

Improving tone production on the flute with regards to embouchure, lip flexibility,
vibrato and tone colour, as seen from a classical music perspective

by

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Abstract

An investigation was done on the methods used by performers of classical flute music to improve their flute tone. A literature study was done and a methodology created. This resulted in detailed dissection and then discussion of the various aspects that influence flute tone. Thereafter a series of practice charts were developed, which can be used to guide performers, students and teachers in their experiment to improve and diversify flute tone.

The key areas of flute tone that were examined are: embouchure, lip flexibility, vibrato and tone colour.

It has been found that different methods work for different people to improve their flute tone, and therefore personal experimentation is necessary in order to achieve the required tone, which also depends on personal taste.

Keywords

Flute tone, Interpretation, Experimentation, Practice charts, Embouchure, Lip flexibility, Intonation, Vibrato, Tone colour, Resonance.

Opsomming

'n Onderzoek is gedoen om die metodes te bepaal waardeur uitvoerders van klassieke fluitmusiek hulle fluittoon verbeter. 'n Literatuurstudie is gedoen en 'n metodologie is geskep. Dit het gelei tot 'n gedetailleerde analise en bespreking van die verskeie aspekte wat fluittoon beïnvloed. Daarna is 'n reeks oefenkaarte ontwikkel, wat gebruik kan word as 'n gids vir uitvoerders, studente en onderwysers tydens hulle eksperimentering om fluittoon te verbeter en uit te brei.

Die hoofpunte van fluittoon wat ondersoek is, is: embouchure, lipsoepelheid, vibrato en toonkleur.

Dit is bevind dat verskillende metodes suksesvol is vir verskillende mense om fluittoon te verbeter en daarom is persoonlike eksperimentering noodsaaklik om die verlangde toon – wat van persoonlike smaak afhang - te verkry.

Sleutelsterme

Fluittoon, Interpretasie, Eksperimentering, Oefenkaarte, Embouchure, Lipsoepelheid, Intonasie, Vibrato, Toonkleur, Resonansie.

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Chapter 1: Introduction

1.1 Motivation for the study

Returning to a career in music after working in Information Technology for a few years, I faced the challenge of returning my own flute playing to an acceptable standard. Having not played the flute for a few years, I found the initial challenge to be good tone production. Tone production is in my opinion the most important aspect of flute playing, because the player has to produce the flute sound through adequate embouchure formation and blowing technique, as opposed to an instrument such as the piano where basic tone production is achieved through 'simply' pressing down the keys. Furthermore, on any instrument, technique and musicality will likely not woo an audience unless a pleasing tone is produced. Garner (1998:69) says that good tone is an essential element of any flutist's total package as a musician, because if the flutist does not produce a sound that is pleasing to the ear, no one will want to listen to it.

The quest to produce a good flute tone is an ongoing one, a task that flutists will continually work on throughout their careers. It is important to know how to make continual improvement in flute tone, to be able to practise constructively and not have a vague hope that the time spent will in some way result in improved tone. The vast amount of information available on the topic of flute tone production indicates the importance of the subject. This information is however spread among a wide variety of sources and contains different approaches and methodologies to producing good flute tone. I will attempt to condense this information, infused with my own experiences, into one comprehensive document and draw up practise charts that can be used by flutists, teachers and students to practise in a constructive way that will produce the desired results.

1.2 Aim of the study

The aim of this study is to determine how to improve tone production on the flute, in order to help

- i) performers to further improve and/or diversify their tone quality,
- ii) teachers to gain insight into tone production techniques,
- iii) learners to progress quickly and effectively on the flute.

The aim of this research is not to promote the methods of any specific flute school, but rather to list the different methods used by the different schools, in order to give the reader a comprehensive overview of techniques available to improve flute tone. This information can then be used by the reader to experiment and find an individual approach towards improving flute tone.

The research question can be formulated as follows:

How can a flutist, as a performer of classical music, improve his / her tone production with regards to embouchure, lip flexibility, vibrato and tone colour?

This question will be investigated from the points of view of the performer, the teacher and the student flutist.

1.3 Delimitations of the study

The dissertation focuses on the improvement of flute tone production without taking into account the material or the make of the instrument, and for the following reasons:

1. A series of experiments have been performed by Prof. Joan Lynn White of Appalachian State University to determine differences in the tonal spectra of five otherwise similar Muramatsu flutes made of varying materials. Two were of sterling silver, and one each was of 14 carat gold, white gold, and palladium. The results of her experiments suggest that there is more tonal variation obtained on any particular flute from one flutist to another – and from performance to performance by any particular flutist – than there is between the different flutes made of different material. (Phelan 2001:39.)
2. Robert Dick (1986:9) states in his book *Tone Development through Extended Techniques* that the tone of the flute is not just the tone made in the instrument, but it is a complex combination of the flutist and the flute. He explains how the sound resonates inside the body of the flutist and therefore affects the resulting tone. This view of the tone as a combination of resonators explains why several players can play the same flute and sound different, as well as why one flutist, playing on several different flutes, sounds essentially the same.
3. Marcel Moyse (1998:17) acknowledged the fact that the individual is more important than the flute: “The characteristics of the flute itself interest me less. So many rich amateurs own magnificent

instruments and play them so poorly ... so many metals stop vibrating when hands touch them..."

It will be assumed throughout that the flutist is in possession of a good quality flute capable of producing a 'good tone'.

There are physical limitations to producing good flute tone. For example a bad posture will have an adverse effect on tone production. This dissertation will not deal with physical limitations or the ways in which to remedy such limitations, but will assume that the flutist has no physical limitations to playing the flute and has a playing posture conducive to the production of 'good tone'.

1.4 Problems encountered

Flutists, authors and teachers have different opinions on improving flute tone, and for the following reasons:

1. Most of the changes that need to be made by a flutist in order to produce good tone are inside the flutist's mouth. These changes are not easily visually perceptible due to the fact that the facial muscles are very small compared to other muscles. The changes that can be perceived by watching a flutist play do not give enough information to adequately describe the physical efforts involved in producing good flute tone.
2. As it is not possible to describe the physical aspects of tone production from an objective viewpoint, we draw on the experiences of great flutists to tell us how they produce tone. Due to the incomplete knowledge of the anatomy and physiology of the face, these flutists are unable to accurately describe exactly what they do to produce good tone, and the information received from them is highly personalised. Even though two flutists might use exactly the same formulae, due to their different subjective experiences, each will give a different explanation when asked how good tone is produced.
3. Due to the physiological differences in people, different things work for different people. "We probably should concede that the incredible complexity and individuality of the muscle-nerve network of the human face preclude the likelihood of anyone coming up with a universal approach that will work perfectly for everyone" (Kujala 1994a:10).
4. There are different opinions as to what good flute tone is. If there is no agreement on the outcome that is attempted, the methods are likely to vary.

A short discussion follows on the topic of what good flute tone is.

1.4.1 What is good flute tone?

A person's conception of what good flute tone is seems to correlate with the influences and experiences he / she has had with regards to flute tone.

In the early twentieth century, there were different national schools of flute playing, the most prominent being the French, German and English schools. The French Flute School used metal flutes of the modified Boehm system hand-crafted by Louis Lot and others, and a playing style that featured a light tone and vibrato. It stood in contrast to the mostly wooden instruments German and English flutists played using a strong and steady sound. In the German school there was a kind of articulation, of maintaining the tone, which seemed to derive from the Baroque style. (Wye 1988:6; Powell 2005; Meylan 1988:123)

According to Wye (1988:6; 1993:11), the national characteristics of flute playing in any specific country were the result of the influence of one or more well-known performers in that country. In the early twentieth century, teachers used books of studies, but mainly drew on their own experiences as performers to help their students. As individual experience is unique, the influence of great teachers on their students was different from teacher to teacher and from country to country. This caused diversity in flute playing worldwide.

Travel, recordings and radio gradually started to merge the different national styles of playing. As people came into contact with the playing styles of other countries, their own ideas as to what good flute tone is, started to change. Present day flutists have become accustomed to recordings, compact discs, cassettes, national and international conventions, well-equipped music shops, and an enormous range of flutes, head joints, accessories and learning aids. (Wye 1993:11; Clardy 1996:10)

Bruderhans (1997:120) explains that in addition to the above-mentioned reasons, a more unified idea of ideal flute tone developed because of the need for a method of tone production which would be most capable of coping with the requirements of the music, as well as with the acoustics of modern

concert halls. These requirements are stated in Table 1.

<i>Musical requirements</i>	<i>Acoustical requirements</i>
<ul style="list-style-type: none"> • wide range of dynamics and colours over the whole range of the instrument • clarity of articulation • smooth legato • correct intonation 	<ul style="list-style-type: none"> • projection of all levels of dynamics and colours even in big concert halls • good projection in competition with other instruments (in an ensemble) • clarity, smooth legato and contrast when recording

Table 1: The musical and acoustical requirements with which a flutist needs to be able to cope

Meylan (1988:124) is of the opinion that after 1960 flute playing was in danger of becoming standardized worldwide because records and rapid travel helped to ensure the prevalence of the post-war French school, which was dominated by Jean-Pierre Rampal. Although the wide availability of recordings, information and performances by international flutists initially had an effect of unifying worldwide ideals of flute tone, after some time the same elements became the cause of diversification. With the wide availability of literature in books, magazines and Internet articles, individuals gain access to an ever-widening knowledge base. The latest innovations are made known worldwide very quickly. Internet discussion groups make it easy to share opinions worldwide. The different opinions encountered in these discussion groups, prompt the individual to form personalised opinions. Students have access to teaching materials over the Internet to form ideas different to those encountered in the teaching studio.

In addition to the availability of information and sound examples, a large variety of instruments are available to choose from. These don't only include Boehm flutes, but also Baroque flutes, modern wooden flutes such as those made by Powell and Yamaha, wooden head joints for silver flutes, sliding head joints, and flutes made of different materials like platinum, palladium and carbon fibre. These instruments all have different tonal output and a different range of tone colours.

Another reason for diversification is the demands of composers: the flute music of the avant garde makes use of chords, microtones, noises made by the keys, tongue clicking, multiphonics, singing while playing, etcetera. These auxiliary sounds are not new to flute playing, though traditional methods of classical music deemed them to be incorrect until the twentieth century. There is a

changed attitude to investigating these features, both to including them in performances, and to the manner in which they are perceived aesthetically. (Meylan 1988:126; Dick 2002.)

In addition to all of the new advances that lead to diversification, people are also reconsidering methods used to perform traditional classical music. Different opinions now exist as to the ideal flute tone for traditional classical compositions. Baroque flutes are increasingly popular in trying to recreate true baroque sonorities. Modern wooden flutes have become more popular, even for orchestral repertoire (Burgess 2001; Brahms 2003; Krychman 2004).

Conclusion:

It is clear that it would be very difficult to define exactly what good flute tone is. Good flute tone varies according to the type of music being played, the time period, the techniques used by the composer, the type of instrument used, and personal taste. Because there are different opinions as to what good flute tone is, there will most definitely be different opinions as to how to improve flute tone. I attempt to group the methods under relevant topics and focus on similarities rather than differences, because focusing on similarities should point out those techniques that work for the majority of flutists. I attempt to give a condensed, but comprehensive, overview on improving flute tone.

The quest for good flute tone is a very personal one, where individuals need to experiment to find their own best flute tone. But what would be the most efficacious way to go about this?

1.5 Research methods

The information gathered from an extensive literature study is combined with personal performing and teaching experience so as to develop an effective methodology for improving tone production on the flute. Opinions, suggestions, ideas and the results of personal practical experience and practical experimentation are analysed, investigated and compared; thence that information which will inconclusively lead to the acquirement of “good flute tone” is systematically correlated and catalogued.

The sources consulted for the literature study include books, magazines, Internet articles and Internet discussion groups. More than a hundred sources have been consulted in an attempt to get a comprehensive understanding of the different methods used by flutists to improve flute tone. This

information has been condensed into the relevant chapters to give a detailed discussion of each topic. The material has further been condensed into practise charts that can be used in a practical way to experiment with the different aspects of flute tone.

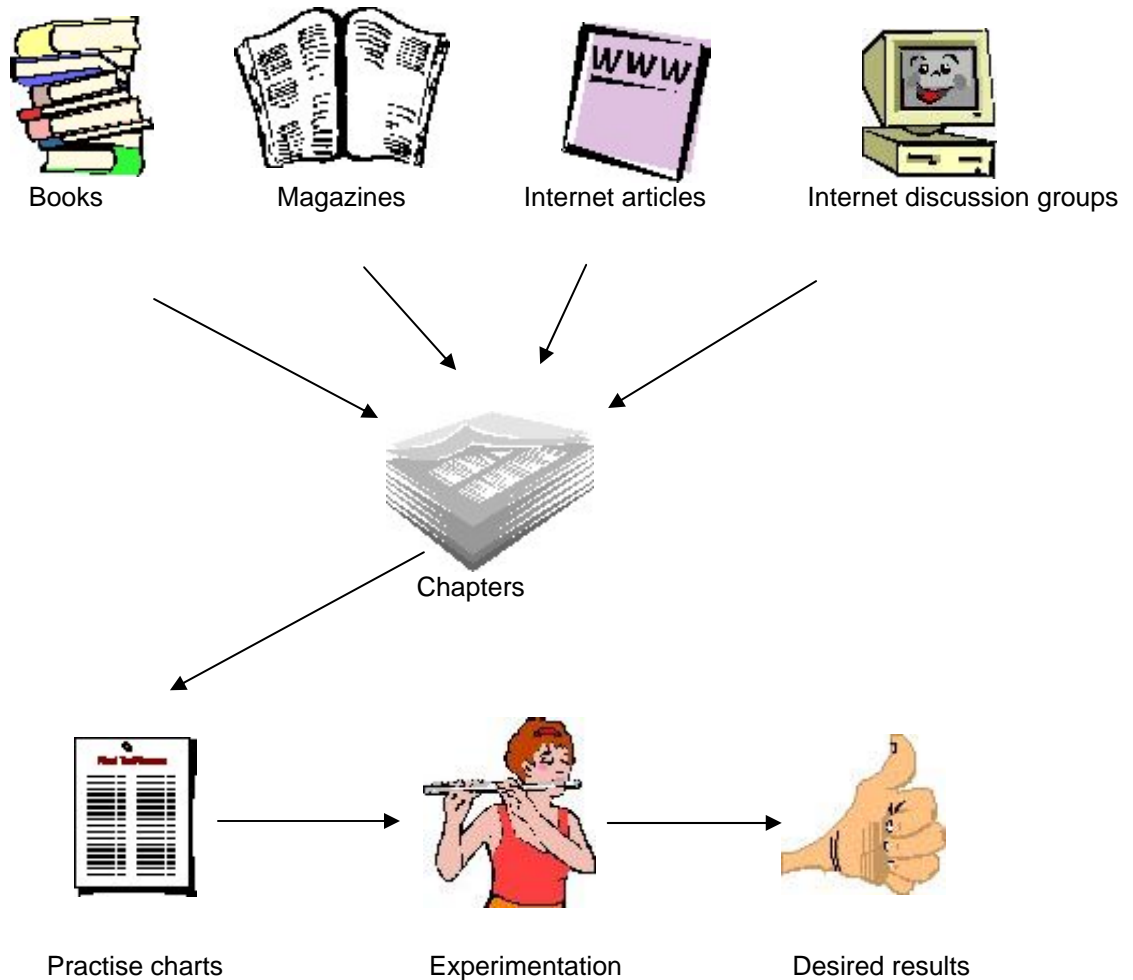


Figure 1: The research method illustrated.

I have experimented with the practise charts as I developed them and have found them helpful in improving my own flute tone. I hope that the dissertation will result in improved tone for any reader who experiments with the practise charts.

1.6 Organisation of the dissertation

Each of the topics listed in the research question will be discussed in an individual chapter, in order to give a comprehensive overview of the material covered in the research. Each topic is then condensed into a practise chart that can be found in Chapter 6.

1.6.1 The embouchure

A discussion of the embouchure is an appropriate starting point for this dissertation, because it is the crucial point where the sound is formed and modulated: without a proper embouchure, there will be no proper tone production. In this chapter a definition of embouchure is given, as well as an explanation of how sound is produced on the flute. The different aspects of embouchure that can influence tone production are listed and discussed. A short discussion of the physiology of the face is also included in this chapter, because it is easier for the brain to send messages to specific muscles if a person is aware of their existence and interaction. It is also easier to describe and discuss embouchure techniques if the individual is aware of the physiology of the face.

1.6.2 Lip flexibility

A study of lip flexibility is the logical next step after a basic good embouchure has been mastered. A good embouchure gives a good basic tone quality, but this quality needs to be extended to the full tonal range and to the full dynamic range of the flute. Lip flexibility is crucial in playing with good intonation. The different opinions of a few key authors are given with regards to playing large intervals. At this stage it is important to develop listening skills, not only to be able to discern good tone, but also in order to discern tone colour between consecutive notes, as well as differences in intonation.

1.6.3 Vibrato

At the stage where a flutist's tonal portfolio consists of a good basic embouchure, combined with some fundamental lip flexibility skills, it will still generally be found that the tone is lacking in warmth and vibrancy. Playing with vibrato is a good method of adding warmth and vibrancy to the tone. The addition of vibrato to the tone also has other added benefits, which are listed in this chapter. A portion

of the chapter is dedicated to methods of learning vibrato. The variables of vibrato, i.e. amplitude and speed, and the different combinations thereof, are discussed and illustrated.

1.6.4 Tone colour

Tone colour is necessary to make the flute sound more interesting. A large variety of tonal colours can be created on the flute and the palette is as varied as the flutist's imagination allows. Whereas the previous chapters aim to create a good basic tone, this chapter aims to help the flutist differentiate and develop a personal style and sound. Some level of maturity is needed, as well as keen listening skills. This aspect of flute playing allows flutists to use their creativity.

Resonance is discussed hand in hand with tone colour as it is an important means of enhancing the tone quality and because it uses some of the same techniques that are used for tone colour. The chapter contains explanations of what tone colour and resonance are and the relation each has to the harmonic series. Techniques for the incorporation of tone colour in flute playing are discussed. The chapter also looks into the different methods and body parts that can be employed to increase the effectual size and modulate the shape of the resonator inside the flutist's body.

1.6.5 Practise charts

For every topic discussed in the dissertation practise charts can be found in Chapter 6. These practise charts can be used for personal experimentation with the different elements of tone production.

1.6.6 Summary and recommendations

This chapter serves as a summary to the dissertation, incorporating the recommendations on how to improve flute tone, as has been discussed in the previous chapters. Special attention is given to the use of the practise charts and guidelines are given on how to use them effectively.

