THE TEACHING OF PERFORMANCE TECHNIQUES
FOR CORNET AND TRUMPET

by

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ABSTRACT

The Teaching of Performance Techniques

for Cornet and Trumpet

by

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A study of the basic performance techniques used by cornet and trumpet specialists and the common problems encountered by cornet and trumpet players was made through reference to personal experience, personal interviews, and articles in journals, magazines, bulletins, and books.

Three areas of performance were studied: (1) tone production, (2) intonation, and (3) technical development.

It was found that there is usually more than one solution to a problem, and that each solution given must be individualized to meet each player's needs. Most of the problems players encounter can be prevented if one uses correct playing procedures while playing a quality instrument with a properly sized mouthpiece.

To become a successful cornet or trumpet player, a student must follow an assiduous daily practice routine, must possess a concept of how a tone characteristic of the instrument should sound, must be able to
form a correct embouchure, and must understand the problems of intona-
tion.

(123 pages)
PART I

TONE PRODUCTION
CHAPTER I

INTRODUCTION

The nature of the problem

Teachers of cornet and trumpet are constantly faced with the problem of discovering diagnostic and prescriptive procedures which might be useful in the teaching-learning situation. To be an effective diagnostician, the teacher must be thoroughly familiar with the techniques used in playing the cornet or trumpet.

Some of the problems students encounter while learning to play the cornet or trumpet and teaching procedures that have proved to be successful by cornet and trumpet specialists will be presented in this paper.

Three areas of performance will be discussed as they relate to the instrument and the player: (1) tone production, (2) intonation, and (3) technical development.
CHAPTER II

PROPERTIES OF CHARACTERISTIC TONAL QUALITY

Vincent Bach writes that the most important asset a competent player has is the ability to produce a tone that is characteristic of the instrument producing it. ¹ A person may be an excellent sight reader, may have sufficient pitch discrimination, and may develop adequate finger facility, but may still be unable to produce a vibrant tone that is characteristic of the instrument and pleasant to the listener. The purpose of this chapter is to discuss the physical factors the player must possess and control in producing a characteristic tone.

According to Bach, a musical tone consists of the prime or fundamental tone, which determines the pitch of the sound as a whole. The quality of the tone is determined by overtones with frequencies which are exact multiples of the vibration of the fundamental tone called harmonics; non-harmonic overtones are non-multiples; and vibrations which are non-periodic are classified as noise.²


Furthermore, to obtain a clear tone with good response from a brass instrument, a player must produce a predominate fundamental tone including certain harmonics which determine the brilliance and timbre of the tone. The non-harmonics which distract from the response of the fundamental tone must be reduced or the response becomes insecure and the tone "nasal." "The worst of these are called wolf tones; [sic] they do not respond at all, causing the player to crack them."³ "Nasal" or "foggy" tones are caused by non-harmonic partials and non-periodic vibrations. The resonance of the tone is improved because the harmonics support the vibrations of the fundamental components.

Along with the scientific viewpoint of what a good quality tone consists of, the beginning player must also have a concept of how a cornet or trumpet tone should sound. Hovey writes concerning the teaching of tone, "in this phase of music more than any other you can learn by imitation."⁴ The beginning student should not be allowed to produce a sound on his instrument until he has been exposed to a desirable tone, either by hearing a live performance by the teacher or someone else who has the ability to produce a tone characteristic of the instrument. If a live performance is not available, good recordings should be used. The student should be encouraged to hear as many excellent performers on the cornet or trumpet as possible.

³Ibid.

The question, therefore, which the writer poses is this: how does the player control the quality of tone? To answer this question, the varying physical factors that the player possesses and controls will be discussed.

