibrato. A faulty vibrato is considered to be vibrato that does not enhance the violinist's tone to the fullest. The teacher needs to proceed very carefully when attempting to teach or correct an advanced student's vibrato. "The most successful artists with the most beautiful tones today were not taught to

vibrate" (Babitz, 1954). They were encouraged to listen to many professional violinists who had perfected their vibrato; however, the main emphasis was on a natural and individual tone (vibrato). It was believed that the student's vibrato would become like his or her own personal speaking voice. A trained vibrato will sometimes lack personality, and it will sound mechanical if it is too measured and regular. However, if a student is trying to copy somebody else's vibrato, there are exercises that will help him or her copy the other person's tone. Usually the student's tone will still lack something of the original model because "the real beauty of a fine tone lies in its individuality, not in the correctness of its speed or width" (Babitz, 1954). This writer agrees very strongly with this theory of not teaching vibrato.

Flute teachers are also divided on the subject of teaching vibrato. Today there are just as many flutists who were taught vibrato as there are who acquired a natural vibrato. The difference is usually easily detected because the student who was taught vibrato tends to overuse it. This student's vibrato also tends to be a little too slow or too fast. A flutist with a good natural vibrato will tend to have more even vibrations and of course a very individual sound. The issue of instruction versus non-instruction of vibrato should only be considered for the advanced student. Most young students (flute or violin) will require instruction on how to begin producing vibrato. However, once they have passed the beginning stages of producing vibrato, Babitz recommends that the teacher should back away from the subject. He even cautions the teacher on correcting a faulty

vibrato.

"Teachers should use great restraint in correcting vibratos, and particularly in the case of young players, they should not attempt to improve an adolescent vibrato to mature standards, thereby interfering with natural development. Vibrato fixing is a new and dangerous toy and should be used only when natural development seems to be lagging (Babitz, 1954).

### Vocal Vibrato

The vocal vibrato should be of interest to all instrumentalists mainly due to its natural and smooth ability to move/glide from one pitch to another. However, it also is not without problems and teaching difficulties.

"One of the most perplexing problems for the choral director is the obtrusive vibrato" (Anderson, 1779, p.212). The same is also true in regard to a flutist's vibrato. Anderson believes it is necessary to understand the entire philosophy of vocal vibrato in order to tackle a specific problem such as "obtrusive vibrato." The following categories contain material that could easily be applied to flute vibrato.

### Natural Phenomenon

Vocal vibrato is usually considered as an acoustic representation of rapid and continuous changes in pitch and intensity. Vibrato is considered the fastest variation on pitch that the human mechanism is capable of producing.

It is an important quality to a healthy and trained vocalist. Vocal vibrato is considered to have a free and natural swinging of notes that other instrumentalists work so diligently



to obtain. The percentage of vibrato among the singing tones of trained singers is very high, around 95% of their total singing tones. Most singers find it very difficult to produce one song or even one note without the use of vibrato. "Vibrato is perceived as a fusion of the varied pitches and intensities employed, which in part explains why so many singers can use vibrato effectively to the enrichment of their voices" (Mason and Zemlin, 1966).

A well-developed human voice vibrates in pitch, intensity, and timbre. Vibrato should indicate to the listener a free but energized sound; unfortunately this is not always the case. A vocalist who sings with vibrato is definitely more interesting than one who sings without vibrato. For years string players have tried to perfect a vibrato that is as free and as natural as a vocalist's vibrato (Anderson, 1979, p.212). Flutists are sometimes referred to a good voice instructor in order to learn to open their throats and use a freer, less restricted vibrato. One renowned flutist who studied with a vocalist for an intense year is Jean-Pierre Rampal. He often comments (in various articles and at master classes) on how one year of studying voice enhanced his flute playing more than he had ever imagined it would. Today only a few flute teachers have truly accepted the value of having a flutist study voice.

Sometimes a straight tone may be more desirable in vocal music such as in church music, e.g., Medieval and Renaissance motets. However the straight tone does several problems that are difficult to correct. For example, when the chorus sings with a

straight tone, the intonation becomes more critical and tuning more difficult. Voices are not as easy to tune as a piano due to the vast differences in vowel colors, vocal tracts, and articulations. Straight tones are also very difficult for the singer to sustain and they tend to cause a great deal of fatigue for the singer. The straight tone is often avoided, especially in a chorus, due to these problems and several others (Anderson, 1979 p.213).