Chapter 2: The embouchure

2.1 What is embouchure

The Concise Oxford Dictionary of Music gives the following definition of the word embouchure: “In brass and some woodwind playing, the mode of application of the lips, or their relation to the mouthpiece” (Kennedy 1991:206). McCaskill & Gillian (1983:10) defines embouchure as the “formation of lips in playing position”. Buyse (1995:18) explains that the core of the French word embouchure is *bouche*, which means mouth, and she gives the meaning of embouchure as “how the mouth is arranged or set on the instrument”. Porter (1973:7) defines embouchure as the “mode of applying the lips and mouth to the mouthpiece of a wind instrument as expertly advised and the mode actually adopted or developed by a player for a particular mouthpiece of a wind instrument”. The embouchure also includes the facial muscles and the jaw position and movements; it includes anything that forms the shape of the air stream, regulates its speed and controls the angle at which it strikes the edge of the embouchure hole (Hinch 1990:9).

2.2 How sound is produced by the flute

In order to determine how the lips must be formed in relation to the lip plate, it is necessary to understand how the flute produces sound. Harrison (1982:6) describes sound production very effectively:

Recorders, ocarinas, whistles, fifes and panpipes all belong to a family of instruments that employ the same simple means of producing sound: a jet of air, a sharp edge and a tube. The recorder is the most familiar type of flute which illustrate this 'jet-edge system' very clearly. Inside the beak of a recorder mouthpiece there is a slot-shaped tube called the windway. It is about 3.5 cm. long, 1 cm. wide and 0.25 cm. deep. Air which is blown into one end of the windway is shaped and concentrated and directed across a short gap so that it hits a sharp edge. When the air hits that edge, it doesn't simply split in two. For a brief moment, most of the air goes *over* the edge, and then for a moment it goes *under*. This switching to and fro is extraordinarily rapid; it happens hundreds, even thousands of times every second. The air turbulence which results is modified and amplified by the rest of the instrument and this turbulence is what our ears detect as sound.

The flute works on the same principle as the recorder. There is a windway to shape and direct an air-jet, a gap and then an edge to 'split' the air. The windway, however, is not built into the instrument itself; flutists form these between their lips. The edge to which the breath is directed is the edge of the

back wall of the embouchure hole.

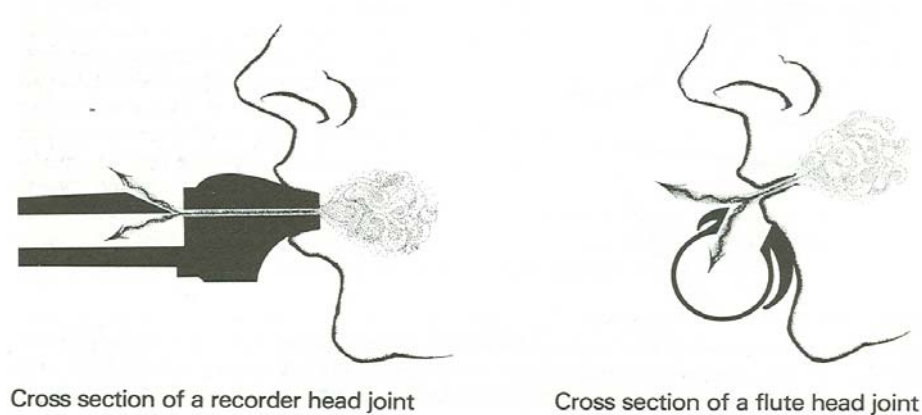


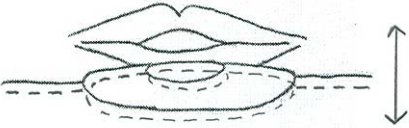

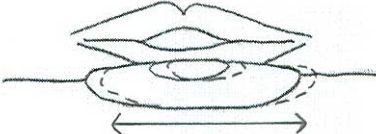

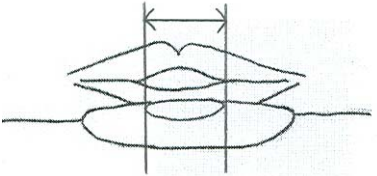
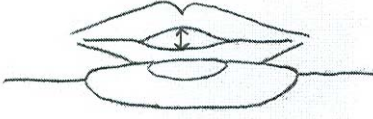

Figure 2: Cross section of recorder and flute head joints. (Harrison 1982:6.)

The formation of the lips is of the utmost importance, because it forms the windway that shapes and directs the air. The shape of the windway controls the shape, concentration and angling of the air-jet and these factors largely determine how pleasing a sound the flutist can produce (Harrison 1982:7). Krell (1973:5) states it in an appropriate way: “Since the flutist has no built-in resistance in the form of a reed or mouthpiece, he must make his own mouthpiece by building this resistance in the musculature of the lips themselves so as to contain, shape and aim the column of air that is pressed against them”.

2.3 Aspects of embouchure that influence tone production

Shotola (1996:23) states four aspects of flute alignment that will influence tone production considerably if they are changed. Without adjusting the shape of the embouchure, these aspects of placement are: (a) placing the flute higher or lower on the lower lip; (b) the amount of the embouchure hole that is covered; (c) placing the embouchure hole off-centre; and (d) how high or low to hold the flute with the arms, because this affects the angle of the lip plate to the lip.

To these I would like to add the following aspects of adjusting the shape of the embouchure, which are (e) the width and (f) the depth of the aperture between the lips; and (g) whether to play with a smiling, straight or sad embouchure. Also, (h) the angle of the air jet can have an influence on tone production, not only in changing octaves, but in the resonance of a note. This is not necessarily the same as turning the flute in or out and thereby changing the amount of coverage as in (d).

Factor	Description	Diagram
Vertical positioning	Relation of the lips to the lip plate: positioning the flute a bit higher or lower on the lower lip.	
Coverage	The amount the embouchure hole is covered by the lower lip.	
Horizontal positioning	Relation of the lips to the lip plate: positioning the lip plate a little to the left or right of the centre of the lips.	
Positioning of arms	Lifting or lowering the arms effects the horizontal angle of the lip plate to the lips.	
Width of aperture	Horizontal distance (width) of the opening between the lips in relation to the width of the embouchure hole.	
Depth of aperture	Vertical distance (height) of the opening between the lips.	
Embouchure shape	Smiling, straight or sad embouchure.	

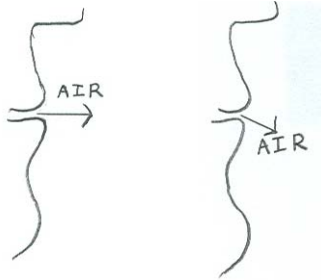
Factor	Description	Diagram
Angle of air jet	Lifting or lowering the air stream by moving the lower lip (jaw) forwards or backwards.	

Table 2: Aspects of embouchure that influence tone production

2.3.1 Vertical positioning of the embouchure hole

The following two tables summarize different opinions on vertical positioning of the embouchure hole, given in chronological order:

Author	Pro higher placement	Reasons
Colwell (1969:143)	Place the embouchure hole in the centre of the lips, and then roll the flute out one-quarter of a turn, bringing the flute to rest right above the bottom of the lower lip.	No reason given.
Barcellona (2003b:32)	Setting the lip plate under the lower lip is inefficient. The flute must be placed on, not under, the lower lip.	This placement is necessary to split the air column in half: the strike edge is raised and divides the air stream evenly.

Table 3: Opinions of authors promoting higher placement on the lip

With regards to Colwell's method of placement, both Garner (1999:18) and Shotola (1996:23) say that this results in too high a placement, making the tone sharp and thin.

Although Barcellona suggests that the flute be placed *on* the lower lip, he continues to say that it should be placed a quarter inch (6.35mm) below the aperture and that flutists with thin lower lips

should place the tone hole lower on the lip than flutists with full lips.

Author	Pro lower placement	Reasons
McCaskill & Gillian (1983:10)	The edge of the embouchure hole should be against the edge of the lower lip (approximately where the red meets the white).	No reason given.
Nyfenger (1986:49)	Place the flute under rather than on the lower lip. The exact placement varies according to lip sizes and shapes.	The lower lip must be free for maximum mobility and flexibility. The lower lip is partially paralyzed when confined by the lip plate and necessitates the jaw being used as a replacement for the potentially more facile lip. If the flute is high on the lip, the angle of the air stream against the back wall will tend to be shallow and the tone equally shallow and dull, whereas a lower placement allows a deeper angle and tone. An efficiency of motion is gained by the lower placement which is useful when negotiating changes in the angle of the air against the back wall to create different tone colours.
Wye (1988:17)	For an average sized lower lip, the edge of the embouchure hole is best placed at the edge of the red part of the lip.	If the lip-plate is too high on the lip, it will be difficult to focus the tone.
Garner (1999:18)	The inner edge of the tone hole should be placed at the edge or just below the red line of the lower lip. The optimum placement can be found by placing the lip plate of the flute in the crook of the chin.	This placement allows more lip surface to direct the air stream, corrects sharpness, and opens the tone significantly.

Table 4: Opinions of authors promoting lower placement on the lip

The optimal vertical position of the embouchure hole can be found through experimentation, by making slight adjustments to the placement of the lip plate while listening carefully for the place where

the clearest tone is produced. Shotola (1996:23) gives the following advice:

There is no single prescribed spot that works best for everyone because lip sizes differ; players should experiment to determine their best placement. If the lower lip is large, a player may find that placing the flute higher on the lip produces the best results; those with thin lower lips should try moving the flute lower on the chin. The best placement will be obvious when the tone is wonderful; yet finding it again after putting the flute down for a while may be difficult without checking in a mirror. This placement will soon become natural.

2.3.2 Coverage

In the table below a summary is given of the opinions of authors on the topic of coverage. Entries are in chronological order. Although the descriptive language differs, the opinions are similar.

<i>Author</i>	<i>Too much coverage</i>	<i>Too little coverage</i>	<i>Ideal coverage</i>	<i>Visible / audible results when correct</i>
Altes (1956b:320)	If the aperture is brought closer to the edge of the embouchure hole, the tone will become brighter and will eventually become metallic.			
Colwell (1969:143-144)	Small and thin tone, limited response to attack, difficult legato playing, limited range of dynamic variations, flat intonation.	The tone will be empty or shallow in quality and will require more air. Thin tone with sharp intonation.	The lips should cover a quarter to a third of the embouchure hole.	The position where the clearest tone is produced.

<i>Author</i>	<i>Too much coverage</i>	<i>Too little coverage</i>	<i>Ideal coverage</i>	<i>Visible / audible results when correct</i>
Hunt (1979:19)	The tone will be lifeless and the pitch too flat.	The tone will be breathy and without centre of focus.	Found by experimentation.	The air stream is divided into two equal parts. The tone sounds the best with this positioning.
Harrison (1982:8-9)	Pitch too low, tone muffled.	Pitch too high, tone reasonably loud but characterless.	Approximately one third of the embouchure hole should be covered.	
McCaskill & Gillian (1983:10)			A quarter to a third of the embouchure hole should be covered by the lower lip.	Roll the head joint in or out to find the place where the most resonant tone is produced.
Hinch (1990:10)	Tone may improve initially, but will be flatter and softer with little dynamic range and little tone-colour variation.	Tone will be unfocused, breathy and sharp. Will lose a lot of air.	Experiment to find a good position.	
Debost (1996:4)	Thin or reedy tone.	Tone is breathy and out of focus.	Do whatever works best for the flutist.	A tone is produced that the flutist likes.
Moyse (1998:15)	Small, fuzzy, flat tone.	Unclear, lifeless, colourless tone.		
Wye (1988:19)	Small tone.	Windy, unfocused tone.		
Garner (1999:18)	Stuffy and flat tone.		One third of the embouchure hole should be covered.	

<i>Author</i>	<i>Too much coverage</i>	<i>Too little coverage</i>	<i>Ideal coverage</i>	<i>Visible / audible results when correct</i>
Jacobs (2002:81)	Lack of freedom and flexibility to exploit the harmonic content of the flute tone, which helps build a rich and varied colour palette.			
Barcellona (2003(b):32)			A quarter to a third of the embouchure hole should be covered.	

Table 5: Opinions of authors regarding coverage of the embouchure hole

The key to finding the correct amount of coverage for a flutist is through listening and experimenting. Panitz (1993:19) has the following method of finding the correct amount of coverage:

Try positioning the flute with the embouchure hole closed half-way, then with the hole closed 1/3 of the way, etc. Notice the different tonal qualities produced in the various registers. Try playing all registers with one opening or another. Most often it is the bottom and top registers that show up the greatest weaknesses of tonal mismatch.

The following method of Shotola (1996:23) is also helpful:

With only a little wrist movement, turn or roll the flute slowly toward the face while playing a long tone and listen for changes in tone quality and pitch. Next, turn the flute slowly away from the face, listening again for any changes. Find the spot that sounds best and notice if the stream splits evenly.

2.3.3 Horizontal positioning of the embouchure hole

Flutists or teachers are sometimes falsely under the impression that the embouchure hole should be placed in the middle of the lips. That is indeed the ideal position (Buyse 1995:19), but few individuals have the perfect facial structure to accommodate this setup. The truth is that the centre of the aperture should correspond with the centre of the embouchure hole (Hunt 1979:19). This means that if the aperture is off-centre, the embouchure hole should also be off-centre. The embouchure hole of the flute must be in the exact centre of the air stream to produce good tone (Shotola 1996:23).

When questioned about his obvious off-centre placement, Jean-Pierre Rampal said he played in the centre. The questioner politely insisted that he did not, and the master then countered with the observation that the opening between his lips was off to the side and so was the flute and that this amounted to being centred. (Nyfenger 1986:52.)

Robert Cole relates the following story of his first two lessons with William Kincaid (Debost 2002:69.):

During that first lesson, Kincaid noticed that my embouchure was not exactly centered. In fact, it was quite crooked. He told me to look in a mirror while I practiced and to center the embouchure. When I returned the following week, I had the embouchure in the proper place, but had very little control over it. He thought for a while, and then had me play many things (loud, soft, high, low) with my embouchure in its original position. Finally, he told me to do it my way.

One of the most common reasons for an off-centre embouchure is 'cupids-bow' lip formation, also called 'teardrops'. The solution is to close off one or other side of the lips, whichever is the most comfortable, to avoid a double aperture. (Krell 1973:6; Barcellona 2003b:32.) Other reasons for off-centre embouchure include malocclusions, partial harelips, stronger muscles on one side, or just habits (Nyfenger 1986:52).

To determine whether a student's embouchure hole and the opening between the lips are centred, Colwell (1969:143) gives the following advice:

He should be told to place the flute on his lower lip at the spot that seems correct, then stick his tongue into the embouchure hole to be sure that the flute is centered. Unless the embouchure hole is centered directly below the lip opening from which the air column proceeds, a good flute tone is unlikely.

Shotola (1996:23-24) has a different approach:

Observe whether there is a small triangle of vapor on the center of the lip plate. This vapor indicates where the airstream splits on the far edge of the embouchure hole as some air goes into the hole and the rest hits the far side of the lip plate. If it is off center, experiment with placement until the cloud splits in the middle of the lip plate...Move the flute slowly left or right of center while checking the shape of the breath cloud in a mirror and listening for changes in tone.

Experimentation is the key to finding the ideal horizontal position for the embouchure hole. By making slight adjustments to the placement of the lip plate, the optimal position to produce the clearest tone can be determined. (Shotola 1996:23.)

2.3.4 Angle of lip plate to lips

The angle of the lip plate to the lips is determined by how high or low the flute is held by the arms (Shotola 1996:23). If the head is held in a normal upright position, but the flute is not held parallel to the floor, the angle between the lips and the lip plate will not be adequate. The lips should be kept parallel to the embouchure plate (McCaskill & Gillian 1983:10). The angle of the lips to the lip plate affects the tone, not the angle of the flute to the floor. The flute should be held at a 90° angle to the aperture at both the vertical and horizontal axis. If either of these angles is more than 90°, the pitch will be sharp and the tone thin and airy. (Garner 1999:18.)

Experiment with raising or lowering the flute and listen how changes in the angle of the lip plate to the lip affect tone. Check if a lazy posture has developed over time, causing the flute to droop to the right on the lip. Try to line up the flute evenly across the lower lip by lifting the flute a little higher. Players with an off-centre aperture or crooked teeth, however, may find the best tone can be produced if the lip plate is angled down a bit from the lip, to the right. (Shotola 1996:23)

Experimentation should be done both by lifting and lowering the flute vertically, as well as pushing it forwards and backwards horizontally.

2.3.5 Aperture size

The aperture between the lips somewhat resembles the nozzle on a garden hose in the sense that it can be adjusted to a spray or a concentrated stream of water (Krell 1973:6). If the end of a hose is squeezed, the water comes out in a narrower but faster jet. The same holds true with the air from the lip aperture. If the lips are squeezed so as to form a smaller aperture, the air comes out in a narrower but faster jet. A faster air jet will raise the pitch and can increase the volume. On the other hand, if the lips are relaxed somewhat so as to form a bigger aperture, the air comes out in a wider and slower jet. As a result, the pitch is lowered and the volume decreased. In addition to pitch and volume, the aperture size has an effect on the tone quality: a smaller aperture leads to a more focused tone; a bigger aperture leads to a less focused tone. (Hunt 1979:19.)

2.3.5.1 Aperture width

Authors who discuss aperture width agree that the width of the aperture should be no wider than the width of the embouchure hole and that the width of the aperture should preferably be the same as that of the embouchure hole (Colwell 1969:143; Harrison 1982:8; Krell 1973:6). This holds true for the lowest notes; however the higher the note being played, the narrower the aperture needs to be.

The following table gives the opinions of authors on aperture width.

<i>Adverse effects of too wide an aperture</i>	<i>Adverse effects of too narrow an aperture</i>
Coarse, windy and inflexible tone (Colwell 1969:143). Dizziness in beginners (Colwell 1969:144). Unfocused air is inefficient and creates breathiness in the sound, it wastes valuable air (Krell 1973:6). Valuable air escapes to either side and is wasted (Harrison 1982:8). The flutist easily runs out of air (Garner 1999:18).	Small and thin tone (Colwell 1969:143). The flute will be quieter than it needs to be (Harrison 1982:8).

Table 6: Adverse effects of too wide or too narrow an aperture

Few adverse effects of a too narrow aperture are mentioned – probably because it is seldom a problem. Most often, if there is a problem with aperture width, it is that it is too wide. Garner (1999:18) mentions that a way to remedy an aperture that is too wide, is to form the lips in the same way as for saying the word *pooh*. This should bring the lips closer together and narrow the aperture.

2.3.5.2 Aperture depth

Colwell (1969:143) says that the beginner's aperture should be flat in shape rather than round. Most beginners have too large an aperture and the first step towards a smaller aperture is to tell them to pull down the top lip, thereby creating a flatter aperture. This modification will automatically lead to a narrower aperture as well. It is difficult to change either the width or depth of aperture, without automatically changing the other as well.