Embouchure and its effect on tone

The word embouchure is derived from the French word, "bouche," which means "mouth." Embouchure refers to

... the mouth, lip, chin and cheek muscles, tensed and shaped in a precise and cooperative manner, and then blown through for the purpose of setting the air column into vibration when these lips are placed upon the mouthpiece of a brass instrument. 5

The quality of the tone the trumpet player produces is determined by the human embouchure, which "... depends on the lip texture, the cavity of the mouth, teeth formation, the physical condition and the correct training of the performer." 6 The muscles in the lips must be capable of varying their tension and conformation sufficiently to permit the player to obtain a range of three or four octaves, or approximately 36 to 48 different notes, responding from one range to another lightly and fluently while playing either a pianissimo or fortissimo passage of music. 7


6 Bach, Selmer Bandwagon, p. 11.

7 Farkas, p. 5.
To aid the teacher in instructing the student with regard to forming the embouchure, Farkas suggests that two pieces of equipment are necessary: (1) a small mirror which can be placed so the student can see himself, (2) an embouchure visualizer, as shown in Figure 1, which is necessary for the teacher and the student to be able to see what is really happening with the embouchure. 8

Figure 1. Embouchure Visualizer.

Dental-facial factors

A correct embouchure is the cornet or trumpet player's most important asset. Woodwind players have on their instrument several keys which aid them in changing from one tone to another. The trumpeter has only "... three pitch-changing mechanisms to help him,"9 the instrument's valves. All other note changes, tone control, flexibility, and intonation must be negotiated through the use of the embouchure. The lips are to the cornet or trumpet player what a double reed is to a woodwind player. The vibrations

8Ibid., p. 6.

that create the sound for the cornet player are produced by the lips while
the reed vibrates for the woodwind player.

Most of the cornet or trumpet student's technical progress depends
directly upon the efficiency of the embouchure. Most students who are
capable of forming and controlling a good embouchure can overcome the
other technical problems encountered in playing cornet and trumpet with
proper instruction and diligent study.

In helping the beginning student decide which brass instrument to
play, it is the responsibility of the teacher to encourage the student to be-
gin study on the instrument that he is likely to be most successful in play-
ing. If students have extreme dental or facial irregularities of the sort
which will hinder the formation of the correct embouchure, they should be
encouraged to choose an instrument from a family other than brass.

One of the irregularities that cause problems for brass players is
crowded and overlapping front teeth which often cause lip irritation when even
slight mouthpiece pressure is applied. Other irregularities are extreme
spacing between the front teeth, a removable dental bridge or plate, or
discrepancies in the form or size of the jaw which position the teeth and
support the lips and which, in turn, support the mouthpiece. Students who
have a cleft palate, or who have a severe scar on the lip, which may hinder
the lip's flexibility, would generally be more successful on an instrument of
another family.
According to Gibson, research has indicated that thick lips are not necessarily a handicap to good trumpet playing as some teachers seem to believe. 10 Most people have some irregularities which can be overcome "... providing they are aware of their problems and have the talent and industriousness to surmount them." 11

Suggestions for correction of minor irregularities will be discussed in the following section of this paper.

**Forming the embouchure**

The embouchure is a composite of many "... individually simple muscular functions, and when these are understood and applied ... one at a time, they can be assembled successfully into an excellent embouchure." 12

All muscles are capable of contracting and relaxing. It is the combination of these two actions that enables one to make any muscular movement; one muscle is contracting, or growing shorter from end to end and getting thicker, while the other muscle is relaxing or allowing itself to be stretched and becoming thin.

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11 Dale, p. 17.

12 Farkas, p. 17.
The next question is how are the muscles used to form an embouchure capable of responding to the air stream so that it will cause the correct vibration of the lips while they are in contact with the mouthpiece? Haynie writes, "for many years authorities have argued whether to use the smile system or the pucker system."13

The smile system requires the student to draw the corners of the mouth back by contracting the cheek muscles, "... placing the lips in the position of smiling and using the corner movement to raise or lower the pitch."14

According to Gibson, in some cases the smile system increases the flexibility of the player. But as the player contracts the cheek muscles, the center of the lips is stretched thin making them more susceptible to injury. "The lips and especially the center of the mouth are made weaker by the stretching. This usually results in a weak high register and poor endurance."15

The pucker system protrudes the lips into the mouthpiece by relaxing the cheek muscles and contracting the lip muscles, drawing the cheeks in toward the center of the lips. This system permits little, if any, stretching of the lips. "This method is favored by many high note artists as the lips...