The flutist has similar problems in regard to the straight tone. The major difference is that flute students (young and advanced) are encouraged to practice with a straight tone periodically. They are even encouraged to play the Baroque repertoire with less vibrato than normal. Occasionally the flutist will be asked to perform the Baroque repertoire in the original style. This usually requires the flutist to abstain from the use of vibrato completely. The straight tone on the flute is not nearly as difficult to tune as the vocal straight tone. Nonetheless when playing in a band or orchestra the vibrato does tend to cover some of the slight variations of pitch between instruments. The flutist, like the vocalist, produces a much more interesting tone with vibrato than without it.

The vocalist, like the violinist and the flutist, should not be discouraged in his/her use of vibrato but rather should be encouraged to acquire an individualized and controlled vibrato. Often vocalists are not aware of the amplitude of the vibrato that is projected to the listener. What they think they are producing is not always what is heard.

"What is perceived by the mind through auditory feedback is the primary consideration of the 'control loop' theory; thus, the singer, from the onset of phonation, must try to change from the tone he hears himself sing to the tone he wishes to sing as quickly as possible (Smith, 1972).

The flutist has the same problem in adjusting his perceived tone to what the listener is actually hearing. The "control loop" theory was labeled and tested by Deutsch and Clarkson in 1959. Deutsch and Clarkson do not really offer answers in correcting this problem. They simply reveal documented test results that attempt to explain what is physically perceived by the singer. (For more details concerning the testing of the "control loop" theory see Smith, 1972, p. 28).

#### The Physiology of Vocal Vibrato

There are numerous opinions as to what actually occurs physically to produce the vocal vibrato. Ethel Smith believes that vibrato is "created by high laryngeal controls which are evident in the vertical movement of the thyroid cartilage" (Smith, 1967, p.2). When the larynx is in control the singer is not able to regulate the vibrato rate. Also, the frequency variation tends to be mainly above the true pitch of the tone. When the singer sings piano, the frequency variation tends to exceed one-quarter step above the tone. When the singer sings forte, the frequency variation can be as much as one-half step above the tone. The vibrato actually acquires the characteristics of a tremolo when the singer is singing.

When vocal vibrato is correctly produced, the vibrato

becomes an ornament that is directly related to the sensation of support. Physically the vibrato is controlled primarily by the muscles of the respiratory system assisted by the larynx. "The vibrato is produced by minute alterations of body pressures which are reflected in undulations of the breath column" (Smith, 1967, p. 2). This variation in the air pressure causes the pitch to rise and fall as the singer attempts to control the pitch by keeping "the mass, length, and tension of the vocal folds constant. The rate at which the pitch fluctuates depends upon the balance of the suspended tension of two muscle groups" (Smith, 1967, p.2).

Variations in the vocalist's air pressure affect vocal intensity, therefore exhalation must be under control or the sound pressure levels will cause the larynx to make adjustments that will interfere with the vocalist's tone. Experimental studies have demonstrated that while the air flow is held constant, the volume of the sound can be expanded by the contraction of the glottal muscles alone. Applied to the vocalist,

"if a tone is not properly supported and a subject vocalizes on a less than optimal flow of air, desired levels of loudness may be attained by greater muscular effort at the glottal balance [throat muscle], some form of vocal strain will eventually occur. Exhalation seems to be one of the keys to preventing vocal disorders. It must be smooth and no air should escape without producing the maximum tonal sound that the music requires" (Rubin, 1966, p.22).

There appears to be some controversy on how this control is achieved; however, most teachers teach an abdominal type of

breathing. The upper part of the chest is fixed in the inspiration position, while the lower abdominal muscles contract during exhalation and relaxed during inspiration (Rubin, 1966, p.22). In his book, The Singer and the Voice, Arnold Rose (cited in Smith, 1967) explains breath pressure in the terms of abdominal tension and diaphragmatic tension. Rose states :

The greater the tension directed to the abdominal muscles, the greater the amplitude of the vibrations and thus the greater the power of the tone. Also, the greater the closure of the glottis, which tends to increase the pressure.

The greater the tension direction to the diaphragm, the less the inward movement of the thorax, the less breath is expelled and the smaller the mass of vocal cord in vibration. Conversely, the more the diaphragm is relaxed, the greater the contraction of the chest cavity, the more breath is used and the greater the mass of vocal cord in vibration (Rose, 1962, p.91-92).