On the other hand, Buyse (1995:19) prefers to think about forming a circular aperture rather than elliptical because it is easier to produce roundness of sound with a round aperture. She is however talking from the perspective of an advanced flutist who is not likely to have too big an aperture. Increasing aperture depth while keeping the ideal width might help to increase the resonance of the tone.

In order to increase aperture depth, it can be helpful to drop the jaw slightly, so that the teeth are further apart. It might then be necessary to pull the lips tighter in order to get the desired aperture depth.

2.3.6 Embouchure shape

Vastly differing opinions exist on the shape of the embouchure. The table below lists these opinions, presented in chronological order:

Author	<i>Pro smiling embouchure</i>	<i>Pro straight / sad embouchure</i>
Colwell (1969:142-143)		<p>The curvature of the mouth should be straight or even down rather than in a smiling position, otherwise:</p> <ul style="list-style-type: none"> • The tone is likely to be windy and hard in quality caused by an opening that is too elongated and leaks at the corners. • The player has less control of the centre part of the lips. • The necessary compression may be lacking. • The lips become too tight, resulting in dry lips and a strident tone. • There is a good “core” to the tone, but the tone is harsh and the vibrato stiff and unmusical. • An inadequate tone is produced in the lower register.
Hunt (1979:20)		<p>The corners of the mouth should be firm but not tense, drawn down, rather than sideways (not smiling).</p>
McCaskill & Gillian (1983:10)	<p>Stretch the lips back as if to smile (sardonically) while simultaneously forming a tiny opening as if to whistle (stretch back and pucker forward).</p>	
Wye (1988:15)		<p>The smiling embouchure can cause an overly tight and overworked bottom lip and can result in embouchure problems.</p>

Author	Pro smiling embouchure	Pro straight / sad embouchure
Hinch (1990:9, 11)	The smiling embouchure was used in the old English style of playing, inherited largely from Charles Nicholson, where the objective was to make a wooden flute sound as loud as possible.	A smiling embouchure does not work well on the modern metal flute, because it tends to pull the lips inwards, resulting in an embouchure that is too tight. This method leaves little or no room for changes in tone-colour and produces a thin, hissy, raspy tone. A relaxed embouchure is achieved by basically unrolling the lower lip along the lip plate, especially at the corners, where they should virtually droop down.
Clardy (1994:19)	There is a good “core” to the tone	Avoid stretching the lips into a smile because this produces a sharp, thin tone and limits flexibility between registers.
Buyse (1995:18)	The author first learned to play with a smiling embouchure.	The author modified her embouchure away from the smile, because she developed temporal mandibular joint syndrome.
Debost (1999b:4)	The lips should be moderately pulled in a half smile to conduct the air stream effectively and effortlessly. The fashion of a completely loose embouchure, with mouth corners drooping, gives a false impression of relaxation: it does not help control, produces turbo-sound, and, through its instability, increases stress.	

Author	Pro smiling embouchure	Pro straight / sad embouchure
Garner (1999:18)		<p>If students say the word <i>poo</i>, the mouth will form more of a pout than a smile, which produces a fuller tone.</p> <p>A smiling embouchure can produce the following problems:</p> <ul style="list-style-type: none"> • The tone can be unfocused, especially in the lower register. • Flexibility of the lower lip is reduced because it is stretched. This makes register changes difficult. • May cause intonation to be sharp.
Barcellona (2003b:32)	A pouty embouchure, with lip corners turned downward, avoids too much tension in the corners of the mouth but the desire to maintain this position can often be as inflexible as a tight embouchure.	If the corners are relaxed, the lower lip will be relaxed as well, without pouting.

Table 7: A comparison of opinions regarding smiling or sad embouchure

Different schools exist regarding playing with a smiling / straight / sad embouchure. Students are likely to learn the method deemed best by their teachers. All three methods seem to have satisfactory results if an excessive amount of tension is avoided.

2.3.7 Angle of the air jet

The angle of the air jet can be changed by bringing the bottom lip / jaw forward or by taking it backwards. This type of movement is used in changing registers and dynamics (see Chapter 3), but can also be used with a single note at a particular dynamic, in which case the angle of the air jet changes the harmonic content of the note (see Chapter 5).

2.4 Physiology of the face

The muscles of the face must be trained in order to develop an adequate embouchure (Wye 1988:15). In order to train these muscles, it is helpful to know what they look like and what their functions are.

Pearson (2002:14-17) has termed the knowledge about muscles “body mapping”. A person's body map is the representation, within the mind, of his / her body. This representation includes general concepts such as how big a person is, as well as specific ones such as where a person's joints or fingers are. The body map is learned over time and is based on a person's experience and movement. The body map can change as a person grows. A person's body map is often unconscious, but through careful thinking and consideration, it can become conscious.

It is important to have an accurate body map, because the quality of flute tone is determined by the quality of muscle movement, and the quality of muscle movement is determined by the representation of the body in the mind. If people move in a way that is consistent with the way the body is designed, they perform their activities easily. If they try to move in a way that is at odds with how the body is meant to function, their movement will be done with difficulty. If faulty aspects of a body map have been developed, a person can learn to change them, thereby improving performance.

The map of any particular aspect of the body contains the elements of structure, function and size. For example, what is the structure of the lips? Do they consist of muscle, or of some other material? What is the function of the lips in flute playing? What is the size of the lips? Do they consist only of the red part, or also of the surrounding muscles? It can be useful to answer these questions, and then to check your perceived map of the lips with the following section.

Many people think that their lips only consist of the red part, but there is a muscle that goes around the mouth, forming the whole lips, like clown lips. Use of all this musculature is extremely important in finding a flexible and refined embouchure. These “clown lips” are indicated in the illustration below as 1, M and 12. (Pearson 2002:68.)

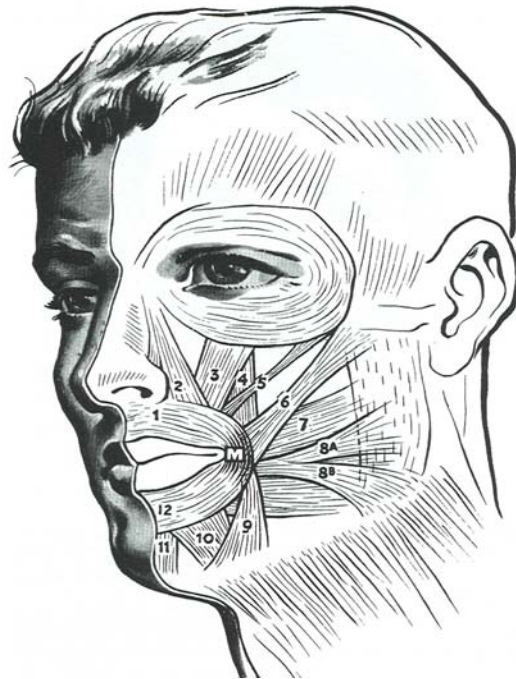


Figure 3: The muscles of the face. (Porter 1973:11.)

The “modiolus” (indicated by “M”) is made more tense in a lateral direction by the increased contraction of the risorius (smiling) (8a and 8b) and buccinator (7) muscles. This permits the free movement of the lips, surrounding the air column directed across the embouchure hole, to exert the delicate control needed to create sound. The rest of the lips (orbicularis oris muscle (1 and 12)) and the modiolus take on a washer-like function to prevent or minimize the escape of air through the sides of the mouth. (Porter 1973:8, 11.)

On first taking up the flute the aperture formed between the lips may be naturally perfect or it may not. It depends, to some extent, on the amount of use the facial muscles have had, particularly around the mouth, in everyday living. An animated face indicates frequent use of many muscles. It is important to note that there are more separate muscles attached to the lips than anywhere else in the human body. The flutist's job is to adapt them for flute playing. Some muscles will be fairly passive because of lack of regular use. For some people, training these muscles will be easy, for others more difficult. (Wye 1988:16.)

In order to have access to information about the body in movement, the kinaesthetic sense needs to be developed. The kinaesthetic sense tells about the body and its movement – its position, its size and its quality. By developing the kinaesthetic sense, a flutist can become as sophisticated at sensing

balance, small tensions and qualities of movement as at sensing minute variations of pitch and tone. Over time, the ability to sense movement becomes more refined, allowing the flutist to move in more delicate, refined ways – especially those as subtle as the small movements of the embouchure (Pearson 2002:20).

Awareness of the muscles around the lips can be obtained by exercises like pouting, sneering, making happy and sad faces, lifting the upper lip up and down, pretending to blow a fly off the nose, etc. (Goodwin 1998:4-5).

Chapter 3: Lip flexibility

3.1 Introduction

According to Moyse (1998:16) lip flexibility is the most important factor in producing good tone quality. Lip flexibility is not only necessary for beauty of tone, but also:

- for flexibility in producing slurred wide intervals
- for inflections
- for the unity of a melodic line
- for evenness of slurs between notes and groups of notes
- for good attacks (especially in the extreme registers)
- and finally for better control of tone quality and intonation during crescendos and decrescendos.

These advantages of lip flexibility can be roughly grouped into the following two categories for the purposes of this study:

- playing in different registers and playing intervals
- intonation and dynamics

3.2 Playing in different registers and playing intervals

3.2.1 Results of the research of Kujala

In his research on the specific techniques used to change from the low to the high registers on the flute, Walfrid Kujala (1994b:18-21) found many differing opinions. He used 25 different pre-1977 sources of which the authors came from a variety of backgrounds (15 American, 4 British, 3 French, 2 German, and 1 Japanese). Their comments fit the following categories:

<i>Technique used to change from the lower to higher register</i>	<i>Number of Authors</i>
Increase air pressure	10
Do not increase air pressure	3
Support tone more	1
Smaller aperture	9
Narrower aperture	1
Rounder aperture	1
No change of aperture	3
Air directed higher	6
Air directed lower	2
Air stream always equally split	1
Jaw higher	3
Jaw forward	5
Jaw more slack	2
Chin forward	2
Roll flute out	1
Roll flute in	2
Do not roll flute in	3
Cover more of embouchure hole (shorter air stream)	6
Cover less of embouchure hole	1
Lower lip out more	4
Lower lip pushed out at corners	1

<i>Technique used to change from the lower to higher register</i>	<i>Number of Authors</i>
Both lips out more	2
Stretch lips more	1
Press lips together more	3
Lip pressure tighter	2
Do not tighten lips	1
Tighten mouth corners	1
Draw back mouth corners	1
Mouth corners pushed out more	1
Pucker forward more	1
Push tongue forward toward lips	1

Table 8: The results of Kujala's research, indicating vastly differing opinions on the techniques used to make register changes

The authors did not stress the same points:

- 17 authors refer to air pressure either positively or negatively; 8 ignore it
- 14 authors reference aperture size; 11 ignore it
- 10 authors refer to air direction; 15 ignore it
- 10 authors refer to jaw or chin motion; 10 state or imply forward motion of the lip; 7 ignore it

Kujala (1994b:19) gives the reason for these differing opinions as the inability to make reliable observations of oneself. He says that if a neutral party observed and analyzed each player scientifically, he would find that each flutist used methods for register changes that are far more in agreement than the table above indicates.

I think it is possible that the differing opinions are due to the fact that people indeed do use different

methods for changes between registers. The possibility also exists that people use the same method, yet experience it differently. Therefore it can be advantageous to discuss the different methods of changing registers in order to find the method that works best for each individual.

3.2.2 Results of my own research

The knowledge that people use many different techniques for making interval changes did not prove to be helpful in my attempt to create a methodology. Therefore I have examined the writings of several authors on the topic of register changes with the purpose of ascertaining what the similarities are and what the reasons are behind the different techniques. My analysis is presented below, showing the opinions of the nine most informative authors:

<i>Author</i>	<i>Change air speed</i>	<i>Change air direction</i>	<i>Method</i>	<i>Reason</i>	<i>What to avoid</i>
Barcellona (2003a:26)	Yes	No	Move the air stream nearer and farther to the embouchure hole by moving the lips forwards and backwards in a lateral direction.	Moving the air stream closer to the embouchure hole decreases resistance, thereby increasing air speed.	Do not blow harder, because the octave will be louder, sharper, and coarser than the fundamental.
Nyfenger (1986:50-51)	Yes	No	Change the lip opening from larger to smaller to produce the next partial.	<ul style="list-style-type: none"> • Involves the least motion – efficient. • Homogeneity and stability of tone colour is achieved. • Other muscles are left free for other functions. 	Do not move the lips or jaw forwards and backwards: this might alter the angle of the air stream, thereby changing the quality of tone and the pitch.

Author	Change air speed	Change air direction	Method	Reason	What to avoid
Debost (2002:144, 154-155)	Yes	No	To reach the octave: <ul style="list-style-type: none"> • Low abdominal support • Smooth phrasing with fingers • Great stability of the lip plate on the chin 	Increasing low abdominal support increases the air speed. Decreasing abdominal support decreases the air speed.	Move the lips as little as possible; otherwise the weak lip muscles will become overworked. A comfortable lip position in the medium range applies to all registers.
Wye (1988:19)	Yes	Sometimes	Increase the air speed (no specific method given) in order to play the octave.	Increase in air speed is needed to change to the next octave.	Do not raise the air stream, because it changes the tone colour and raises the pitch. The air stream should only be raised enough to keep the pitch accurate.
Krell (1973:39-41)	Yes	Yes	Air speed is increased through gradual compression of the lips and added support from the diaphragm. At the moment of the upward interval jump, the lips are moved forward to change the air direction upward.	Each note has an ideal air speed. Changing to the desired air speed, combined with a change of air direction produces a smooth interval change.	Do not set the lips in a fixed embouchure position, but keep them flexible.

<i>Author</i>	<i>Change air speed</i>	<i>Change air direction</i>	<i>Method</i>	<i>Reason</i>	<i>What to avoid</i>
Louis Moyses (1991:22)	Yes	Yes	Narrow the opening in the lips to increase the air speed in order to play the octave. Bring the jaw forwards and upwards very slightly to change the angle of the air stream.	This method should produce octave changes easily and effortlessly.	Do not pinch the lips or blow harder. The mouthpiece must not be compressed towards the flutist.
Harrison (1982:66)	Yes	Yes	To play the octave, reduce the size of the aperture and shorten the gap between the aperture and the embouchure-hole. Draw the bottom jaw in a fraction to correct the angle of the air jet.	Air speed is increased by reducing the size of the aperture and shortening the gap between the aperture and the embouchure hole. The jaw must be pulled in, because a shorter air stream needs to be pointed down in order to split evenly on the edge.	-
Colwell (1969:145)	Implied	Yes	Move the jaw forwards and backwards	<ul style="list-style-type: none"> • The shape of the aperture is changed • the embouchure hole is covered more / less • the size of the throat opening is changed 	When drawing the jaw back (for lower notes) the lower jaw should not slide underneath the upper jaw, but gradually drop as it recedes.

<i>Author</i>	<i>Change air speed</i>	<i>Change air direction</i>	<i>Method</i>	<i>Reason</i>	<i>What to avoid</i>
Altes (1956a:16, 34)	Yes	Yes	Gently compress the lips and move the lower jaw forward to produce the octave.	The lips must be progressively tightened and the air stream raised to produce higher notes.	-

Table 9: A comparison of opinions regarding techniques used when playing large intervals and playing in different registers

Authors agree that register changes are achieved through a change in air speed. Some add to that a change in air direction, while some feel that this is not necessary. Furthermore authors recommend different techniques of achieving changes in air speed and air direction.

Change of air speed is apparently achieved through any of the following techniques:

- Forwards and backwards movement of the lips
- Forwards and backwards movement of the jaw
- Changing the size of the lip opening
- Increasing and decreasing the amount of abdominal support

Change of air direction is apparently achieved through either of the following techniques:

- Forwards and backwards movement of the lips
- Forwards and backwards movement of the jaw

3.2.3 Detailed descriptions of methods employed to play octaves

Table 9 above was very helpful in comparing the opinions of the authors, but did not provide sufficient space for longer descriptions of the methods employed. Below are some of the methods that have longer explanations or descriptions.

3.2.3.1 The soda straw experiment of Barcellona

In order to explain the reason why forward movement of the lips will increase air speed, Barcellona (2003a:26) uses the following experiment:

Flatten one end of a soda straw ($\frac{1}{4}$ " diameter) to create an elliptical shape similar to a flute embouchure. Place the flute on a table, steady your arm on the tabletop, aim the flattened end of the straw toward the far edge of the embouchure hole, strike edge, and blow gently. When the straw is aimed correctly, it will produce a very sharp fundamental, C#5.

Be sure the air column splits equally, and half goes into the embouchure hole and half flows over the strike edge to create a clear sound. For the octave above the fundamental, move the straw closer to the strike edge and blow steadily at the same angle. When this produces a consistent tone, move the straw away from the embouchure hole until the octave drops to the fundamental. With practice this jump between octaves will become easy.

The acoustical phenomenon that makes the air in the flute vibrate twice as fast for the octave without the player increasing the air speed may seem confusing. As the air column exits the flattened end of the straw it meets resistance from the outside air, which decreases the air speed greatly with every millimeter that it travels. At the strike edge, the air velocity is only strong enough to produce the fundamental, but with the flattened end of the straw closer to the embouchure hole the air encounters less resistance, is faster, and produces the octave. There is no need to blow harder because the distance between the straw and the embouchure hole is less.

3.2.3.2 Explanation of Nyfenger's method

Nyfenger's (1986:62-65) method of playing large intervals relies on the presence of the overtone series to help with the interval shift.

An octave change such as A1 to A2 is slurred by changing the aperture. If the dynamic level is to be the same, the amount of air used, or support, remains constant. Should the lips change suddenly from open to (more) closed, there will be a percussive or abrupt change of pitch and tone (Fig 4a). However, by changing the air speed gradually toward the end of the low note (Fig 4b), more high overtones are created until the upper octave finally emerges or is drawn out of the low note in a smooth and satisfying fashion.

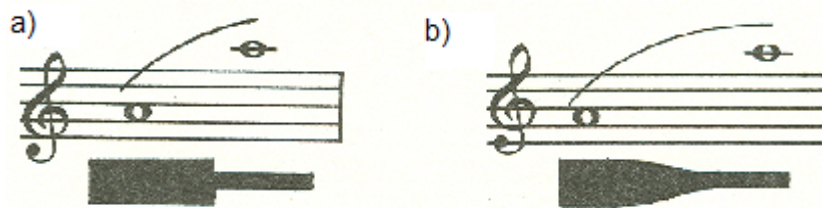


Figure 4: A graphic representation of the lip opening during an abrupt octave shift (a) and a smooth octave shift (b). (Nyfenger 1986:62.)