14 Gibson, p. 19.
15 Ibid.
will withstand mouthpiece pressure more easily."\textsuperscript{16}

More trumpet and cornet specialists today seem to advocate a combination of stretching and pursing of the lips. By using the previously stated combination, the player is able to have sufficient tension to make the lips very responsive and still provide enough cushion for the mouthpiece so that the lips will not be easily damaged. Actually a tug-of-war takes place between the muscles in the lips and the muscles in the cheeks to keep the proper tension and flexibility in the lips. The corners of the lips should remain in approximately their natural position and should be held firmly against the teeth, so that they will not stretch outward or pull toward the center. By saying the word 'pooh' while keeping the corners of the lips firmly against the teeth, the player can usually obtain the desired tension needed in both the corners and the center of the lips. The aperture of the player's lips is like the hub of a wheel, with all facial and lip muscles pointing toward the center of the lips, as the spokes point toward the hub of a wheel.

"Actually, the center of the lips should be somewhat 'puckered' but the lips should still be held firmly against the teeth and not protrude."\textsuperscript{17}

If a trumpet or cornet player has an excessive stretch in the corners of the mouth causing a thinning in the texture of the lips, the result, generally will be a 'pinched' tone and a loss of flexibility. On the hand, if the corners

\textsuperscript{16}\textit{Ibid.}

\textsuperscript{17}Dale, p. 21.
of the player's mouth allow the lips to pull away from the teeth into the
mouthpiece, the results, usually, will be a distorted, 'fuzzy' tone, 'sloppy'
tonguing, and poor intonation. Puffed-out cheeks usually indicate a lack of
attention to muscle control in the center of the lips.\textsuperscript{18}

When the player is first learning to play the trumpet or cornet or
is changing from the smile system only (stretching the lips) or the pucker
system only (pursing the lips) to using a combination of both, he sometimes
becomes disheartened because the corners of his mouth become tired first.
Farkas claims this is the place for lips to become tired first and is a sign
that one is using the correct embouchure in most cases.\textsuperscript{19}

Another check to find out if the player is using and forming the
embouchure correctly is to listen for a sizzling sound of escaping air
while the student is playing the instrument. If the player is focusing the
muscle action toward the center of the lips and keeping the corners of the
mouth firm, the air leak will, usually, take care of itself. The lips actually
have to seal themselves to the mouthpiece "... so that the air column is
hermetically sealed or completely airtight at the point of contact between
lips and mouthpiece."\textsuperscript{20} In this respect the player's lips must not only act
as a coupler between the mouth and the mouthpiece but also must become a
sort of built-in washer.

\textsuperscript{18} Ibid., p. 23.

\textsuperscript{19} Farkas, p. 16.

\textsuperscript{20} Ibid., p. 5.
Jaw position

One of the basic factors involved in cornet playing is the manner in which the jaw is prepared to give the mouthpiece a solid foundation. The normal overbite for many players allows the lower lip to roll too far under the upper lip. The problem which presents itself if the lower lip rolls under too far is that the air stream direction is altered because its direction is changed so it blows down at the floor or the bottom of the mouthpiece cup instead of flowing on a straight line into the instrument’s leadpiece. Farkas writes,

... fifty percent of all embouchure problems are based directly on this illogical use of the air-column--this careful bringing up of a free air-column right from the bottom of the lungs, letting it continue through an open, clear throat, and then just where it would do some good as it enters the horn, violently deflect it with the lips so that it seeks to flow directly down over the chin and toward the floor. 21

The direction of the air stream can be controlled if the lips are supported by the jaw in such a way that both lips are directly opposite each other in an up and down consideration, so that one lip does not slide behind the other.