Rose's theory on abdominal tension and diaphragmatic tension and Smith's electromyographic study of abdominal muscles and the rate of vocal vibrato is very similar to Gartner's explanation of diaphragm and throat vibrato for the flutist. From Smith's electromyographic investigation the flute teacher can acquire a greater knowledge and understanding of what is actually happening in the throat during vibrato production.



## Chapter VII

## SUMMARY

Conclusion

## Chapter I

A historical study of flute vibrato which includes the historical and pedagogical aspects which will assist a qualified flute teacher in helping their students to develop their own individual vibrato. In this writer's opinion, there are a limited amount of studies written in the area of flute vibrato. Many of the commentaries that exist have the tendency to focus on one special aspect of flute vibrato, or they cover the topic too broadly. The flute teacher of today needs to know every technique or approach possible before attempting to teach or direct a student in producing vibrato.

## Chapter II

It is necessary for the flute teacher to have a thorough knowledge of the history of vibrato. By studying historical vibrato, one becomes aware of the different types of vibrato flutists have used over the years. Pitch vibrato is thought to be one of the earliest vibratos, beginning around 1707. Intensity vibrato was first used in the Baroque era as a type of swell on a single note. Timbre, also known as tone vibrato does not appear to have existed until around the 1800s. This particular vibrato evolves from intensity vibrato and is dependent upon the physical make-up of the flute.

There are a few early sources which one can learn more about how flute vibrato originated. Agricola's book (1528) is one of the earliest books published on musical instruments. Vibrato in this book is talked of as being used as an ornament. In 1636, Mersenne writes about vibrato used as a type of tremolo. The early wooden flutes required yet another type of vibrato known as finger vibrato. In Hotteterre's book (1707), one finds a detailed explanation of the two ornaments relating to vibrato on the wooden flute, the battement, and flattement.

In the 18th century, a vibrato produced by force of air begins to develop. Quantz defines vibrato in his book (1752), as a swelling and diminishing on a note with a finger flattement on the nearest hole. In 1761, Delusse writes about a breath vibrato which attempts to imitate the organ vibrato.

In the 19th century, interest in flute vibrato continues to grow. The following authors and flutists comment on different techniques involved in producing an effective vibrato; Jams, Nicholson, Coche, and Carte.

Vibrato of the late 19th and 20th century was mainly concerned with a shimmer in the tone and a fast, continuous pulsation in the tone. Taffanel, and his student Gaubert, were two of the first flutists to advocate this type of vibrato. Moysé, a student of Gaubert, calls the flutist's attention to the use of vibrato as a musical expression. In the early 1900s, Moysé showed concern about the misuse of vibrato and commented that it was often performed very poorly.

Georges Barrere and Georges Laurent were two of the first

flutists to bring vibrato into the United States, while the British and Viennese were among the last to even consider using vibrato. Vibrato was finally accepted by the American orchestral woodwinds by 1940. However, prior to 1940 there was great controversy on the use of vibrato in the orchestra or any chamber wind ensemble. It was Barrere's vibrato that became the United States' first vibrato. Although his vibrato was very rapid and shimmery in tonal quality, he constantly guarded against the overuse of vibrato. William Kincaid was the first American flutist to develop a slower, smoother vibrato, with varied speeds and expanded intensity.

Taffanel, Gaubert, Moyse, Barrere, Laurent, and Kincaid might be thought of as innovators in their own time. Like the American pioneers, they brought forth new and original concepts to the flute world.

### Chapter III

It is necessary to give consideration to composers' intentions and the different styles of the period. Chapter III considers stylistic practices of flute vibrato in Baroque, classical, and avant-garde music.

The use of vibrato in the music of J.S. Bach refers mainly to the flute sonatas, and three religious works. Many of Bach's works were originally written for recorder. However, in his religious and orchestral works he used both the recorder and the transverse flute. The Suite in B minor and the Brandenburg Concerto No. 5 were written for the transverse flute, while the

second and fourth Brandenburgs call for recorder. There seems to be some question as to use of the modern transverse flute instead of the recorder as indicated by the composer. The modern flute produces a much shriller sound than the wooden Baroque recorder. However, in Schweitzer's opinion the overall effect does not seem to suffer due to the use of the wooden flute. However, it is this writer's opinion that modern performances of Bach's works will tend to differ from the composer's intentions due to the changes in musical style and the construction of the flute.