The process of playing descending intervals is not as easy as that of playing ascending intervals. The muscles involved in opening and closing the aperture are better equipped for closing, tightening, and gripping than for opening. Therefore descending intervals are likely to be jagged, apologetic, or of a compromised nature when compared with ascending intervals. Moving to a lower note must therefore be anticipated by reversing the ascending procedure in a smooth fashion without stopping the air support. One helpful hint is to imagine the position and feeling of the lower note before reaching it.

3.2.3.3 The metaphors of Krell

Krell (1973:13, 39-41) uses several metaphors to explain the importance of air speed and air direction in flute playing:

The aircraft

Just as an aircraft must have a critical flying speed for each altitude, so must each note in the scale have an air speed corresponding to its altitude in the range of the flute scale. For instance, to be convincing a high A must sound like a high note and reflect the exertion required for its production. Similarly, a low A must sound low and reflect the relaxation implied by its lowness.

The elevator

It is not enough to find the optimum placement for a single note according to its required air speed, but it is important to be able to move from one pitch placement to another, bridging leaps with sound. Intervals can be forced or simply fingered, but the musical solution is found in preparing the leap,

whether up or down, on the preceding note by increasing or reducing the intensity of the first note to the relative intensity level of the second before making the change. It is much like taking an elevator to a selected floor before moving off at the new level.

This technique is illustrated in the following slow motion example of the octave shift where the air speed is slowly increased (a) from, say, ten to twenty miles per hour by a gradual compression of the lips and added support from the diaphragm. At the critical moment a compressive shift of the lips (forward) and change in the air direction (up) will produce a musical glide to the top octave.

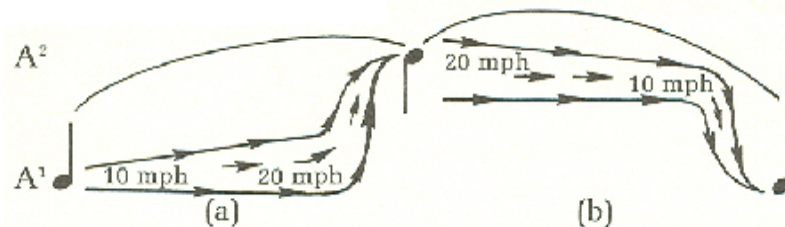


Figure 5: A graphic representation of an octave shift illustrating increase in air speed and change of air direction. (Krell 1973:40.)

The action is reversed in the descending octave leap (b). The intensity on the top octave is slowly reduced by gradually relaxing the lips and diaphragmatic support and at the last moment the embouchure shift (lips back, air angled down) is made so that the octave settles into the fundamental.

The diver and the weight lifter

Interval slurs resemble the execution of a swan dive from the preparatory springboard generation of energy to the soaring glide of the descent. Or they are like the distribution of energies in the snap, catch and extension callisthenics of the weight lifter.

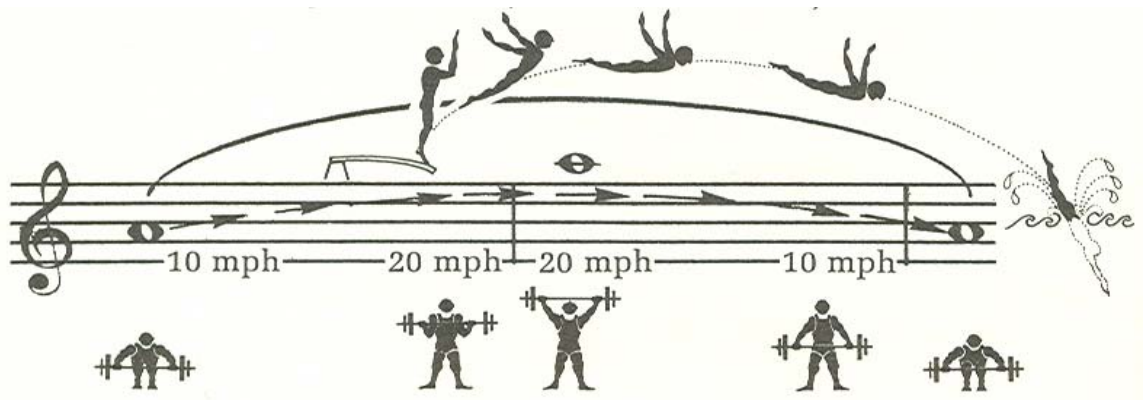


Figure 6: An illustration of energy use during an octave shift. (Krell 1973:40.)

This same procedure applies to all intervals, no matter how small or large. The degree of embouchure shift is subtly adjusted to the size of the interval. Lean on the lower notes as though you were pressing them into the upper and diminish on the upper notes to float them into the lower. In each case the intensity is raised or lowered on the preceding note to the relative intensity of the second.

3.3 Intonation and Dynamics

Pitch adjustments are made in a similar way to interval changes: by changing the air speed, air direction, or a combination thereof. This is achieved through applying the same methods used for register changes, namely:

- Forwards and backwards movement of the lips
- Forwards and backwards movement of the jaw
- Changing the size of the lip opening
- Increasing and decreasing the amount of abdominal support

There is one more method that can be used for intonation and dynamics: head movement. This is applied at the dynamic extremes to keep the pitch constant.

In general, a greater air speed or higher air direction is needed to raise the pitch and to play softer, and a lower air speed or lower air direction is needed to lower the pitch and to play louder.

(Barcellona 2003c:32; Buyse 1995:19; Debost 1999b:4; Gippo 2001:8; Hahn 1983:18; Harrison

1982:79; McCaskill & Gillian 1983:56; Nyfenger 1986:96-98; Panitz 1993:18; Peck 1995:21; Willoughby 1994:11; Wye 1988:19-21.)

3.3.1 Mobility

A certain level of mobility is needed in order to play in tune over the whole range of the flute at any dynamic level. Wye (1980:34) explains how to develop the mobility that is needed:



1. Play the C natural fortissimo and at the same time make a diminuendo without making any corrective movements with the lips, jaw or head. The note will go flat.
2. Now play the same C natural, but this time try to bend the note both up and down by moving your lips and jaw forward and, if the note won't move enough, also raise your head. Do not move your hands, arms or flute to do this.



Before practicing loud and soft playing, and diminuendos and crescendos, you will need to obtain enough mobility to enable you to alter the pitch easily and at will. Next, then, practice this jazzy exercise. Do not finger the third note of each bar; make the semitones by bending the pitch downwards.



Once the above exercises are mastered, different dynamic levels can be taken into account.

3.3.2 Dynamics

Most people can play in tune at one dynamic level; it is dynamic changes that affect intonation unfavourably. Every time the air stream is changed, the pitch is affected. An embouchure has to be extremely flexible in order to compensate for the effects of changes made to the air stream.

(Wechsler 1999:24.)

The ability to play in tune at different dynamic levels can be acquired by following the steps below:

1. To start with, the ability to play both loud and soft notes consistently in tune must be mastered. (Hahn 1983:19.)
2. Crescendos and diminuendos should be practised. The techniques of playing loud and playing soft are used, but gradual changes are used to go from soft to loud and from loud to soft. Maintain tone quality and pitch. (Hahn 1983:19; Nyfenger 1986:97.)

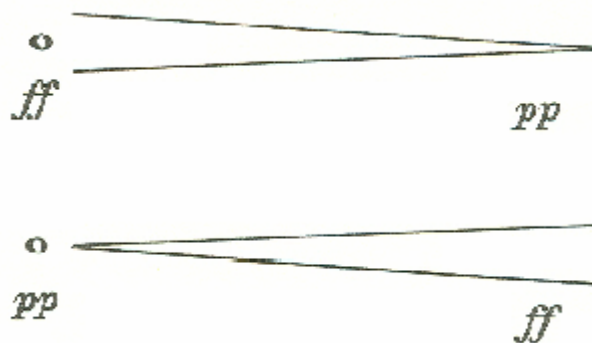


Figure 7: The second step in playing with good intonation: practise crescendos and diminuendos. (Nyfenger 1986:96.)

3. The process in (2) can then be sped up: the same movements are required, only faster. Eventually it will be possible to taper even an eighth note to perfection. This exercise should be practised on various pitches. (Nyfenger 1986:97-98; Wye 1980:35.)

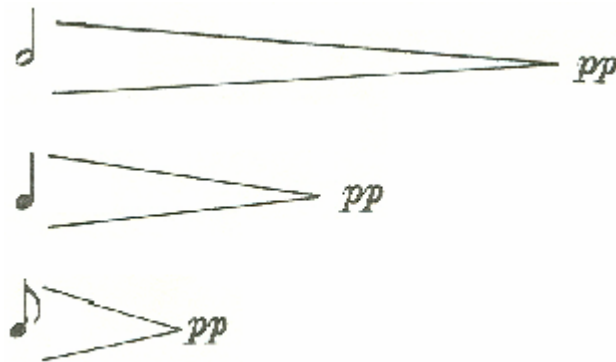


Figure 8: The third step in playing with good intonation: increase the speed of crescendos and diminuendos. (Nyfenger 1986:96.)

3.3.3 Learning to listen

There is one distinguishing difference in the acquisition of lip flexibility for the purposes of playing large intervals and for the purposes of playing with good intonation: good intonation requires a good ear in addition to flexible lips.

There are a large number of variables that can have an effect on intonation. A good quality flute with a good flute scale is important. Changes in air speed, angle of the air stream, temperature, and each player's anatomy affects intonation. Furthermore, the type of ensemble, the harmony, the flute's voice within the chord and the chord changes need to be taken into account. Playing in tune not only requires knowledge of intonation tendencies and intervals, but also a trained ear. A good ear and critical listening skills need to be developed in order to be able to play in tune. (Wechsler 1999:24)

It is important to know how to teach students to listen. Well-known schools of music (Unisa, ABRSM, and Trinity/Guildhall) teach very valuable listening techniques, e.g. intervals, recognition of rhythmic patterns, time signatures and cadences, etc., but do not teach listening skills involving tone quality or intonation. Here are some guidelines on how to develop these:

- Hold notes for their full duration: a quarter note must be held for a full beat, a half note for two full beats, etc. This trains the ear to listen to the note for its full duration. Often students will hear that the beginning of a note sounds good, but they do not pay attention to the middle and the end of notes, especially of long notes. (Wechsler 1999:24.)
- Learn to play long notes with the purpose of self-examination: this will teach the individual to hear

desirable and less desirable aspects of his / her tone and will lead to the ability to improve tone. (Wye 1980:5.)

- Learn to differentiate between different instruments by listening to them: this trains the ear to differentiate between tone colours in the most basic way.
- Learn to differentiate between tone colours on the flute: this trains the ear to differentiate between tone colours in a finer way. This can be done firstly by identifying different tone colours in other flutists' playing, e.g. on a recording, and later by creating different tone colours in one's own playing.
- Learn to play notes with homogeneity of tone. Even notes next to each other can have different colours unless they are listened to carefully and matched by ear. (Nyfenger 1986:63; Wye 1980:7.)
- Sing specific notes played on the piano: this will train the ear to sing on pitch, which can help to play on pitch.
- Learn to recognise notes as being higher or lower than another. This will later lead to the very important skill of hearing whether pitches are higher or lower on a very small scale – leading to the ability to tune properly.
- Practise to tune to the piano. Like most things, the ability to tune well (and therefore play in tune) comes with practise. (Wye 1980:132.)
- Practise tuning different notes with a tuning meter. Do not use the eyes to tune, but the ears, and then check that the tuning meter shows the note to be in tune. (Wye 1980:21; Hahn 1983:18-19.)
- Learn to play long notes at various dynamic levels, also with crescendos and decrescendos, while keeping the intonation the same. This cannot be done without listening. (Hahn 1983:18-19.)
- Listen to recordings of outstanding players: this teaches the student different styles of music, as well as broadens the spectrum of what is possible on the instrument. (Krantz 1995.)
- Learn the differences between just and tempered scales and learn the ability to adjust according to the harmonies being played. (Wye 1988:122-125.)

Chapter 4: Vibrato

4.1 Definitions of vibrato

Several authors give definitions of vibrato. At the most basic level vibrato is defined by Hahn (1983:19) as follows:

Vibrato is the pulsation of sound heard in the performances of both singers and instrumentalists.

Debost (2002:260) depicts the pulsations to be variation in pitch:

Vibrato is a modulation in the pitch of the flute tone, making it rise and fall in a more or less controlled fashion.

Hunt (1979:21) describes vibrato as a kind of vibration in the sound, a pulse of a certain speed and depth that is caused by fast alternation in the speed of the vibrating air column, which in turn causes a small variation of pitch.

In his definition of vibrato for wind instruments, Moyse (1973:10) states that both pitch and volume are varied:

Regular and simultaneous variations of the volume and of the pitch of a sound continued during its emission. These variations or undulations can be more or less rapid, more or less intense, and more or less pleasing. The quality of the vibrato depends on the quality of the tone, the technical facility, and especially the musical intelligence of the performer.

McCaskill & Gillian (1983:61) go one step further, adding timbre to the definition:

Vibrato is the pulsation of a tone used to add color and motion to a musical line. It involves the fluctuation of a tone's frequency (pitch), amplitude (loudness), and timbre (overtones). Although vibrato adds beauty to a tone its overuse may detract from a performance, therefore it must be used with discretion.

4.2 Purpose

When used correctly, vibrato serves several purposes:

- Vibrato is a means of expression that enables the player to express musical feeling through his /her instrument (Moyse 1991:2; Hutchins 1994:13; Krell 1973:14-15; Debost 2002:261; Hunt 1979:21;

Haid 1999:17).

- Vibrato lends colour to the sound (Debost 1998a:4; Hunt 1979:21; McCaskill & Gillian 1983:61; Rainey 1985:123).
- Vibrato is the poetic use of emotion to enhance the tone, an emotional device to deliver a subtext of what we play (Gippo 2001:8).
- Vibrato creates intensity and gives direction to the musical line (Rainey 1985:115; Hahn 1983:19; McCaskill & Gillian 1983:61).
- Vibrato is one of the most expressive tools for tone development, projection and phrase shaping (Clardy 1994:19).
- Vibrato adds a lyrical quality and an element of freedom to the flow of sound (Krell 1973:14).
- Vibrato helps with intonation (Debost 1998a:4).
- Vibrato animates the tone, to help carry it through a phrase or toward silence (Debost 2002:261).
- Vibrato helps sensitive legato playing (Debost 2002:261).
- In soft dynamics the tone has less natural energy and vibrato will keep the sound alive and carry energy through the intervals within a phrase (Debost 2002:261).
- Vibrato helps to taper into silence (Debost 2002:261).
- Vibrato projects the sound with energy (Gippo 2001:8).
- Vibrato adds beauty to the tone (McCaskill & Gillian 1983:61).

4.3 How vibrato is produced on the flute

Authors have differing opinions on how vibrato is produced on the flute:

<i>Author</i>	<i>Method</i>
Krell (1973:15)	Vibrato is most probably produced by a combination of the delicate vibration of the throat and the elastic reinforcement of the diaphragm, acting together and sympathetically.
Wye (1980:133)	Vibrato should be produced by using the larynx and by fluctuating the air speed and therefore the air pressure with the diaphragm.

Author	Method
Gärtner (1981:126)	Vibrato does not originate in the diaphragm. The necessary alternation of tension and release of the breath is brought about by the periodic compression and release of the abdominal and thoracic muscles. In such “thoraco-abdominal” vibrato the larynx actively participates with muscular activity – the degree of laryngeal involvement can vary. Vibrato can be purely laryngeal without any participation by the abdominal muscles, thoracic muscles, or diaphragm.
Rainey (1985:117)	Vibrato is produced by using the throat constrictor muscles and the diaphragmatic muscles. These may be used separately or in combination. Diaphragmatic vibrato is produced by increasing or decreasing the wind pressure by a controlled motion of the diaphragm and surrounding muscles. Throat vibrato involves the constrictor muscles which control the amount of air entering the instrument. These muscles contract and expand permitting just enough air in and out to complete the cycle necessary for vibrato.
Nyfenger (1986:79)	The abdominal muscles cannot be moved fast enough to produce a usable, singing vibrato. The concept of the pectorals, diaphragm, or abdominal muscles doing this work must be recognized as merely a reaction to the work of the throat.
Willoughby(1994:12)	Vibrato should be based in the diaphragm; not only for the control possible, but also that the throat may remain open and unrestricted.
Coelho (1995:27)	Vibrato is produced by the throat, not the abdominal muscles. The diaphragm cannot produce such movements and the abdominal muscles are too big to create a fast vibrato. Although too much abdominal muscle tension is fatiguing, a certain amount of abdominal support maintains air pressure.
Walker (1995:15)	Vibrato comes from the combination of throat and abdominal muscle pressure; which one is paramount depends on the register. In the high register the air has to be moved more and has to be physically pulsated from the abdominal muscles. The vibrating motion in the low register is more from the throat, but using that motion in the next octave will cause the vibrato to dissipate and vanish completely in the third register.
Haid (1999:18)	Vibrato is not caused by the diaphragm, but by the contraction and release of the abdominal and thoracic muscles and is always combined with activity in the larynx.
Wechsler (1999:25-26)	Some flutists produce vibrato by pulsating the throat very rapidly, using <i>ooh-ooh-ooh</i> , otherwise known as the nanny-goat vibrato. Others produce vibrato by pulsating the air from the muscles in the abdominal area, in a <i>ha-ha-ha</i> or <i>hoo-hoo-hoo</i> fashion.

Author	Method
Potter (2001:20)	Advanced flutists use their throats to produce vibrato, but with beginners this concept interferes with keeping an open throat. Pulses from the diaphragm however will not provide a fast enough vibrato and at some point students naturally shift the vibrato to the throat. For those students who don't make the transition it becomes necessary to introduce the idea of engaging the throat.
Debost (2002:260)	Extensive measurements show that the diaphragm has no role in vibrato. Since vibrato cannot be produced by the lips or the chin, its mechanism must initiate somewhere in the throat area.

Table 10: The different opinions of authors on how vibrato is produced

Whether scientific evidence may show that vibrato is produced more by the abdominal muscles, or more by the throat is inconsequential: it is clear that most authors / flutists believe it to be a combination of the two. The reason is that vibrato is *experienced* as a combination of vibrations in the throat area and the abdominal muscles. Since scientific measurements are not available to us in everyday practise, it is more important to be aware of what vibrato 'feels' like, regardless of whether this is proved scientifically correct by tests.