The lips are supported by the upper and lower teeth; so if the lips are aligned vertically, the front teeth must be aligned vertically. The upper jaw is immovable so the lower jaw must align the teeth, usually by protruding.

21 Ibid., p. 7.
The distance the jaw should be thrust forward can be determined by the following test. Have the student moisten his finger and hold it near the pursed lips. Then have him blow a column of air and locate the air stream with the finger. By moving the lower jaw forward the student will find he can change the direction of the air stream. With the use of an embouchure visualizer and a mirror the student can actually see what happens to the lower lip when the jaw is receded and then brought forward.

Most players feel that thrusting the lower jaw forward is completely unnatural, but front teeth align everytime one bites off a piece of food. For example, when one eats a raw carrot, the front teeth come together to bite. According to Farkas, "the thrust forward jaw position is not only normal, but, in my opinion, is an absolute necessity if one is to get that air-column directed straight through the horn for a big, rich, and free tone." Judgment must be used in determining how to thrust the lower jaw so it does not protrude too far allowing the air stream to be blown upward instead of straight into the instrument. The teacher must also use judgment with a student who has a malformed jaw or teeth and take this condition into consideration when having the student project his jaw.

The teacher should observe carefully to make sure the student does not let the jaw recede when he begins to play. Many players initially form

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22 Haynie, p. 63.

23 Farkas, p. 7.
a good embouchure and then distort it as they put the mouthpiece up to their lips.

Aperture

The aperture is the opening in the center of the lips that the air stream flows through causing the lips to vibrate. The direction of the lips in proportion to the air stream is as important as the direction of the air stream into the instrument, which has been discussed earlier.

Some players use a pout or project the lips into the mouthpiece. The protrusion of the lips is sometimes hard to detect except by sound. According to Farkas, the tone will usually be "... thick, dark, ... without ring or resonance and inclined to be grainy, or slightly rough." All of the air is not being converted to vibration, or the vibration is being caused on the inside of the lips.²⁴

Some players turn their lips in behind the teeth, as was mentioned before. The problem with turning the lips in is that when the player blows, the opening in the lips is closed thus restricting the air stream. Players who seem to choke or pinch off their tone as they play louder should see if the lips roll in or out. The rolling in or out of the lips can be corrected, if the teeth are aligned vertically, by stretching the corners of the mouth slightly and by pulling down on the chin muscle. Again, the embouchure visualizer will help in determining the extent of the problem.

²⁴Ibid., p. 20.
Many players have a problem with the lobe, which is the fleshy mount of muscle tissue in the center of the upper lip. The labial frenum connects the upper lip to the gums and extends from the gum to the lower part of the upper lip. Because of the muscular tissue around the labial frenum, most students’ center upper lip sags or protrudes slightly where the brass player forms the aperture. This protrusion must not be allowed to shut off the air stream or interfere with it in any way or protrude over the opening in the lips.

The player can generally correct the problem of a sagging center lip by slightly rolling this section of the upper lip so that the lip will be held against the teeth in a fairly straight line. A check can be made to see if holding the lip firmly against the teeth will prove effective by having the student 'buzz' his lips while watching in a mirror so that the teacher and the player can see and feel the exact point where the air is striking the upper lip. If the point where the air strikes is on the outer dull reddish part of the lip, the lip is rolled in enough. If the point is still on the inner fleshy part of the lip, the lip needs to be rolled in a little more. The common tendency is for this center section of the upper lip to slip out while the student is playing in the lower register because the tension in the lips is relaxed too much. This tendency is even greater if the player is playing in a "... fortissimo or tongued passage when percussive puffs of air slap against the tip of the lip."25

25Dale, p. 20.
The size of the aperture opening between the lips is controlled by the lower lip. As the lower lip tightens, the tension in the upper lip is increased and vice versa. When the student is playing in the high register, the aperture should look like the elliptical opening of an oboe reed and for the lower register it is similar to the opening of a bassoon reed. Thus the aperture's shape is similar in both registers; the only change is a little larger or smaller opening. Like the oboe reed, if the opening is too small, it will close off the air stream causing a choked sound; and on the very soft passage the sound will cut off altogether.