Although there are differences of opinion among flutists on the use of vibrato in Bach's music, some common ground does exist. Both Willoughby and Moyses believed that vibrato should be used strictly as an ornament or as enrichment to the tone. The vibrato should be used sparingly and only for the important notes and phrases.

Moyse spent a great deal of time studying the effects of vibrato in Baroque and early classical music. Unfortunately, his results were at first disillusioning. His sonority became harsh, while his intonation became unstable. However, through diligent study of the violin, voice vibrato, and continuous practice on the flute he was finally able to produce a vibrato and tone that was superior to the other flutists of the time.

In the Classical era, the Mozart Concertos, No. 7 in G Major (K.313) and No. 2 in D Major (K.314) are two important works of the flutist's repertoire today. It is through careful study of the classical style that one can determine the correct or appropriate use of vibrato for these concertos. Although the two

concertos were both completed by 1778, some flutists, such as Moyse, Kincaid, and Peck, interpret the G Major concerto in a pre-Classical style (this writer tends to support this interpretation).

There appears to be no dispute over the D Major Concerto. Kujola suggests that the D Major concerto should be played in strictly the classical style, with trills started on the written note and not approached from above as in the Baroque era. The rapid changes in the design of the flute during the classical period might also have influenced some of the vibrato changes during his period. A type of timbre vibrato was just beginning to be used in the classical period. The timbre vibrato was used to bring out as important note in a phrase or to outline the melodic lines. Also, metal flutes were much more responsive to the vibrato vibrations than the wooden flutes. The most important factor of vibrato in the classical period was controlling the speed and depth of the vibrato.

Vibrato is usually used more extensively in a flutist's solo repertoire than in the orchestral repertoire. In solo works the flutist does not have to worry about blending with other instruments. However, there are some guidelines that have been established by William Kincaid which a flutist should take into account. Kincaid points out how vibrato can affect the intensity of a note in a scale and warns against the use of vibrato in running passages.

In the orchestra or chamber ensemble it is necessary that all the woodwind vibratos blend smoothly together. It is also



important that the flutist be in complete control of the vibrato in order for the woodwind chair's tone to blend together. The speed of the vibrato should be adjusted to the tempo of the music. The allegros would have a faster speed and be more brilliant in timbre. Taff believes that the vibrato in the lower register should be slower while faster in the higher register. This writer does not agree with Taff on this point. The register that the flutist is playing should not completely determine the speed of the vibrato. The speed and timbre of the vibrato should be determined from the music. We are reminded by Moyse that there is nothing worse than a musician who believes their vibrato is the best and will not blend with the other members of the orchestra. Taff's comments on the flutist's vibrato in the following orchestral works; Brahms Symphonie No. 1, Mendelssohn's Fingal's Cave Overture, and Debussy's Prelude a' L'Apres-Midi D'une Faune. Taff's comments on these three works are accepted and followed by most professional flutists's today.

Intensity vibrato is the main style of vibrato for the modern flutist. However, the timbre (tone) vibrato is also used in conjunction with the intensity vibrato. In modern or avant-garde music, the timbre will need to be altered a great deal in order to give the effect the composer desires. In avant-garde music a spread vibrato (out of focus) is often used and will tend to accent the stuffy timbre which is produced. Often in avant-garde music, the composer will write N.V., meaning no vibrato, over a certain pitch or pitches. A majority of the time these N.V. notes are in the flutist low register or the extreme high

registers from a3 and above. Some composers will require the flutist to vary the speed and/or the intensity of their vibrato in order to create the desired effect. Reynolds, an avant-garde composer, uses three types of marking to specify the type of vibrato he wants; N.V. (non vibrato), V (normal vibrato) and S.V. (stressed vibrato). Although Reynolds does specify which vibrato is to be used, Harby is even more specific in his vibrato instructions. He uses a sliding scale from zero to ten to show how much vibrato is to be applied to a particular note. This writer concludes that avant-garde vibrato tends to be very detailed and specified, compared to the traditional or early styles of flute vibrato.