4.4 Prerequisites for learning vibrato

With the exception of Bonner (1998:14), who believes that beginners take to vibrato more readily than more advanced students, authors maintain that the following techniques should be mastered before attempting vibrato:

- Good tone quality (Moore 1962:9).
- A clear, steady sound where the throat is open and relaxed in all registers (Hahn 1983:19; McCaskill & Gillian 1983:61; Nyfenger 1986:77; Rainey 1985:116).
- Sufficient air speed (Gippo 2001:8).
- Good breath control (Moore 1962:9).
- Purity, substance and colour of the basic sound (Moyses 1991:2).
- Emotional readiness – must be able to feel the music. In the absence of musical feeling, vibrato will be a mechanical pulsation which will not enhance the performance in any way. (Moore 1962:9.)

4.5 Learning vibrato

Marcel Moyse has never taught vibrato as such to his students. They learned to play with a singing tone, and as they acquired the maturity to actually 'feel' music, they naturally acquired the warmth of tone and the singing quality which we call vibrato (Moore 1962:9).

Some students are able to produce vibrato naturally, however the large majority has to be taught how to do it. Even if a student acquires a natural vibrato, it is advisable to teach the student the technicalities involved: this will give the student a deeper understanding which will lead to better control and conscious improvement of the vibrato already acquired.





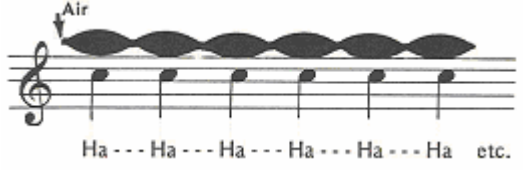
The following is a systematic approach to learning vibrato, containing the ideas of various authors.

4.5.1 Getting an understanding of what vibrato sounds like

The student needs some high-quality sound examples of vibrato. Vibrato should be demonstrated by playing to show how vibrato can colour the sound. In addition to this real-life example, it is a good idea to make a tape of about ten different examples of proficient vibrato, from flutists, singers and violinists. The student should listen to it repeatedly to develop a sound concept of vibrato. (Walker 1995a:16; Willoughby 1994:12.)

4.5.2 Learning to produce pulsations in the sound

Listening to examples should provide the student with a good enough concept of vibrato to be able to imitate it. However, there are students who have difficulty producing the first pulsations in the sound (Walker 1995a:16). Below are several methods that can be used to teach students to produce pulsations in the sound:

Author	Method
Hunt (1979:21)	<ul style="list-style-type: none"> • Say “ah” into the flute, producing as good a sound as you can, on middle D. • Play a long D emitting the air stream as steadily as possible. • While playing a long D, push the air out at regular intervals from the diaphragm. It might look like this  <ul style="list-style-type: none"> • Increase the frequency of the “peaks” of sound, reducing the depth of them.  <ul style="list-style-type: none"> • Increase the speed so that the “peaks” equal the “valleys” in duration. 
Hahn (1983:19-20); Coelho (1995:27)	<p>Produce a series of staccato notes without using the tongue, expelling short puffs of air as in laughing.</p>  <p>Using the same series, try connecting these pulses of air with a very slight amount of air.</p> 
McCaskill & Gillian (1983:61); Wye (1980:134)	<ul style="list-style-type: none"> • In the beginning it may be helpful to have a friend push against the abdomen to achieve rhythmic pulsation. • Start pulsations slowly with exaggerated motion, surging the air as if pronouncing “hah”.
Walker (1995:16)	<p>Try whistling and adding waves of vibrato, then playing the same thing on the flute. This technique usually works quite well, making any discussion of further physical</p>

Author	Method
	involvement unnecessary. If the above technique of producing a natural vibrato does not work, introduce the epiglottis, the muscle that controls whistling, laughing, coughing and crying sounds. Laughing and crying are outward signs of human emotion so it is appropriate that flutists also use this same muscle to put emotion into the music. Developing a natural vibrato begins with learning to control the epiglottis with rhythmic <i>hah hah hah</i> pulsations. With time the vibrato moves down into the chest so the sound has more depth.
Debost (2002:261)	Practise a sort of humming <i>mf</i> on easy notes, middle D or middle G (hmm...hmm...hmm...etc.) in an eighth-note rhythm, <i>a tempo giusto</i> .

Table 11: Methods used to develop pulsations in the sound

4.5.3 Speeding up the pulsations into a usable vibrato

The pulsations should be practised with a metronome, starting with two to four pulses of the vibrato per second (crotchet = 60), increasing the speed until a natural rate is found (Willoughby 1994:12; Krell 1973:16; Hunt 1979:21; Hahn 1983:20; McCaskill & Gillian 1983:61; Kincaid 1995:25; George 2002a:18; Wye 1980:134). A good rate for vibrato is four pulsations to the beat at a metronome setting of 84-96. (Wion 2005.)

As soon as the pulsations are fast enough and can be played at different metronome tempos, they need to be incorporated into pieces. This needs to be developed into a natural sounding vibrato that can be used at different speeds to depict the different moods of the music. The development of a natural vibrato takes time and depends to some extent on the musical maturity of the student.

4.6 Variables of vibrato

Regardless of whether vibrato is naturally acquired, or consciously learned, the student must learn to control it, and be able to vary it consciously as the music requires. The variables of vibrato over which the flutist must have control are amplitude and speed.

4.6.1 Amplitude

This parameter refers to the width of the pulses in the tone. This is a combination of the amount the pitch is changed, as well as the amount the volume or intensity is changed.

The width of the vibrato pulses can vary from an almost imperceptible pitch variation, to a semitone pitch variation. When the pitch variation is imperceptible, the variation is largely in intensity. The volume can also be varied to such an extent that there is almost silence between the pulses. (Wion 2005)

The pulsations result in variations in pitch, volume, intensity and timbre. These largely go hand in hand: if there is a raise in volume, the intensity will increase, and the timbre will change somewhat and there will most likely be an increase in pitch.

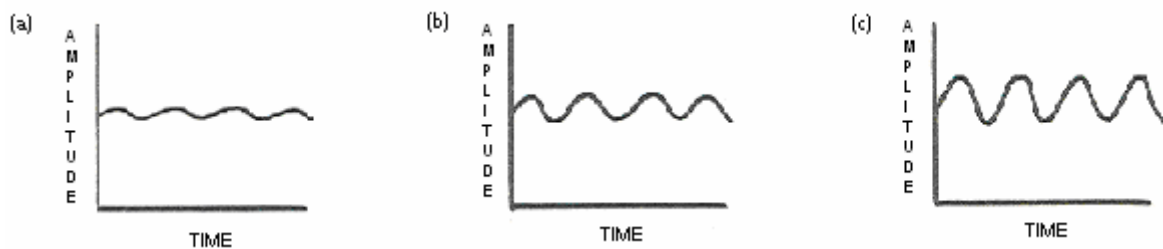


Figure 9: Visual presentation of vibrato, illustrating variation in amplitude. (McCaskill & Gillian 1983:61.)

Example (a) in Figure 9 illustrates a narrow vibrato. There is little variation in pitch or volume and the intensity between the hills and vales does not vary much. Example (b) shows a moderate vibrato of which the pulse variations are neither narrow nor extreme. Example (c) illustrates a wide vibrato, with big pulse variations. If vibrato of this type were to be recorded and played back slowly, it would be easy to identify the variations in pitch, volume, intensity and timbre. Each of the examples in Figure 9 has a valid place in music; the flutist needs to be able to produce all three (and variations in between), and use them in appropriate places in music.

The amplitude of vibrato is usually related to the dynamic level in the sense that at a soft dynamic level the amplitude is usually narrow and at a loud dynamic level the amplitude is usually wide (Moyses 1973:16). To do the opposite, i.e. to play forte with a narrow amplitude or to play piano with a wide amplitude, is hard to do and generally not musically satisfactory.

In the following three illustrations Debost (2002:260) shows the relationship of the amplitude of vibrato to the dynamic level:

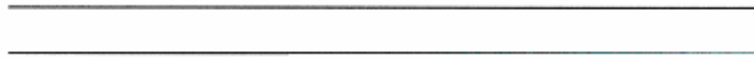


Figure 10: Tone without vibrato is symbolized as parallel lines.

Vibrato should be 'inside the tone'. It gives more density, economy, and intensity to the tone, whatever the dynamics:

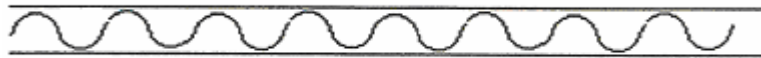


Figure 11: Tone with vibrato at a suitable amplitude.

Vibrato should never go 'out of the tone', whatever its speed:

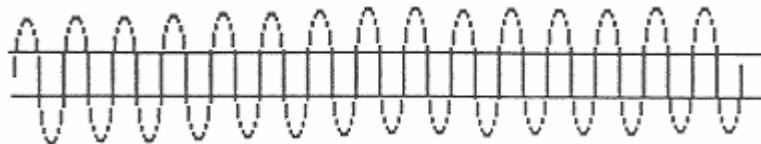


Figure 12: Tone with vibrato at too wide an amplitude.

The opposite of the above also holds true: vibrato of which the amplitude is too narrow for the dynamic level will not enhance the tone sufficiently and will not be audible. If the vibrato amplitude of a *pp* note is applied to an *ff* note, the human ear will be incapable of detecting it, or will hear only a slight quavering or uncertainty in the sound, as the difference between the loops will be negligible. Therefore the amplitude must be increased in proportion to the volume of the tone in order to make the vibrato usable and expressive in louder dynamics (Nyfenger 1986:79.):

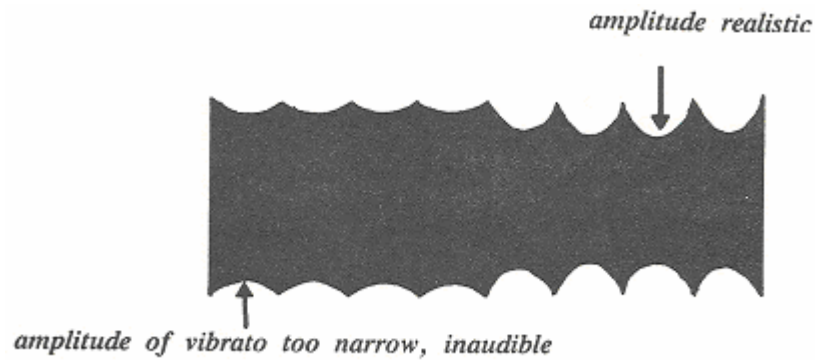


Figure 13: Visual representation of amplitude that is too narrow (left) and amplitude that is appropriate to the dynamic level (right). (Nyfenger 1986:78.)

In a diminuendo, the amplitude of vibrato needs to change as the dynamic level changes: the amplitude needs to be wider for the louder dynamic level and needs to become narrower as the dynamic level becomes softer. In a fine diminuendo the last wisp of tone must be free of vibrato, which must be terminated gently before the end of the note. As illustrated in Figure 14, it is not only the amplitude that becomes narrower, but in fact the complete vibrato pulse that becomes smaller. This means that as a diminuendo progress, the vibrato becomes gradually faster. It should not be attempted to make the vibrato faster during a diminuendo; this will happen naturally. (Nyfenger 1986:79.)

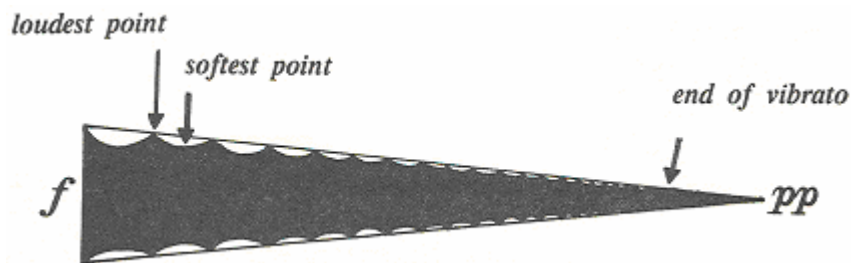


Figure 14: Vibrato with a suitably decreasing amplitude in a diminuendo passage. (Nyfenger 1986:78.)

The natural tendency is for vibrato to be bigger when playing louder, but an uncontrolled vibrato can actually waste the energy of a large sound. It can become obnoxious and increase the tendency to go sharp and / or to sound forced. Therefore vibrato must be moderated in strong dynamics to keep maximum projection without sounding shrill. (Debost 2002:262.)

4.6.2 Speed

This variable refers to the number of pulses per time unit. Normally vibrato will have four to seven pulses per second, depending on the mood and character of the music being performed (Wye 1980:137).

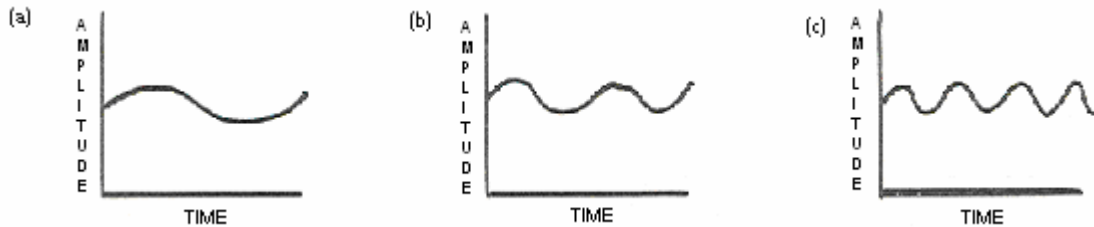


Figure 15: Visual presentation of vibrato, illustrating variation in speed. (McCaskill & Gillian 1983:61.)

Figure 15(a) illustrates a slow vibrato, (b) a vibrato at medium tempo, and (c) shows a fast vibrato. In general the vibrato rate is slower in the lower register and increases as the notes go higher (Kincaid 1995:25; Nyfenger 1986:21, 79; Krell 1973:16; McCaskill & Gillian 1983:61; George 2002a:18).

4.6.3 Combinations of vibrato amplitude and speed

Different vibrato amplitudes and speeds can be combined to create a wide range of diverse effects, not only in different pieces or in sections of the same piece, but sometimes for the duration of one note.

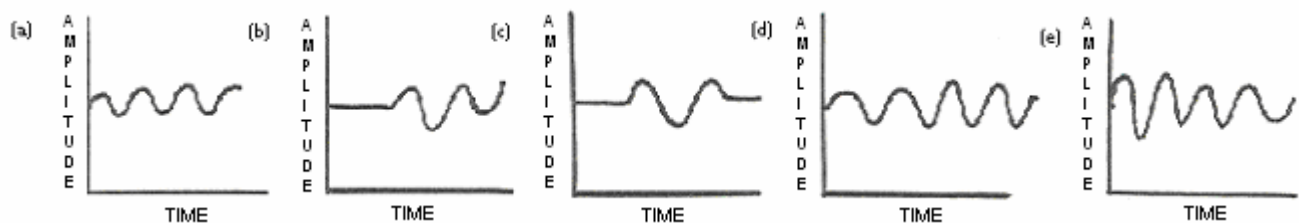


Figure 16: Visual presentation of vibrato, illustrating variations in both amplitude and speed. (McCaskill & Gillian 1983:61.)

The examples in Figure 16 are just some of the possible combinations of vibrato speed and amplitude. The possibilities are as numerous as the flutist's imagination allows. Example (a) shows vibrato with a slight increase in amplitude, while the speed seemingly stays constant. In example (b), vibrato only starts halfway through the duration of the note. Example (c) shows a note that starts and ends without vibrato, with two pulsations of vibrato in the middle of the note. The note in example (d) starts with a medium vibrato, which is then increased slightly both in speed and amplitude. Example (e) starts with a wide and fast vibrato of which the amplitude is decreased and the speed kept the same.

Narrow vibrato slower than 4 pulses at a metronome setting of 84 can create a peaceful effect but if it is wide it can tend to intrude on the sound and draw attention to itself (Willoughby 1994:12). Vibrato that is faster than four pulses at a metronome setting of 96 will tend to involve tightness and sound nervous, especially if combined with a larger width. A faster vibrato sounds more intense than a slow one. A fast and wide vibrato is the most intense. A slow narrow vibrato can sound sensuous. A slow wide vibrato can sound languorous. A fast vibrato that varies only intensity can sound nervous. (Wion 2005.)

4.7 Integration

After learning to vibrate, the vibrato must be integrated into the music. The following steps can be followed to achieve integration (Hahn 1983:20):

- Begin using vibrato in actual musical pieces with notes that are equal to or greater than a minim in length.
- Gradually begin applying vibrato to notes shorter than minims.
- Experiment with varied intensities of vibrato. Try exaggerating the pulse, then try making the pulse as slight as possible.

4.7.1 Beginnings

One of the initial mistakes students make when learning vibrato, is to start each note without vibrato and then start an upward vibrato. Most of the time, it doesn't musically make sense to start a note without vibrato; also, the upward vibrato has an adverse effect on pitch / intonation. Instead, the note should be started at the top of the pitch, in tune with the accompaniment, and be vibrated downwards

(Wion 2005). For the most part, starting a note with vibrato is preferable to adding it after the note is sounded. String players often vibrate on a string before drawing the bow to sound the note (Coelho 1995:27).

4.7.2 Intervals

After learning to vibrate on long notes, it is important to learn to vibrate through intervals. Stopping the vibrato when changing notes stops the flow of the music and creates an artificial effect. Vibrato should be continued regardless of finger activity. (Walker 1995:16.)

4.7.3 Fast passages

Nyfenger (1986:21-24) describes two problems with vibrato in fast passages:

Long notes can easily be sustained with vibrato without sounding distorted or artificial, whereas faster-moving notes may be adversely affected. Vibrato used during fast passages can cause inequalities in the dynamic shapes of individual notes, as each note may unintentionally begin on strong or weak points of the vibrato loops:

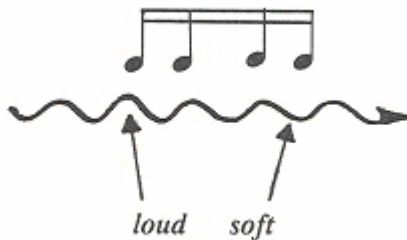


Figure 17: Visual presentation of vibrato incorrectly used during a fast passage; the effect is inequality of sound between the different notes. (Nyfenger 1986:23.)

Another unsatisfactory way to use vibrato is to cause each note to be coordinated with one loop of vibrato, creating a “poor man's portato”, a nagging effect often called ‘wah-wah’:

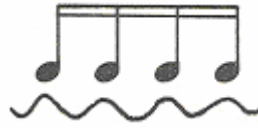


Figure 18: Visual presentation of vibrato incorrectly used during a fast passage: the 'wah-wah' effect. (Nyfenger 1986:24.)

Wion (2005) and Krell (1973:16) consider it good practice to vibrate evenly and consistently on long notes, but not on short notes or in running passages. In slow passages the transition between notes can be enhanced by shaping the vibrato on a note in such a way that the note ends on the upper (strong) point of a vibrato loop, thus making a smooth and true legato connection to the following note. When performers vibrate on quick notes there is a tendency for this legato to be broken.