On the other hand, if the player's opening is too large and round, the air stream will not cause the lips to vibrate because it does not rub the lips, especially on a pianissimo attack. The air stream is so small it "... sneaks through the too-large opening without even touching the edges, so to speak, resulting in no vibration whatever!" However, the common tendency is for the player's aperture to be too small instead of too large.

Most of the problems players have with the aperture is in pianissimo playing or playing in the high register. About any type of embouchure will speak in some manner if enough air is blown through it, but the results are not always desirable. Either the aperture opening is too big, or the lips are stretched so tightly that they close off the opening. One can determine to

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26 Farkas, p. 38.
some extent if the aperture is too large or small or shaped correctly with the use of an embouchure visualizer and a mirror, but the first determining factor usually must be the quality of tone the player can produce.

The following are some of the problems the player encounters with an aperture that is shaped too flat. These problems were compiled by Phillip Farkas and included in this paper as he described each.

1. **Tight, bright, hard tone.**
   This tone is usually too brittle to be pleasant to the ear. In spite of this over-brilliance, the tone is generally small in volume and has a constricted quality, a quality which makes the listener instinctively want to "clear his throat."

2. **A tendency to play sharp.**
   This sharpening usually shows up most distinctly during soft passages, and occurs in all registers.

3. **Pianissimo attacks which fail to speak.**
   If the cause is too flat an opening, the air has trouble getting through the lips, resulting in a choked, small, sizzling sound instead of the note. Or, often the attack is accompanied by a lip resistance which makes the player feel as though he is getting red in the face. When the lips finally part, the sound disconcertingly blurts out louder than wanted.

4. **A sizzling sound, like frying bacon, particularly apparent in long-sustained, soft high notes.**
   This is caused by little "strings" of saliva which bridge the small gap between the lips, especially at the corners of the aperture. These flutter and buzz, interfering with the cleanness of the air column. These saliva strings, being viscid, will stretch just so far and cannot bridge the gap in a properly arched lip aperture. When this arch is high enough, the little strings simply never come into existence, or if they should, they cannot stretch the distance involved and will break at the least breath of air.

5. **Inability to carry a diminuendo down to nothing.**
   The diminuendo will continue just so far and then the note suddenly stops vibrating. Often this
stopping is preceded by the sizzling sounds described in number 4 above. The note suddenly stops vibrating because the lip opening is too flat. In fact, the only reason that there is an opening at all, in this case, is because air is being forced through it. In the course of a diminuendo, when the air force diminishes to a certain point, the lips simply collapse together, completely stopping the note.

When the lip aperture is correctly shaped, it is formed and not blown into this shape. In other words, the correct opening is so formed that even when air is not passing through it, the shape is maintained by the correct use of the muscles involved. Such an opening will not collapse when the air column is carried down to a mere thread, and consequently a diminuendo can be brought right down to infinity. 27

If the student has any of the above mentioned symptoms, usually the aperture opening is too flat and the following corrective procedures should be tried.

1. The upper and lower teeth have to be separated enough to help pull the center of the lips apart. This can be done by lowering the jaw slightly and arching the center of the bottom lip downward.

2. The chin has to be pointed or stretched downward in such a manner that there are no wrinkles in the chin. If the chin is pointed or stretched with sufficient strength, the shape of a 'U' will be formed that runs from each corner of the mouth to the center of the chin. Pointing or arching the chin downward will help in controlling the size of the aperture.

3. One of the common causes for the aperture being flat is that too much smile is used, or the muscles in the cheeks out pull the lip muscles stretching them too tight for the proper arch to be controlled in the center of the lips. There is one muscle that circles the mouth completely called the "orbicularis oris" that must have fairly even tension all around the mouth. \(^28\) This can be brought into balance by the player's slightly puckering or pursing his lips a little more.