#### Chapter IV

Gartner's experiments and studies focused on discovering if vibrato is produced in the throat, the diaphragm, the throat and diaphragm, or mainly in the abdominal muscles. He researched and explained the two separate muscle systems from which vibrato is produced. It is the contractions and relaxations of the diaphragm which produces the vibrato at a slower speed. When the vibrato speed increases the diaphragm is less involved, while the larynx is more involved. During fast vibrato the larynx is exclusively used over the diaphragm. Gartner gave background information and a detailed account of the anatomy concerning both the breathing and support techniques. The two large muscle systems of the abdomen are the diaphragm and the thoracic muscles. The diaphragm is considered the most important muscle

in regard to breathing.

Support is a fundamental prerequisite for good tone, whether with or without vibrato. Gartner then explained and defined the support that is necessary for a flutist to acquire. He considered support to be both a natural and unnatural process. The inhaling muscles are relaxed during the natural exhalation, while the exhaling muscles are tightened. These muscle groups are tightened in an isometric manner creating a balance between the inhaling and exhaling muscles. Therefore, the steadier the flutist supports the breath, the more control they will have over their airstream. The weaker the support of the breath, the less control the flutist will have.

In regard to experimental techniques, Gartner chose electromyography. This technique proved to be the best suited for testing muscle actions that are synchronous with vibrato. It measures minute voltages generated by electrochemical muscular contractions, too small to be seen by the human eye. Electronic devices are used to amplify and record the electrodes. Gartner had twelve flutists participate in the electromyograph experiments; each of the flutists produced a straight tone and five different types of vibrato. They were then asked to perform three designated orchestral excerpts. The four muscle groups in which Gartner experimented were the abdomen, chest area, diaphragm, and larynx.

Needle electrodes were first used to study the abdominal muscles. Although accurate in measurement this process proved to be too painful to for the flutists involved in the experiments.

The needle electrode experiments gave way to the use of skin electrodes. The skin electrodes were then used to study the abdomen, chest, and larynx muscle groups. In order to study the diaphragm, a special probe had to be constructed which had an electrode attached to the interior end. A rubber balloon was used to insulate the electrode connections. A myograph was also used to study the activity of the larynx. Gartner then used X-ray sound films to back up his findings from the myograph technique. He concluded that the activity of the archothyroid muscle during vibrato was simultaneously active with the laryngeal muscles. Gartner also used skin electrodes on the face to monitor the moment of the muscles around the embouchure.

## Chapter V

There are two basic types of vibrato used on the flute today, the diaphragm and throat vibrato. The diaphragm vibrato is produced by the abdominal set of muscles which control one's breathing. The vibrato is actually produced by the diaphragm and the abdominal wall muscles pushing against one another. Osborne uses a fluoroscope machine to study the diaphragm vibrato. The fluoroscope function similar to a simple X-ray except it X-rays the internal structures. Although the fluoroscope has proven to be a useful technique, Gartner's probe (with the electrodes attached) is a more accurate technique in this writer's opinion. The fluoroscope reveals that the diaphragm does not cause the vibrating sound that most flutists expect it to produce.

One of the most important techniques in vibrato production

is being able to control the speed. Weisberg explains how vibrato is an pulsation of air placed on a pre-existing column of air. Another important component of vibrato is the amplitude, which is basically the difference between the minimum and maximum dynamic level. The flutist should cautiously watch the pitch when working on control of the amplitude.

The two basic methods for teaching diaphragm vibrato, are by Garner and Osborne. (Osborne's methods have been previously stated.) Gartner uses a combination approach for teaching this vibrato, which is a rote physical approach and an intellectual approach.

It is also necessary that a flutist have a good concept of breath technique before trying to produce a vibrato. Maxym believes that breathing is acquired in three stages; the diaphragm breath, the chest breath, and the reserve breath. Maxym suggests a whole series of exercises to help the flutists reach the maximum ability in breath control. This writer finds the breath control exercises by Toff more practical in teaching a student breath control. Gartner's exercises in teaching diaphragm vibrato are very accurate and actually help the student feel the intercostal muscles working. While Osborne's exercises are very similar to Gartner's it is this writer's opinion that he overemphasizes a strict rhythmic approach to the beginning student.

In throat vibrato the back of the tongue is against the throat, and the throat becomes more restricted when the pulsations of the vibrato increase in speed. The vocal cords

opening and closing in varying degrees help to produce the throat vibrato. Gartner's diagram of the larynx and vocal cords help us to visualize the opening and closing of the larynx and vocal cords.