Wye's (1980:137-138) opinion is different to that of Nyfenger, Wion and Krell: he states that vibrato should be used in faster passages. The vibrato should be quite fast (up to quavers at a metronome speed of 132). The effect is that the vibrato is not audible as independent wobbles anymore; therefore there will not be inequalities in the dynamic shapes of individual notes, as Nyfenger suggested. With increased vibrato speed, the wobbles begin to even out until there is an almost straight tone, which is perceived as a type of expression rather than as vibrato.

4.7.4 Intonation

The ear perceives the top of the vibrato wave to be the in-tune part of the note. In order to play with vibrato, a flutist must lower the basic pitch of the note so that the vibrato pulsations will come up to the correct pitch and the ear will perceive it as in tune, not sharp. If the lower part of the vibrato wave is in tune, the flutist will sound sharp. (Wechsler 1999:25-26.)

Sometimes a flutist will successfully start a note in tune with accompaniment and then vibrate above that pitch. James Galway uses this technique masterfully, however in the hands of a less masterful player, particularly if the upward push is greater and slower, the effect on the listener will be sharpness rather than brilliance. (Wion 2005.)

4.7.5 Ensemble playing

The musical context is of the utmost significance when selecting a vibrato style or when choosing to omit it altogether. To project a calm, secondary voice, little or no vibrato is appropriate, especially when the leading voice is played on a non-vibrato instrument, so that undue expressiveness from other members is an intrusion. On the other hand, a prominent vibrato of sufficient speed and amplitude can be very helpful in projecting through a heavy cover of other sounds, as is the case with many orchestral solos. (Nyfenger 1986:22.)

There should be consensus of vibrato style in each section of an orchestra 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. A good musician listens and matches vibrato speeds to the style periods and to other musicians. (Krell 1973:17; George 2002a:18.)

Chapter 5: Tone colour

5.1 The importance of tone colour

Tone colour is necessary to make the flute sound interesting. Wye (1988:17, 24) compares the use of only one tone colour to an artist who draws in only black on white paper. Although it is possible to make an attractive drawing in only black, it would be more lively and appealing in different colours. In the same way, musical painting is more interesting when the palette has many colours.

The use of different tone colours is a method of adding expression to the music. In addition to dynamics and vibrato, a flutist has tone colours with which to create a personalised performance of a composition (Wye 1993:111; McCaskill & Gillian 1983:63). Krell (1973:13) feels that tone colour serves as a central means of communication. Music has many different things to say and the flutist should be capable of communicating these through a variety of tonal qualities. For example, the flutist should be able to change the colour of tone to indicate textures of light and darkness, and to reflect manifold emotions. Wincenc's (1998:86) ideas correspond to those of Krell regarding musical communication. She states that all musicians should be telling stories through their music. Just as a person reading a fairy tale to children would use variations in the colour of his / her voice to depict different dramatic moods and characters, so flutists should use tone colour to depict the different moods and characteristics of the music.

5.2 Definitions of tone colour

Tone colour is the quality of a musical note which, at the very basic level, distinguishes different types of sounds or musical instruments from each other. Through tone colour, it is possible to tell instruments apart just by listening to them, even if they play the same note at the same dynamic level. This characteristic tone of an instrument is due to the presence of a combination of distinct frequencies which are present when a note is played. (Timbre 2006; Kamien 1992:5.)

At a more refined level tone colour is used to describe the differences in sound between two flutists playing the same note at the same dynamic level, even on the same flute. Due to various factors, one being the physiological differences in the bodies of the flutists, the tone they produce will not have

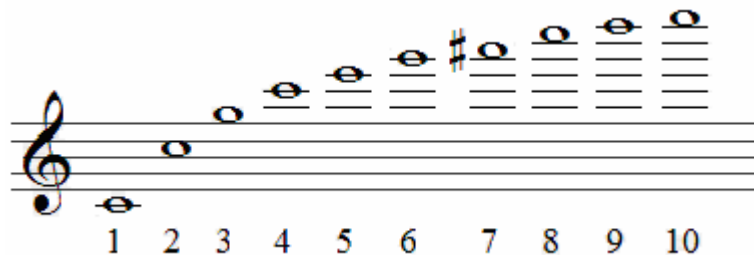
entirely the same colour.

The term tone colour is used in this chapter to depict the subtle variations in sound that one flutist can make on one note, even at one dynamic level. The differences in tone colour are due to the varying combinations of overtones in the sound (Wincenc 1998:86).

5.3 The harmonic series

Any note played on an instrument will set up sympathetic vibrations at set intervals from the original note. This is the harmonic series. (Stallard 2006a.) The lowest possible frequency of a note is called the fundamental frequency. This frequency determines the pitch of the note. The fundamental note is accompanied by other, higher-frequency tones that are generally called overtones. (Harmonic series (music) 2006.)

Sounds that have only one frequency (the fundamental tone) are not very interesting. They have no musical colour. When an instrument is played, a particular set of frequencies is heard, but these frequencies are blended so well together that they are not heard as separate notes. The number, order and relative intensity of this combination of frequencies give the note its colour. (Schmidt-Jones 2005; Van Blerk 1994:422.) For example, the characteristic tone colour of the clarinet is due to the presence of only every second overtone in the harmonic series. The flute has relatively few overtones present, which gives it a pure sound compared to the nasal quality of the oboe, which has a larger number of overtones (Van Blerk 1994:429).



1 – The fundamental frequency

2 – 10 Overtones heard with the fundamental frequency

Figure 19: A harmonic series written as notes. (Schmidt-Jones 2005.)

The combination of overtones used is not only relevant in distinguishing between different instruments, but also allows the flutist to create different tone colours on the flute through subtle variations in the strength of the overtones (Wincenc 1998:86). While the general nature of overtones is a product of the instrument itself, the relative interrelationship between them is controlled by the player (Rainey 1985:163).

5.3.1 Influencing the harmonic series

When playing flute, tone colour can be varied by emphasizing either the lower range or the higher range of the harmonic series, or, put differently, by adding or taking away higher overtones. If the higher harmonics are stronger, the tone has edge and brilliance; if the lower harmonics are stronger, the tone has mellowness and a dark quality. The relative strength of the overtones is influenced by air speed, the angle of the air stream, tongue position and the use of vowels. (Kincaid 1995:24; Coelho 1995:27; McCaskill & Gillian 1983:63.) The openness of the throat, the size of the aperture of the embouchure, the placement of the jaw, and the angle of the head also factor into the ability to create different tonal colours (Wincenc 1998:86).

5.3.1.1 Air speed

The faster the air stream, the brighter the tone because higher overtones are emphasized, whereas the slower the air speed, the darker the tone because lower overtones are emphasized (Coelho 1995:27).

5.3.1.2 Angle of air stream

If the air stream is aimed a little high the lower overtones are weakened, at the same time tuning will rise. The tuning is then corrected by slowing the air stream. This gives a light transparent sound with less projection. With a little deeper angle (the air is aimed more downwards), a faster air stream is needed to keep the note in tune. This gives more overtones resulting in a richer sound and better projection. (Stallard 2006b.)

5.3.1.3 Tongue position and vowels

Tongue position and vowel formation are very closely interrelated. Judith Bentley (Walker 1995b:14) teaches her students to adjust a tone colour by changing tongue position. She finds that the most natural correlation is using different vowel sounds.

The use of the tongue and vowels is discussed in more detail in the following section on resonance.

5.4 Resonance

Resonance is discussed hand in hand with tone colour because it is a means of enhancing the tone quality. The techniques used not only add resonance to the tone, but are important keys to the use of tone colour. Both resonance and tone colour have to do with the harmonic series: the use of tone colour manipulates the combination of overtones in the sound while the use of resonance suitably shapes a cavity in order to vibrate sympathetically with the overtones in the sound, thereby enhancing them.

5.4.1 What is a resonator?

A resonator is a hollow device that vibrates with and amplifies waves (Resonator 2006). Most instruments incorporate a resonator of some kind in order to add volume and body to their sound, very often simply a contained space in which the sound can echo. Violins, cellos and guitars have hollow wooden bodies; xylophones have empty tubes or boxes under their keys. Flutes do not have resonators and although the enclosed column of air acts as a partial resonator, the body of the flutist is an important means to add resonance to the tone. (Harrison 1982:51.)

5.4.2 The importance of the size and shape of the resonator

In many keyboard percussion instruments, (e.g. the xylophone), below the centre of each note is a tube, which is a cavity resonator. The length of the tube varies according to the pitch of the note, with higher notes having shorter resonators. The size of the resonator required depends on the pitch of the note. (Resonator 2006.)

The pitch of a cavity resonator rises as its volume decreases. An example of this can be experienced by blowing across an empty pop bottle: the pitch rises as the bottle is gradually filled with water to decrease the volume of the air cavity. On the other hand, keeping the volume the same, the pitch will fall as the area of its opening decreases: the pitch falls if the opening of the bottle is partly covered with tape. What counts is the relationship between the volume of the cavity and the area of the opening, not their actual measurements. (Mather 1998:77.)

The air vibrations that produce flute sound cause vibrations of the air in the throat, sinuses, mouth and lungs. The sound travels from the flutist's lips where it is created, outwards into the flute and into the air, as well as inwards into the player's body; the sound flows both ways simultaneously (Dick 2004). The body cavities (throat, sinuses, mouth and lungs) act as resonators. The air in these spaces resonates without any active help from the flutist; however, the flutist needs to adjust the size of the spaces to be appropriate to the pitch that is being played. This improves the quality, the purity (for more attractiveness), and the intensity (for greater expression and projection) of the tone, and the flute responds faster. (Mather 1998:75.)

5.4.3 Controlling body resonators

The resonances listed below work independently of one another. One technique can be learned at a time and can be mastered before the next is attempted. If a certain technique does not prove to be helpful, it might be that it is not being done correctly (perhaps more development and control of the muscles is needed); or it is already unconsciously being done; or it may not be suited to the shape and size of those parts in the flutist's body. (Mather 1998:75.)

5.4.3.1 Sinuses

Small muscles on each side of the nose enable people to open their sinuses for greater enjoyment of a pleasant scent. The more the sinuses are opened, the more flute tone improves. To cultivate these resonances, a flutist can pretend to be holding a beautiful rose just below the nose and to slowly inhale its perfume; then to keep that feeling while playing. (Mather 1998:75.)

5.4.3.2 Nostrils

Flaring the nostrils adds a little edge (high overtones) to the sound, which may improve the low notes but make the high ones strident. When well developed, the flaring is automatically accompanied by a downward movement of the upper lip. This helps to direct the air more downward, especially if the upper lip is short. (Mather 1998:75-76.)

5.4.3.3 Larynx

Keeping the Adam's apple or larynx as low as possible, adds depth to flute tone in all three octaves and particularly in the bottom and middle ones. If at first it is difficult to lower the Adam's apple, try yawning with a closed mouth, dropping the jaw, and / or lowering the back of the tongue. (Mather 1998:76.)

5.4.3.4 Mouth and throat

As seen in 5.4.2, a cavity resonator's size needs to be adjusted in order to provide the best resonance. The pitch of a cavity resonator falls as the area of its opening decreases and / or its volume increases. In flute playing, the mouth acts as cavity resonator and the cavity opening that should be adjusted is the one leading to the throat, because the lip opening is too small to have an effect. The throat opening is reduced by moving the rear of the tongue back and is enlarged by moving the rear of the tongue forward. (Mather 1998:77.)

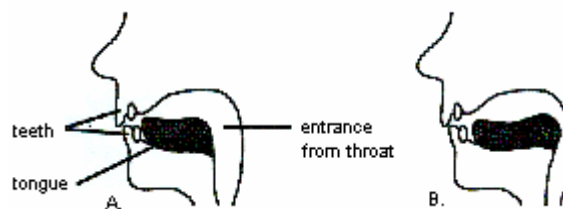


Figure 20: Illustration of the throat opening enlarged by the tongue in a forwards position (A); and reduced by the tongue in a backwards position (B). (Mather 1998:77.)

The positions of the rear of the tongue are, approximately:

- Below G1: gradually farther back proceeding down the scale; all the way back by D1;

- G1-G2: no effort to open or close;
- Above G2: gradually further forward proceeding up the scale; all the way forward by C4.

The volume of the cavity is controlled by

1. how close the top of the tongue is to the hard (front) palate,
2. raising and lowering the soft palate and
3. the inflation (if any) of the cheeks. Always keep the throat as large as possible just below the throat opening, to make the lung resonances more effective.

Adjusting the positions of the middle and tip of the tongue improves the strength and attractiveness of the tone as the dynamic level is changed:

<i>Type of note</i>	<i>Tongue position</i>
Soft notes	Place the middle of the tongue high and the tip forward to increase the overtones.
Loud notes	Place the middle of the tongue low and the tip back to decrease the overtones; otherwise they may be too strong.
Loud high note	Bunch up the tongue so that the rear is forward and the tip back.
Soft low note	The tongue should be elongated.

Table 12: Tongue positions relevant to different dynamic levels

5.4.3.5 Soft palate

The soft area (velum) toward the rear of the palate, which ends in the uvula, can be raised and lowered. Raising the soft palate enlarges the opening at the back of the mouth, which helps high notes but weakens low ones. Raising the soft palate blocks the passage from the mouth to the sinuses; opening the sinuses then has no effect. On high notes, experiment to find whether raising the soft palate or opening the sinuses gives better results. (Mather 1998:78.)

5.4.3.6 Jaw

Dropping the jaw tends to lower the middle of the tongue and draws back its tip. The rear of the tongue is close to the jaw hinge and so hardly rises or falls. Therefore dropping the jaw increases the volume of the mouth without altering the area of the opening to the throat. The result is to lower the pitch of the resonance to favour low and loud notes. Dropping the jaw also directs the air jet more downward, which further helps low notes. Raising the jaw reduces the volume of the oral cavity, which improves high and soft notes. (Mather 1998:78.)

5.4.3.7 Cheeks

Relaxing the cheeks somewhat when blowing lets the air pressure inflate them like a balloon. This enlarges the oral cavity, rather like lowering the middle of the tongue and dropping the jaw, to help loud and low notes. If it is found that inflating the cheeks changes the embouchure and affects the sound detrimentally, the cheeks and / or the embouchure should be firmed up. (Mather 1998:78.)

5.4.3.8 The use of vowels

Kohut (1985:189-191) explains how singers apply the use of vowels to increase resonance and regulate tone quality:

The oral cavity consists of the voice box, throat and tongue. Attempts to exert direct control over individual muscles in the oral cavity should be avoided. All operate automatically in an integrated fashion. The size and shape of the oral cavity can be regulated through indirect means through the use of various vowels. One way this is accomplished is by varying the relative size of the mouth opening; another way is by positioning the tongue in different ways.

Vowels are labelled according to their function:

- Open vowels: vowels that create a large mouth opening, such as AH in “man”. These are suitable for low notes because of the larger cavity that is created in the mouth.
- Closed vowels: vowels that result in a small mouth opening, such as EE in “me”. These are suitable for higher notes because of the smaller cavity that is created in the mouth.

- Front vowels: vowels that cause the front (not the tip) of the tongue to be raised. Front vowels are bright in tone colour.
- Middle and back vowels: vowels that cause the middle or the back of the tongue to be raised. Back vowels are dark in tone colour.

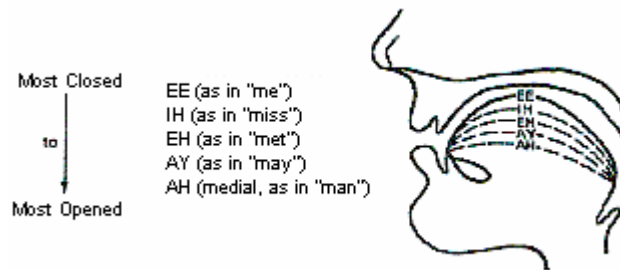


Figure 21: Cross section of the face showing the position of the tongue for front vowels.

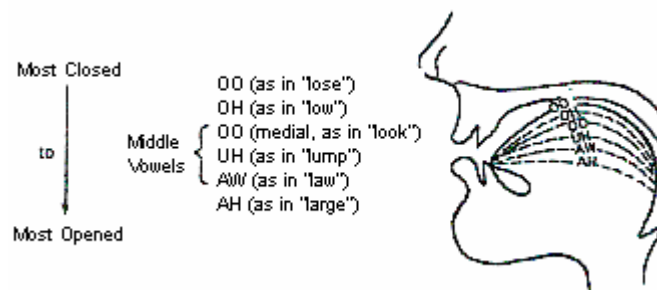


Figure 22: Cross section of the face showing the position of the tongue for middle and back vowels.

In Figure 21, notice that the front part of the tongue arches upward on EE whereas in Figure 22 it is the back part of the tongue that is raised, especially on OO. Both happen to be closed vowels, but OO produces a dark tone, while EE produces a bright one. Singers capitalize on this as a means of regulating resonance throughout the vocal range. A low pitch seeks large resonance cavities (throat, chest and mouth); a high pitch seeks small resonance cavities (head, nasal cavities). As a result of the many different tongue, lip and jaw positions possible through the use of different vowels and vowel combinations (diphthongs), the singer has at his or her disposal a built-in set of adjustable resonators.

Wind players regulate the size and shape of their oral cavity in much the same way that singers do – through the use of various vowel formations, the most common ones being “tee, tah, too or tu, and

toh.” Traditionally, wind players think of “tee” as producing the brightest sound, with “tah and too” aimed toward a progressively darker tone and “toh” being the darkest quality.

Mather (1998:76) advocates the selection of vowels to be used based on pitch and dynamic level:

The vowels used are pure and should be sustained: *oo* (as in “too”), *oh* (“foe”), *ah* (“ma”), *ay* (“day”) and *ee* (“bee”). The series *oo-oh-ah-ay-ee* moves from the sounds with the fewest overtones to those with the most, and from the strongest fundamentals to the weakest. In the application of this method of vowel use, the vowels are always applied in the above order:



Figure 23: A diagram showing the use of vowels determined by pitch and dynamic level.

Five different vowels are used (*oo-oh-ah-ay-ee*) and the range of the flute is correspondingly divided into five sections. Focusing on the *f-mf* dynamic level, each vowel of the series is used in the corresponding range. The vowels with the fewest overtones are used for the lower notes, since the lower notes naturally have more overtones than the higher notes, for which the vowels with the most overtones are used. Next, looking at the *fff-ff* range, the vowel series is moved up to the right, which means that the range of notes using the “*oo*” vowel is larger. The reason is that loud notes generally have enough overtones; therefore vowels containing few overtones are suited to them. Focusing on the softer dynamics, the vowel series is moved to the left, which means that vowels richer in overtones are used for lower notes. The reason is that the softer the note being played, the less natural overtones it contains. For projection, soft notes need the increased overtones provided by the vowels later in the vowel series.