4. It is very important that the corners of the mouth are a shorter distance apart when forming the embouchure or playing, than when the player is smiling. It is possible for the player to form a broad smile before forming the embouchure and have equal tension between the cheek and the lip muscles without drawing the corners of the mouth in. Farkas suggests forming the lips first and then drawing back the smile to form the proper embouchure and tension necessary. \(^29\)

The problem with the aperture's being too flat is usually the most common, but the aperture can also be too wide. This problem can be

\(^{28}\) Ibid., p. 39.

\(^{29}\) Ibid., p. 40.
detected by a "... hollow, dull, furry tone quality." The player can usually correct this problem by applying a little more tension in the corners of the lips or by not pulling the lower chin down quite so much.

How large or small should the aperture be? It seems the aperture vibrates the horizontal width of the opening in the lips. This can be shown and substantiated by the following statement.

A basic law of acoustics states that if a vibrating object, such as a violin string, is touched at the halfway point in its length, the resulting half-length should sound an octave higher than the full-length string.

The player's aperture is similar to the violin string in that if the opening size is reduced the pitch will rise if the air column remains the same. In Figure 2 the opening is only about half as wide for the octave change from one note to another.

Figure 2. Aperture opening.

\[\text{Figure 2. Aperture opening.}\]
The size of the aperture is also affected by volume; the softer one
plays, the smaller the opening and the louder one plays, the bigger the
opening. To produce a big sound, a big air column is needed, and the
aperture opening has to allow room for the air column to flow into the
instrument. Farkas writes that,

The highest, softest, note one can play is the
result of the smallest lip aperture he can produce . . .
the lowest, loudest note one can play will require the
largest lip aperture he can produce.
A perfectly calculated crescendo during an
ascending scale passage could conceivably be produced
with no change in the size of the lip aperture. 32

The above theory is stated because a note in the high register requires
a smaller aperture than a note in the low register. If the player started with
a pianissimo, which requires a small aperture and air column, and played an
ascending scale up an octave and a half to a forte, the aperture could remain
the same because the higher note requires a smaller aperture even though the
volume is louder.

Muscular endurance

The muscles that control the embouchure are as important to the cornet
or trumpet player as the leg muscles are to a track star. These muscles must
be developed slowly and consistently. A cross-country runner cannot gain the
necessary endurance and strength needed to run a 2-mile course by walking

32 Ibid.
around the block once a day, nor can the cornet or trumpet player strengthen and develop the embouchure by playing the C major scale only once a day.

Both need an organized daily-practice routine. The daily practice, if properly organized, is the most important factor in increasing endurance. Mueller writes, "anyone who wishes to play a brass instrument well must do some playing every day."33 If the player practices regularly and then stops for even just two or three days, the lip becomes soft and flabby; and the player loses his flexibility and tone quality.34

Clarke recommends that the embouchure may be strengthened by always playing softly and never harshly. The softer one plays when practicing, the stronger the embouchure will become. This has proven to be more successful in building the embouchure than resorting to 'brute force' that results in destroying the nerves of the lip, leaving it numb.35

The purpose of developing endurance for the brass player is to enable one to play in both the upper and lower register of the instrument with control and confidence. In most cases, a responsive and flexible embouchure insures this confidence.


34 Ibid.

Endurance has to be developed slowly by playing long sustained passages for a short length of time, at first, and then gradually increasing the playing time. Mueller claims,

> Endurance cannot be practiced when the lips are fresh. The best time to work on endurance is at the end of the practice session, taking care not to play excessively in the high register, and only at moderate volume.  

The player has to use good judgment in determining how long to practice. If the player continues to play in the high range with full volume after his lips are very tired, the embouchure muscles can be seriously injured. Until the embouchure is fairly strong, the player is wise to divide his practice time into two sessions per day. Clarke writes, "always remember when the least fatigue is noticeable to rest a few moments, even if in the first few minutes of practice." The lips are like a finger when a piece of string is wound tightly around it—left for any length of time, the finger becomes numb. The lips also become numb when the mouthpiece is pressed against them constantly. Tetzlaff writes that all the hard performers (professionals) recommend a 1:1 ratio of playing to resting.