## Chapter VI

This writer chose to do a comparison study of violin vibrato and vocal vibrato to flute vibrato. The violinist and vocalist were selected due to the stability and maturity their particular vibrato has acquired over the years. The violinist offers the flutist a very detailed history of vibrato. The history of violin vibrato reveals comments on vibrato by predominant violinists and teachers, dating from the early 1700s to 1973.

Leopold Mozart cautions the violinist on the overuse of vibrato and how to apply the vibrato only at the end of a composition or on a long note, not during moving passages. While Flesch on the other hand, considers vibrato to be an essential part of the violinist's tone. He stated that vibrato should not be restricted only to slow passages. In the 1930s, Robjohn emphasized that each performer should have their own unique style. He also believed it necessary for the student to learn to control the width and frequency of their vibrato. Whone points out that vibrato by itself does not produce intensity. It is the frequency of the vibration that helps to produce intensity. Therefore, in order for the violinist to produce a vibrato that really enhances the tone there must be a balanced combination of frequency and vibration.



Whone also mentioned that a violinist may produce different emotions or colors by varying the intensity of certain notes. This is also known as timbre vibrato. Flutists should strive to vary the intensity in order to produce different emotions or colors. Donald Peck, principle flutist with the Chicago Symphony Orchestra, is able to produce an extraordinary range in different colors or emotions by varying both the intensity and having meticulous control of his embouchure.

Whone does not recommend varying the vibrato during fast passages, instead he believe it should be reserved for slower passages. It is necessary for the flutist to keep the vibrato flowing between notes during slower tempos, but to leave out the vibrato completely during fast passages.

Kogon, a violinist, insists that a student with a trembling vibrato play a slow scale without vibrato, so that they will hear a pure sound. It is necessary for a flute student, working on vibrato, to constantly return to scales, long tones, and simple melodies so they will retain the true pitch or sound.

Babitz introduces the two basic approaches to teaching violin vibrato. Some teachers do not believe in teaching vibrato at all, rather they think it should come naturally. However, there are other violin teachers who believe that vibrato should be taught as early as possible. Flute teachers have also divided themselves into these two areas of thought, although they are not as aware of the division as violin teachers. Today, a majority of flute teachers tend to fall into the teaching category simply for its simplicity or directness with the student.

This writer does not completely agree with this approach. Instructions should on be given at the point the student first begins to produce a vibrato. They need to be shown basic diaphragm exercises (such as Gartner's) and be reminded to always use correct breath support. After this has been accomplished the teacher should not discuss vibrato and allow the student to create their own individual vibrato. When the student has reached an advanced level of skill, the teacher should encourage the student to vary the vibrato in order to acquire greater control, flexibility, and color.

The vocal vibrato is the vibrato that all instrumentalists should study due to the natural and smooth ability to glide from one pitch to another. Vocal vibrato can produce a very free and natural vibrato that other instrumentalists only acquire through very diligent practice. A vocalist uses vibrato for 95 percent of their total singing tone. It is very difficult and a great strain on the vocal cords for them to sing without vibrato. A well developed voice is also able to vibrate in pitch, voice, intensity, and timbre. Unfortunately, many vocalists are not able to produce a free and energized sound. Sometimes the sound will become restricted due to the tightening of the throat or the lack of air support. However, a good voice teacher can be a great help to a flute student who is closing their throat and making throat sounds, or producing a very this or shallow sound. As a new voice student they will relearn breath support and how to control the use of air. Next the voice teacher will have the student lower the back of their tongue, and raise the palate in

order to produce a smoother movement from one note to the next. The vocalist is also encouraged to create there own individual vibrato. The teacher will usually only comment on removing obstacles that might interfere with the vibrato. This writer highly recommends that serious flute students take at least one year of private voice lessons. The student will walk away with a greater understanding of their body's physiology in required to breath control, open throat, and vibrato.

#### Suggestions for Further Study

The study of flute vibrato has become an absolute necessity for the prospective flute teacher. It is necessary for the teacher of advanced students to have as great a knowledge and understanding as possible about a flute technique that is as individualized as vibrato. This paper contains experimental studies, and a historical application to teaching flute, however, current experimental studies on teaching flute vibrato are not included. The next step would be to observe students at various ages and levels whose teachers are applying some or all of the teaching techniques presented in this paper. In order to be an accurate study, this would need to be a long-term study, over a period of two to four years. This writer has found her study to be very valuable and has already applied some of these techniques with current students.

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