In experimenting with the above method of vowel use, I initially found it overwhelming: there were too many vowels, note ranges and dynamic levels to remember. However, experimenting with only the *f-mf* dynamic range, taking the time to memorise the vowel series and the ranges, I found that the

method enhanced my resonance, and that the different vowels were suited to the different ranges.

It must be kept in mind that vowels are used for both tone colouration and increased resonance, but that they are used in different ways. For example, Figure 23 shows which vowels to use in which range and at which dynamic level for optimum resonance. For tone colour, however, one might choose to use a completely different vowel because the vowel will give the desired colour. An example of such a case would be if a flutist decides to play a soft note in the middle register with an “oo” vowel: because it does not contain so many overtones it will give a “yellow” tone. Knowing which vowels give good resonance in the different ranges and dynamic levels is a good starting point from which to explore further with the purpose of creating different tone colours.

5.4.3.9 Silent singing

The following explanation of silent singing is given by Dick (1986:9-10):

If one looks under the bars of a vibraphone, a resonator tube is found beneath each bar. Each of these tubes is of the correct length to amplify its note. The throat can function in a similar, but far more sophisticated manner. In order for the throat to function as resonator, the vocal chords should be held in the position they would be in if one were preparing to sing the note that is to be played on the flute. To understand this sensation, the flutist should play a note on the piano (or other fixed-pitch instrument) that is comfortable in the vocal range, and then prepare to sing it. Before the note is sung, there is a change in the throat when the vocal chords are brought to the correct position to sing the pitch. When the vocal chords are held in this position, the throat is able to resonate this specific pitch optimally. The vocal range of the flutist, and the octave the flutist's voice is tuned to, do not seem to be critical factors; the accuracy of the pitch, however, is.

Mastery of throat tuning is achieved by practise of singing, and simultaneously singing and playing the flute. It is important to remember that, unless one is a trained singer, far more air can be put through the flute than can be put through the vocal chords while singing and that it is possible to strain the vocal chords easily. When singing and playing together, the air speed is determined by the comfort of the vocal chords. Untrained vocal chords will tire easily and practise should not be any longer than can be handled comfortably.

The first step toward silent singing is to find the lowest note that can be sung comfortably and softly. Find the lowest easy note - one that does not make the throat feel distorted. Next, sing the note softly, and while singing, bring the flute up to position, form the embouchure, and play the same note in the flute's low octave while continuing to sing. This may take a few attempts, but it is a coordination soon learned. The next step is to use this lowest note as the starting point in an exercise similar to number one in Taffanel and Gaubert's daily studies book (Taffanel and Gaubert 1923:112), but practised in the following manner:



SLOWLY ♩ = 40

play normally sing without playing, but finger pitches, use syllable "oo": sing and play together play normally, but with sensation of singing

higher voice:

lower voice:

Since the air speed is determined by the vocal chords, and it is necessary to sing softly regardless of the octave the flute is played in, the embouchure will have to take on an additional role in the flute's second, third and (after much practise) fourth octaves. An analogy that describes this situation is that of a garden hose and tap. If the tap is opened only very slightly, the water pressure is quite low, but if the nozzle of the hose is tightened, a small jet of water emerges at great speed. Singing softly and playing in the higher octaves works in the same way. The initial air speed is low, so that the voice is not strained, but the embouchure is changed so that a small air stream is squeezed, pressurized at the embouchure so as to emerge fast enough to sound the note in the correct octave.

The 'silent singing' created by holding the vocal chords in position to resonate each note takes much less effort than actual singing, and since the vocal chords do not engage, the air speed is not affected by 'silent singing' and it is possible to tune the throat while playing at all dynamic levels. As time passes, the daily practise time involving singing can and will expand, as will the flutist's vocal range. Gradually both higher and lower notes can be added. There will, however, be pitches "out of range" as the practise pattern given above ascends, and when the voice reaches its upper limit, it should be dropped an octave. Upper limit is defined for these purposes as the highest note that can be produced easily, in a relaxed manner, while playing the flute.

5.5 Practical ways to learn to use tone colours

The methods of three authors on incorporating tone colours in flute playing are presented below.

5.5.1 Trevor Wye's method (1988:18-19)

The first step in learning to play with different tone colours is to be able to play the fundamental tone with very few overtones. This tone can be described as a yellow colour, a hollow, beautiful, big but buzzless tone. The following three experiments can help to find this tone:

- Play low G. Try parting the lips more than usual, making a slightly wider gap between the front teeth. Don't raise the direction of the air. If this larger hole makes a difference, remember how it feels, and use it when trying to sound hollow and large. It may open up the sides of the aperture and increase the amount of air escaping; this can be controlled in time.
- Try slowly changing the cavities in the mouth and throat. This is done by partially yawning – not too much, as it causes tension – and moving the tongue around. Try this on one note only. Make a mental note of any improvement or change.
- Play a long, low G, and change the shape in the mouth continually as in saying A-E-I-O-U. Observe any changes in the tone quality. Make a mental note of any interesting sounds.

After this fundamental tone has been practised for some time, overtones can be added. If the flute was to be turned in, or covered more, harmonics would certainly be added but at the same time, the fundamental would be diminished with a resulting loss of projection, and the notes will be flat. The listeners will hear a thin, buzzy sound. The rich, strong (purple) colour has to be practised by building on top of what has already been learnt in the previous experiments. The hollow “yellow” fundamental tone is the basis on which to add harmonics to produce a purple sound. Harmonics can be added by using the centre of the lips to hold the air stream and direct it downward.

5.5.2 Carol Wincenc's method (1998:86-88)

Before trying to achieve tone colours, one must work to create homogeneity of sound. One must be able to produce the notes of any scale with complete consistency and seamlessness.

Arduous work in controlling the dynamics of the sound and learning to taper a note are the baby steps in gaining mastery of tone colour. Playing pianissimo is critical and every bit as important as filling the instrument to a fortissimo dynamic. Colouration is not really dynamic change, but this is one of the best beginning approaches in striving for colour change, as it teaches the manipulation and control of the air stream with the use of the lips, jaw and aperture while not faltering in intonation.

A critical requirement for the development of tone colour on both the students' and the teachers' part is to listen. One must learn to listen before one can learn to reproduce or produce. One needs to be able to hear the subtlest changes in tone and to learn to use those changes.

The physical sensations must be monitored for flexibility, mobility and poise. The flutist needs to become aware of any unnecessary tightness in the body in order to relax. Then the imagination can be used to form a mental picture of the desired sound. Try to match this quality easily, pleurably, and fully while working toward an ever-present forward direction from the first note to the next. Repeat this again and again working for constant improvement without straining. Singing the exercise on the syllable *ah* can help to improve the tone quality.

When the desired new tone colour is achieved on long notes, it needs to be applied consistently over the range of the flute. Scale studies, e.g. the Taffanel and Gaubert daily exercises no. 4 and no. 5 can be used to achieve this, as well as melody work, e.g. the *24 Small Melodious Studies with Variations* by Marcel Moyse.

5.5.3 Thomas Nyfenger's method (1986:113-114)

In the following exercises, eliminate vibrato, dynamic and pitch variation.

Play a low G, and sustain it in *mf* with normal tone. Then blow down toward the lower part of the back wall by manipulating the lips and to some extent the jaw. Avoid a new placement of the flute on the lower lip, as these new sounds should be accessible in conjunction with those already mastered. The pitch will be flat, and the player must compensate for this by closing the lips. Faster air off the back wall will bring the pitch back to normal, and also offers a new, reedier quality. Save it for the proper, tasteful occasion.

Playing the same low G, blow at a less acute angle, or more across the embouchure hole, again noting the quality and pitch change. The tone is less “centred”, and the pitch is sharper. To adjust the faulty pitch, the lips should be opened to decrease the airspeed, which will also add to the diffused quality. Again, save this tone quality for the proper occasion.

Next, practise moving from the normal, neutral position to one or other of these tone qualities by employing long-tones with gradual metamorphoses. Pitch and volume must be maintained for the time being. Volume and colour changes, and even pitch variations, will be useful at some point and in conjunction with one another, but for the moment, isolating them is essential. First work on colour or timbre changes while maintaining the same dynamic level. Later add first a crescendo to the downward-blown colour and then a diminuendo to the across-blown one. Later, reverse this process, a more difficult manoeuvre.

5.6 Learning from other instruments

A wealth of music exists for instruments other than the flute and by borrowing and transcribing some of these masterworks for flute, much can be learned. In an attempt to sound like the original instrument, a flutist can enhance his / her abilities to imitate, thereby learning new techniques and colours. (Nyfenger 1986:115.)

A good starting point in imitating other instruments would be a close relative, the clarinet. Because of inherent capabilities or idiomatic usage foreign to most styles of flute playing, certain techniques are prerequisite to imitating the clarinet:

- Extreme dynamic control.
- An excellent legato, including the elimination of key-noise.
- The ability to sustain a phrase without vibrato.
- Instant, precise attacks.

Listen to great clarinetists and practise these techniques until they become easy and natural. When returning to flute repertoire, these acquired skills and tastes may influence interpretations in many cases. (Nyfenger 1986:115-117.)

For string imitations, all the techniques employed for the clarinet imitation are needed, plus:

- A variety of vibrato speeds and intensities.
- Multiple articulations with varying types of attacks, lengths, and releases.
- Even keener perceptive powers.

(Nyfenger 1986:18.)

A violinist has at his command the fretting and vibrato of the left hand plus all the resources of the bow – speed and direction, pressure of the wrist, varying contacts with the string and a whole repertoire of intensities depending upon the position of the bow in relationship to the finger-board and the bridge. Flutists should emulate these tonal options and try to approximate them. For example, the flute can produce a finger-board *flautando* (lots of loose air across the embouchure hole) or a bristly bridge tone (pressure of tight air directed more into the flute) together with all the intermediate intensities. (Krell 1973:13.)

We can learn from the tone of bells how to make our instruments resound in the most beautiful way. Listen carefully to the sound of a bell. Even a small bell produces a beautiful tone if struck with a proper attack and vibrato results spontaneously. Such a natural vibrato is not something that can be heard clearly in a superficial way. Unless one tries to listen for it, one may fail to hear it. In other words, if one first hears vibrato when listening to any tone, that tone is not natural, nor is its vibrato genuine. One should try to recognize the beauty of a bell's attack, tone and reverberation, and try to imitate its sound on the flute. (Takahashi 1998:81.)

5.7 The use of imagination

Playing with a variety of tone colours requires a flexible mind as well as a flexible embouchure (Peck 1995:20).

In learning tone colour, every student should trust his own innate imagination, which can be awakened by evoking imagery, painting sound colours, and describing feelings. Examples of artwork can be used to make correlations (e.g. the French Impressionist painter Monet to the composers Debussy or Ravel), to help the student create the colours in their tone. Words like “veiled”, “pastel-like”, “shimmery” or “muted”, plus the visualization of the actual colours bring a painting before us in sound. This way of thinking and playing brings out a larger palette of colour variations. It relies on creativity

and on the music itself rather than on exercises or words. (Wincenc 1998:89.)

Musical compositions sometimes evoke strong pictorial images which indicate appropriate tone colours to the performer. On other occasions, one may have to invent a story with explicit colourations for every *ppp*, crescendo, or *ff*. At these times, we must rely on experience and an understanding of what the composer wants. Of course, it is helpful if a composer is there to explain his own ideas about a piece. But even if he is not, when a performer is open to all possibilities, an imaginative spark can ignite the tonal equivalent of a bonfire. (Wincenc 1998:89.)

Try to place a sound in the mental ear. This can be related to the mind's eye. The effort to recall the exact appearance of something or someone can never produce an image as clear or as vivid as the real-life view of the same subject. So it is with sound. In order to learn to play with different tone colours, it is helpful to listen to a specific recording and try to imitate it. Experiment with the combination of angle, air speed, placement and type of vibrato, until a nearly exact replica of the sound is found. One should remember how it looks, feels and sounds, and add it to one's repertoire of sounds for future use. (Nyfenger 1986:10.)

Chapter 6: Practice Charts

6.1 Practice Chart 1: Embouchure

Below is a chart to keep track of embouchure practise. Every factor should be experimented with one at a time, preferably for a week or longer. Every day the experiment should be stated as well as the result. By the end of the week, significant progress should be noted. Next week, experiment with another factor.

Experimentation does not have to be conducted in the order below and a teacher should be able to advise students as to which factors need the most attention. Once experimentation has been completed in all areas, the cycle can be started again. As an example, a beginner student could start by narrowing aperture width, and then continue through all the other factors. Each of these factors should have a positive effect on the embouchure, but once the cycle has been completed it might be necessary to work on aperture width again.

<i>Factor</i>	<i>Date</i>	<i>Experiment</i>	<i>Result</i>
Vertical positioning: Relation of the lips to the lip plate: positioning the flute a bit higher or lower on the lower lip.			
Coverage: The amount the embouchure hole is covered by the lips.			
Horizontal positioning: Relation of the lips to the lip plate: positioning the lip plate a little to the left or right of the centre of the lips.			
Positioning of arms: Lifting or lowering the arms effects the horizontal angle of the lip plate to the lips.			
Width of aperture: Horizontal distance of the opening between the lips in relation to the width of the embouchure hole.			
Depth of aperture: Vertical distance of the opening between the lips.			
Embouchure shape: Smiling, straight or sad embouchure.			
Angle of air jet: Lifting or lowering the air stream by moving the lower lip / jaw forwards or backwards.			

To explain the process, I have included an example of my own experimentation with embouchure. As can be seen, it is very personal. That is what is needed. It has been determined that people are different and that different things work for different people, therefore it is important to personalise practise and experimentation in order to get the best results for the individual.

Factor	Date	Experiment	Result
Depth of aperture: Vertical distance of the opening between the lips.	08/07/2005	To increase aperture depth, I experiment with dropping my jaw (which increases depth) but then pulling my lips tighter, so as not to have too large an aperture.	Sound became rounder, clearer, louder, and more resonant.
Vertical positioning: Relation of the lips to the lip plate: positioning the flute a bit higher or lower on the lower lip.	15/07/2005	I am content with my current vertical positioning. I struggle however to maintain this position when playing long pieces – the flute slips upward, which results in insufficient resonance. I want to concentrate on keeping my ideal horizontal position during all my playing.	It seems that increased pressure with the left hand, which presses the flute more firmly against the chin, helps me to retain the horizontal position that I desire.
Width of aperture: Horizontal distance of the opening between the lips in relation to the width of the embouchure hole.	28/07/2005	My aperture is too wide when playing in the bottom octave. I need to close the right side of my lips more.	Not a notable change in tone, but my breath lasts longer.
Positioning of arms: Lifting or lowering the arms affects the horizontal angle of the lip plate to the lips.	09/08/2005	At this stage I don't want to experiment with a new arm position. However, I have noticed that, especially in difficult passages, I tend to move my arms much, which results in unclear sound. I want to focus on keeping my arms still in difficult passages.	Passages that seemed impossible are now much easier and can be played with a clear sound.

6.2 Practice Chart 2: Lip flexibility

Lip flexibility is practised with the purpose of producing the desired tone colour in different registers of the flute, playing intervals, and playing in tune at different dynamic levels. Keep in mind that changes are made to (1) the air speed, (2) the amount of air released, (3) the angle of the air stream, or (4) a combination thereof.

6.2.1 Octave shifts and large intervals

Octave shifts and large intervals should be practised in order to produce these easily and smoothly and to keep the same tone colour throughout. Any combination of intervals will provide practise material: use a piece of music in which a variety of intervals appear, use systematic exercises that proceed through the different interval possibilities, or even make up some exercises.

Experiment with the following methods to facilitate octave shifts and intervals:

<i>Factor</i>	<i>Date</i>	<i>Experiment</i>	<i>Result</i>
Forwards and backwards movement of the lips. (Used to change air speed and air direction)			
Forwards and backwards movement of the jaw. (Used to change air speed and air direction)			
Change the size of the aperture. (Used to change air speed)			
Increase / decrease the amount of abdominal support. (Used to change air speed)			

6.2.2 Intonation and dynamics

Mobility of the embouchure is an important step towards good intonation. Remember to practise the exercises in 3.3.1 of Chapter 3 as preparation for the following practice chart.

Intonation should be practised at different dynamic levels. See 3.3.2 of Chapter 3 for exercises and experiment with the following methods to improve intonation at different dynamic levels:

<i>Factor</i>	<i>Date</i>	<i>Experiment</i>	<i>Result</i>
Forwards and backwards movement of the lips. (Used to change air speed and air direction)			
Forwards and backwards movement of the jaw. (Used to change air speed and air direction)			
Change the size of the aperture. (Used to change air speed)			
Increase / decrease the amount of abdominal support. (Used to change air speed)			
Up and down head movement. (Used to change air direction)			

A trained ear is just as important as flexible lips when it comes to playing in tune. It is important to spend sufficient time on aural development as outlined in 3.3.3 of Chapter 3. A good teacher will be very valuable in aiding aural development.

6.3 Practice Chart 3: Vibrato

A prerequisite for the use of this practise chart is to be able to make pulsations in the tone. If this has not yet been achieved, the student is advised to learn how to do this with the aid of a teacher. For details see 4.5.2 of Chapter 4.

6.3.1 Vibrato speed

Follow the advice of Wion (2005) to be able to play vibrato at different speeds:

1. Start by practising vibrato at a comfortable speed.
2. Change vibrato to four pulses at a metronome setting of 84-96. For some students this might mean speeding up the vibrato; for others it might mean slowing down the vibrato.
3. Practise vibrato at even slower and even faster speeds.
4. Practise a different number of pulses per beat, e.g. 5 or 6 pulses at a metronome setting of 60.