The following are suggested procedures for strengthening the embouchure:

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36 Mueller, p. 20.

37 Clarke, p. 4.

Soft warm-ups

A. Buzzing the mouthpiece. The lip muscles are no different from any other muscle in the body: when they have been out of use for a while or overworked, the lips usually become stiff. By buzzing the mouthpiece without the instrument, the player can free the lips of their stiffness making them flexible and responsive. Dale writes, "it is my contention that a few minutes of 'buzzing' on the mouthpiece prior to all other practice or playing is of inestimable value."\(^{39}\)

Have the student hold the mouthpiece out at the end of the stem with the thumb and index finger so that very little mouthpiece pressure, if any, will be applied. The student should begin his lip slurs on about G second line in the staff and slur down a fifth below to C below the staff. Playing very softly, the player should move up the scale by half steps continuing to slur down a fifth on each note.

Bush recommends the following routine be used in playing on the mouthpiece only:

1. Long tones (softly).
2. Slow slurs.
4. Intervals (slurred).
5. Flexibility exercises (softly).

\(^{39}\)Dale, p. 28.
6. Range exercises (in a flexible manner).  

B. Developing equal cheek and lip strength. Many beginning players have a problem getting equal strength between the lip and cheek muscles. Possibly the reason is that we use our cheek muscles when we smile and talk more than we use the lip muscles. The result of this is that the beginning player forms a broad smile, stretching the lips thin, forgetting, or being unable, to control and form a slight pucker. Farkas suggests this exercise in developing a balance between cheeks and lips: while watching in a mirror, one should form a broad smile making the cheek muscles very tense, and at the same time relaxing and letting the lips stretch and become very thin. Keeping the cheek muscles tense, slowly start to pucker the lips by contracting the lip muscles, which will pull the corners of the mouth together. But one needs to make sure that the cheek muscles stay firm. This exercise should be performed "... alternating with a moment of complete relaxation, every five or six seconds for a couple of minutes a day. This will not only educate the cheek and lip muscles, but will also develop their strength."  

__Lip slurs__

Haynie writes,  

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41 Farkas, p. 15.
The best exercises to practice for the development of embouchure are lip slurs, as evidenced by the number of great cornet-trumpet players of the past and present who have written whole books on lip slurs. I recommend the following in order of difficulty: Lowell Little, Embouchure Builder, Pro. Art; Earl Irons, Twenty-Seventy Groups of Exercises, Southern Music Company; Charles Colin, Lip Flexibilities, Colin; and Max Schossberg, Daily Drills and Technical Studies, Baron. 42

Dale suggests the students use the seven different valve combinations starting with open 2, 1, 1-2, 2-3, 1-3, and 1-2-3, slurring the various pitches common to each valve combination, being sure to rest in between.

In playing these lip slurs he must make the lip do all the work and remember not to resort to pressure or force of any kind . . . all lip slurs should begin in the middle register, . . . 43

Long tones

Long tones should be practiced not only on the mouthpiece but also on the instrument. The long tone should be practiced in a variety of ways to be effective. The most common way is to play one volume level for a certain number of beats. Fifield recomends that one practice long tones for a certain number of seconds so that the length of time is consistent. 44

43 Dale, p. 28-29.
44 Glen Fifield, Cornet Clinician, Utah State University Band Symposium (July 10, 1968), Lecture.
The long tones should be practiced with the following dynamics:

\[ PP \rightarrow FF \rightarrow PP \]

\[ MF \rightarrow P, P \rightarrow MF \]

Long tones played with dynamic changes require accurate lip control and will help the player gain control if the same balance of crescendo and decrescendo is used and the tone is not allowed to change colour. "There must be no change in the intonation of the tone in the crescendo and decrescendo." \(^{46}\)

**Long etudes**

Many brass players are unable to play a solo from start to finish because of embouchure fatigue. Brass players can increase their playing endurance by including long etudes in their daily practice routine. Mueller writes that:

The practice of long etudes at slow speeds aids endurance. The performer should gradually increase the length, \([\text{of the etude}]\), so that a margin is created for a given passage. \(^{47}\)

\(^{45}\) Mueller, p. 22.