Daily progress can be recorded in the following chart:

<i>Date</i>	<i>Metronome setting</i>	<i>Number of pulses</i>	<i>Comments</i>

6.3.3 Combinations of vibrato speed and width

Here the student gets the opportunity to combine the different vibrato speeds and widths that have already been practised. A table such as the following can be used to make sure all the possible combinations of vibrato widths and speeds are practised:

		<i>Vibrato Speed</i>		
		<i>Slow</i>	<i>Medium</i>	<i>Fast</i>
<i>Vibrato Width</i>	<i>Narrow</i>			
	<i>Medium</i>			
	<i>Wide</i>			

Use the open cells to write the date and a comment if required. Of course this table is a simplified version of possible combinations – in 6.3.1 and 6.3.2 above there are more possibilities. Students are free to practise as many possibilities as they can come up with – the more possibilities practised, the easier it will be to choose the most suitable one for a particular piece. Remember also to combine the different possibilities of vibrato widths and speeds with different dynamic levels. Give them creative names to help remember what they are. The names given don't have to be perfect as long as they help recall the type of vibrato wanted – they are for personal use only. For a few ideas see the following table:

Name	Description
Strong	A wide vibrato at a loud dynamic, medium speed.
Peaceful	Slower vibrato with narrow width at a medium to soft dynamic level.
Passionate	Wide and fast vibrato at medium to loud dynamic level.
Lovely long note ending	Starting with medium vibrato, medium speed, and medium dynamic level; making a decrescendo, gradually taking away from vibrato speed and width until the vibrato is inaudible and the note as soft as possible while still in control.
Abrupt angry ending	Medium to fast vibrato, medium to wide width at medium to loud dynamic level; progressively getting louder while increasing the vibrato width and speed until the note ends abruptly.

The method of practising different vibrato styles as outlined in the above practise charts is very methodical and structured. This gives the student the opportunity to develop a wide range of vibrato styles from which to choose the right one for the right circumstance. Be careful not to let this methodical approach quench any natural instincts for choosing a vibrato style in the spur of the moment. The student should be led by musicality, rather than by a table of vibrato possibilities. The idea of practising these vibrato styles is to develop the technique, but the technique must always be subject to musical requirements.

6.4 Practice Chart 4: Tone colour






A logical order for the use of the following practice charts seems to be to first experiment with resonance and thereafter with tone colour. The reason is that resonance helps to improve overall tone quality and also teaches skills that will be used for the acquisition of tone colours. There are, however, no hard and fast rules regarding the order of use and practice charts should be used according to need.

6.4.1 Resonance

Factor	Reminder	Date	Experiment	Result
Sinuses	Should be opened - similar to inhaling a pleasant scent.			
Nostrils	Flare nostrils, combined with a downward movement of the upper lip.			
Larynx	Lower the larynx (yawn with closed mouth / drop the jaw / lower the back of the tongue).			
Mouth and throat	Below G1: tongue further back.			
	G1-G2: no effort to open / close the throat.			
	Above G2: tongue gradually further forward.			
	Soft notes: tongue high and tip forward.			
	Loud notes: middle of tongue low and tip back.			
	High and loud notes: tongue bunched up (rear forward, tip back).			
	Low and soft notes: tongue elongated.			
Soft palate	Raise for higher notes.			
	Lower for lower notes.			
Jaw	Drop for low and loud notes.			
Cheeks	Relax the cheeks (experiment how much) for low and loud notes.			

6.4.1.1 Vowels

In the following practice chart, mark the vowel that gives the best resonance in each of the following ranges and dynamic levels. It is advised that the entire *mf-ff* dynamic level be practised before any of the others are attempted. Don't move on to the next dynamic level until the previous one has been mastered. Experiment with the vowels when playing long notes, scales, exercises and pieces in order to conduct a successful experiment. It might be useful to refer to Figure 23 in Chapter 5 to keep in mind which vowel is supposed to work, however all things do not work for all people, and therefore each flutist needs to do personal experimentation to find the best result.

		<i>mf-ff</i>	<i>mp-p</i>	<i>pp-ppp</i>	<i>ff-fff</i>
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				

6.4.1.2 Silent singing

Unfortunately, in my own experimentation with silent singing, I was not very successful. Thus I find it difficult to draw up a practise chart for other people's use. I think the reason for my failure is that I do not have a good singing voice and am not comfortable with singing. I do not like the sound of my own singing, although I do admit that after a flute practise session, I find my singing tolerable. It seems that flute playing improves my singing, rather than the other way round! The principle of moving from the known to the unknown proves to be at work here: my flute playing, which I know and am comfortable with, improves my singing, which I do not have suitable experience with. I would advise the student who would like to explore silent singing to use the book *Tone Development through Extended Techniques* by Robert Dick (1986:9-13) as a starting point towards developing the technique.






6.4.2 Tone colour

Factor	Reminder	Date	Experiment	Result
Air speed	Faster = brighter. Slower = darker.			
Angle of air stream	Deeper = richer (need faster air stream). Higher = more transparent (need slower air stream).			

6.4.2.1 Vowels

The same practise chart will be used as for practising vowels in the section on resonance, although the aim is different: in the section on resonance the aim was to find the vowel that gave the most resonance for each range and dynamic level, and it is important to keep in mind which vowels were the most successful. But in the practise for tone colour, anything is acceptable. The purpose here is

simply to listen to the tone colour that is created by the use of each vowel and to think of a situation in which it would be suitable. It would be appropriate to fill in descriptive names for each colour, as this will make it easier to recollect at a later stage. An advantageous experiment might also be to aim to get the same tone colour over the full range of the flute and to experiment with whether different vowels are needed to achieve this or not.

		<i>mf-ff</i>	<i>mp-p</i>	<i>pp-ppp</i>	<i>ff-fff</i>
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				
	oo				
	oh				
	ah				
	ay				
	ee				

Chapter 7: Summary and recommendations

The research question as presented in Chapter 1 of the dissertation is:

How can a flutist, as a performer of classical music, improve his / her tone production with regards to embouchure, lip flexibility, vibrato and tone colour?

Following is a summary of the findings and conclusion to the question.

7.1 Summary

7.1.1 Embouchure

The formation of the lips is of the utmost importance in forming a suitable embouchure for flute playing. Due to the differences in lip and mouth formation between individuals, precise instructions cannot guarantee success in tone production. It is up to the individual to experiment with embouchure technique utilising the following aspects of embouchure formation:

- Vertical positioning
- Coverage
- Horizontal positioning
- Positioning of the arms
- Aperture width
- Aperture depth
- Embouchure shape
- Angle of air jet

Knowledge of the muscles around the lips is helpful in understanding how they can be applied to form a suitable embouchure.

7.1.2 Lip Flexibility

As discussed in 3.2.1 there are a wide range of differing opinions on how to make register changes on the flute. These differing opinions are due to:

- flutists being unable to make reliable observations of themselves
- flutists using different combinations of methods to make register changes
- flutists using similar methods to make register changes experiencing these methods in different ways

Through literature study it has been shown in 3.2.2 that although several methods are used to make register changes, the aim is to do the following:

- change the air speed – which can be achieved by
 - forwards and backwards movement of the lips
 - forwards and backwards movement of the jaw
 - changing the size of the lip opening
 - increasing and decreasing the amount of abdominal support
- change the air direction – which can be achieved by
 - forwards and backwards movement of the lips
 - forwards and backwards movement of the jaw

The individual needs to experiment with the above methods to find the method or combination of methods that are most successful. Examples are given by Barcellona, Nyfenger and Krell to help to translate this theoretical information into practical examples.

Good intonation and dynamic differences are made through the same techniques used for register changes, with the addition of head movement. Exercises are given to develop mobility, dynamic control and listening skills. Listening skills are extremely important as the ears are the flutist's measuring tool in determining whether the pitch is accurate or not.

7.1.3 Vibrato

Teachers do not agree as to whether vibrato should be learned, or left to the student to develop naturally. All students will not develop vibrato naturally and therefore some need to be taught how to use it. It is important that those students, who develop vibrato naturally, also be taught the intricacies of vibrato so that they will be able to use it properly and with full understanding.

Although scientific evidence might show that vibrato is produced more by the abdominal muscles, or more by the throat, most authors / flutists believe it to be a combination of the two. The reason is that vibrato is *experienced* as a combination of vibrations in the throat area and the abdominal muscles. Since scientific measurements are not available to us in everyday practise, it is more important to be aware of what vibrato “feels” like, regardless of whether this is proved scientifically correct by tests.

The three important steps in learning vibrato are:

1. Getting an understanding of what vibrato sounds like.
2. Learning to produce pulsations in the sound.
3. Speeding up the pulsations into a usable vibrato.

Once the student is able to produce vibrato, the vibrato must be integrated into music and the student must learn how to use vibrato amplitude and speed to create appropriate types of vibrato for different moods in the music.

7.1.4 Tone colour

Tone colour is used as a means of communication, of expression, and of creating an interesting and personalised performance.

Tone colour is the subtle differences in sound that can be made by one flutist on one note, even at one dynamic level. Differences in tone colour are due to the varying combinations of overtones in the sound. Tone colour is varied by emphasizing either the lower range or the higher range of the harmonic series. This is mainly done through the following methods:

- changing the air speed

- changing the angle of the air stream
- changing the tongue position
- changing the vowel-shape formed

Resonance is a means of enhancing the tone colour. The use of resonance suitably shapes bodily cavities in order to vibrate sympathetically with the overtones in the flute sound, thereby enhancing them. The air in the body of the flutist resonates without any active help from the flutist; however, the flutist needs to adjust the size of the resonating spaces to be appropriate to the pitch that is being played.

The size and shape of a resonator and the size of its opening is important:

- Smaller resonators are suitable for higher pitches and larger resonators for lower pitches.
- Larger openings are suitable to higher pitches and smaller openings to lower pitches.

The main resonator of which the size and shape can be regulated in flute playing is the oral cavity with the throat as the opening.

The resonators available to the flutist can be controlled in the following ways:

Sinuses: Can be opened through small muscles on each side of the nose. Flute tone is enhanced when the sinuses are opened.

Nostrils: Flaring the nostrils adds high overtones to the sound.

Larynx: Lowering the larynx adds depth to flute tone.

Mouth and throat: Tongue position influences the size of the oral cavity and the size of the throat opening. This is an important means of changing the size and shape of the air cavity in the mouth.

Soft palate: Raising the soft palate enhances high notes; lowering the soft palate enhances low notes.

Jaw: Dropping the jaw increases the oral cavity without influencing the throat opening, thereby enhancing low and loud notes.

Cheeks: Relaxing the cheeks to some extent increases the oral cavity, thereby enhancing lower notes.

Vowels: The use of vowel-shapes is a detailed method of influencing the size and shape of the oral

cavity.

Silent singing: Silent singing (also called throat tuning) is used to adjust the position of the vocal chords, which influences the tone in a positive way. Silently singing the same note that is being played (even in a different octave) enhances the resonance of the note.

The imagination is very important when learning new tone colours. It is helpful to listen to a recording and try to imitate the tone. Imitating other flutists and even other instruments can help to add variety to a flutist's tone colour palette.

7.2 Recommendations

The quest for good flute tone is a very personal endeavour; each flutist needs to experiment in order to find his / her ideal flute tone.

Having the goal "to improve flute tone" is not a specific enough goal to lead to concentrated practise and good results. The goal needs to be refined. A flutist needs to be aware of the different aspects that make up good tone production: embouchure formation, lip flexibility, vibrato and tone colour. But having the goal "to improve embouchure formation" is still not specific enough to lead to concentrated practise and good results. The topic must be further broken down into specific tasks that can be executed and measured. To this end the practice charts should be useful.

The practice charts provide a methodical approach for improving flute tone production by executing specific tasks / experiments and notating the results thereof. Using the practice charts should be helpful in the following ways:

- They will help to set clear goals, the attainment of which can be measured.
- Notating results will indicate that progress is being made. This helps to motivate more enthusiastic practice.
- Notating the results will also serve as a reference for later: a reminder of the experiments that were successful.
- They will help towards a complete and detailed development of tone production: no aspect of tone production will be missed if the charts are used systematically.

7.2.1 For teachers

Most learners are not independent enough to use the practice charts by themselves. They need a teacher to guide them in the process.

1. In the first place, the teacher needs to discern which aspect of tone production needs the most immediate attention. Although the practice charts follow logically on each other and the earlier topics are easier to master than the later ones, the charts need not be followed in order of appearance, but should rather be used in the order that they will be most useful. If no particular problem seems evident, it will be good to start from the beginning.
2. Give the learner a specific goal from the practise charts for each week's practice.
3. Select appropriate music / technical exercises / note samples according to the student's ability for the next week's practice goal.
4. Evaluate progress in the next lesson and indicate the progress on the practice chart. Tone is difficult to measure and it is difficult to remember a learner's tone quality from one week to the next. Notating progress should help overcome this problem.
5. More advanced learners can be required to fill in the results of experimentations on practice charts by themselves. This should however be checked by the teacher during the next lesson.
6. For beginners, the practice charts can be used with / without the learner's knowledge. The teacher can give assignments and track progress on the practice charts without the young learner having to be aware of the methodical approach that is being followed.

The process of using the practice charts can be summarized by the following diagram:

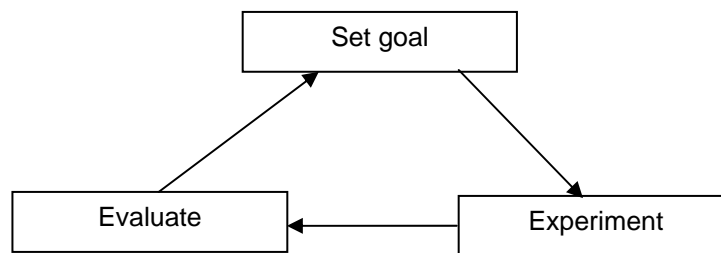


Figure 24: The process of using the practice charts.

7.2.2 For learners

Learners will best benefit from the practice charts if they are used under the supervision of a teacher. It is the teacher's responsibility to determine the order in which the practice charts are used and to give weekly assignments. It is the learner's responsibility to practise diligently and with concentration. If required to do so, the learner should fill in results of experimentation on the practice charts.

7.2.3 For performers

Performers are usually at a level where they can use the practice charts independently from a teacher. If this is the case, the performer fills both the roll of the teacher and the learner. The same steps should be followed as indicated in Figure 24. In the first place, a goal should be set. A performer usually knows which area of his / her tone development needs the most improvement and can accordingly choose a practice chart and set a goal. In the second place, the performer should practise and experiment with the goal from the practice chart, choosing music that will be appropriate to this goal. In the third place, the experimentation should be evaluated and results notated on the practice chart. The use of the practice charts should bring clarity of goals and progress where there perhaps used to be vague aims and vague progress. The practice charts can be especially helpful for individuals who do not have teachers to set goals for them and hold them accountable for progress.

Appendix A: Tone descriptions

Beautiful:	Tone quality that is delightful to the listener.
Big:	Can refer to tone that is big in volume, but also to a tone that contains a large number of overtones.
Breathy:	Extra noise (windy or hissy) audible due to improper breath control (allowing too much air to pass through the aperture) causing an impure tone.
Bright:	Tone that is rich in high overtones.
Brilliant:	Tone that is bright and clear.
Buzzless:	Without extra noise; clear.
Centred:	A tone that contains a well-balanced amount of the available overtones.
Characterless:	An uninteresting tone, nondescript, making no emotional impact on the listener. Devoid of elements that make a tone pleasant to listen to, e.g. sufficient air speed, the right combination of overtones, flexibility.
Clear:	A pure tone in which no extraneous noise is audible.
Colourful:	A tone that is striking in variety and interest. Achieved through a rich collection of overtones and good use of vibrato.
Coarse:	A rough tone, as opposed to a smooth tone. The air jet is not sufficiently shaped and some of the air creates turbulence which results in noise rather than pure sound.
Dark:	Tone that is rich in low overtones.
Empty:	Devoid of sufficient overtones.

- Flexible:** Tone in absolute control by the flutist, to such an extent that it can be bent or flexed without losing any of its purity. Tone that sounds easy and comfortable.
- Focused:** Tone that contains a good measure of the lower partials of the harmonic series.
- Fuzzy:** A tone that contains extraneous noise. Similar to coarse tone.
- Hard:** A too large complement of high overtones is present in the tone, making it unpleasant to listen too. Can also contain extra noise.
- Hollow:** Tone that is void of the lower partials of the harmonic series.
- Inflexible:** As opposed to flexible tone. The flutist is barely managing the tone and does not have the amount of control to be able to shape the tone or play with different dynamics.
- Lifeless:** Tone lacking vital energy – lacking sufficient air speed and overtones.
- Mellow:** Tone that is rich in low overtones.
- Muffled:** Unclear tone lacking the full complement of overtones and lacking projection, thereby being softer than it needs to be.
- Open:** Used to describe a pleasant, unobstructed tone, where the flutist does not cover too much of the embouchure hole.
- Pure:** Tone free of extraneous elements of any kind, faultless, uncontaminated.
- Purple:** Tone that is rich in overtones; as opposed to yellow tone.
- Reedy:** Tone that sounds somewhat like a reed instrument. The combination of overtones present gives it an edgy, penetrating sound.
- Rich:** Fullness of tone, abundant with qualities that make it pleasant to listen to.

- Shallow: A weak tone, lacking a sufficient volume of the fundamental tone, due to the angle of the air stream being too shallow.
- Small: A below average tone, limited in overtones, dynamics, projection.
- Smooth: Tone that is free from roughness or coarseness, fluent, gentle and even.
- Stuffy: Dull tone, sounding as if the respiratory passages are blocked.
- Thick: Tone containing a good measure of overtones; rich.
- Thin: Tone containing a sparse amount of overtones; as opposed to thick.
- Transparent: Tone of which the lower overtones are weakened by aiming the air stream higher than normal.
- Vibrant: An energized, lively sound; as opposed to lifeless.
- Windy: Similar to breathy.
- Yellow: Tone that consists mainly of the fundamental tone: few overtones are present.

Appendix B: Definitions

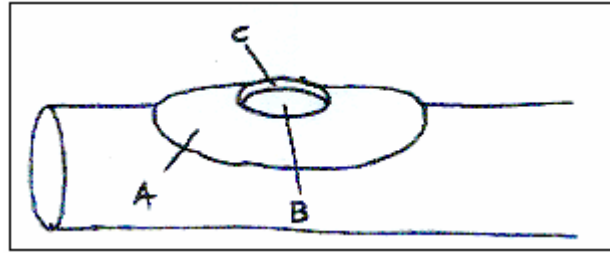


Figure 25: Graphic representation of the top part of the head joint of the flute

- Air Jet:** A column of moving air.
- Aperture:** Opening between the lips when playing the flute.
- Back wall:** The vertical part of the lip plate on the opposite side of the embouchure hole. C in figure 50.
- Coverage:** The amount the embouchure hole is covered by the lips.
- Embouchure hole:** The opening in the lip plate. B in figure 50. Sometimes called the “tone hole” by authors.
- Lip plate:** The elevated part of the flute on the head joint on which the lower lip is placed when playing the flute. A in figure 50.
- Registers of the flute:** The bottom octave is C1 to B1 on the flute, corresponding to C4 to B4 on the piano.
The middle octave is C2 to B2 on the flute, corresponding to C5 to B5 on the piano.
The high octave is C3 to B3 on the flute, corresponding to C6 to B6 on the piano.
C4 to F4 on the flute refers to the notes in the fourth octave of the flute, corresponding to C7 to F7 on the piano.

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