\(^{46}\) Dale, p. 29.

\(^{47}\) Mueller, p. 20-21.
This margin may be obtained by playing the etude through twice instead of once, without a pause. The result will be, with intelligent planning and gradually lengthening the long sustained passages during practice, the solos will be easier, as far as endurance is concerned.

Endurance can also be increased by the use of scales and exercises which will be presented in the section of this paper entitled "Extending the Range."

Mouthpiece placement

Much attention should be paid to the placement of the mouthpiece. The student cannot simply pick up the instrument and blow, but must place the mouthpiece against the lips in a position that will produce the best results.

The mouthpiece must not feel merely perched on the lips. There must be a sensation of a 'grip,' as though the mouthpiece were sitting in a groove, and so that it feels like a natural extension of the lip muscles rather than a cold piece of inflexible metal pressing the lips. 48

It seems that exactly how high or how low the mouthpiece should be placed on the lips is a highly controversial subject among different brass specialists. Farkas suggests that the trumpet or cornet player should use about two-thirds lower lip and one-third upper lip. 49 Haynie recommends

49 Farkas, p. 33.
that the mouthpiece be placed in about the center of the lips with half of the mouthpiece on the upper lip and half on the lower lip. He states, "the object of desiring the mouthpiece to be centered is to allow an equal use of the facial and lip muscles both up and down and side to side."\textsuperscript{50}

The one procedure that most specialists seem to agree on is that the mouthpiece should be placed horizontally as near the center of the lips as possible. Irregular shaped teeth may slightly affect the location of the mouthpiece.

Because the lips are very flexible and pliable, their appearance outside the mouthpiece might be quite different from the actual shape of the lips inside the mouthpiece, so it is important that an embouchure visualizer be used. Mueller writes there are four points of the lips that must have equal tension and the membrane tissue of the upper lip should show slightly inside the mouthpiece as shown in Figure 3.\textsuperscript{51}

Broiles writes,

Players whose embouchure formation is too low on the upper lip suffer the widest variation of performance and inconsistency. You would think that every player would have enough sense to maintain the embouchure high enough on the lip to become anchored so as to survive the punishment it most certainly will receive.\textsuperscript{52}

\textsuperscript{50}Haynie, p. 63.

\textsuperscript{51}Mueller, p. 4-5.

Figure 3. Equal tension points of lips.

Mouthpiece pressure

One of the most common reasons for trumpet players' having bruised or sore lips is that excessive mouthpiece pressure has been exerted against the lips. Many beginning players try to play in the high register too soon or continue to play after the embouchure is fatigued. The usual result is that the player applies excessive mouthpiece pressure which bruises and sometimes even shreds the inside of the lips. "But more dangerous than this, which heals quickly, [referring to the bruised or shredded lips] is the general decline of the vibratory capacity of the overall tissue."53

Farkas writes, "the regular use of excessive pressure will not only result in poor tone and sluggish technique, but will shorten the players

53 Ibid.
endurance and, in the long run, shorten his playing years. 54

According to Farkas, the lips are like a freshly baked doughnut that has raised properly and is spongy. Place this doughnut between two pieces of plate glass and notice how the hole in the center becomes smaller as the glasses are pressed together, and the doughnut is flattened. The doughnut is no longer spongy but is now much firmer than its original consistency. The lips respond the same way when pressed between the teeth and the mouthpiece. The aperture becomes smaller, pinching off the air stream, and the blood circulation is cut off to the lips. "Of course, human lips cannot take this punishment indefinitely." 55

Dale lists three of the main causes of excess pressure.

1. Use of the 'smile system' which thins the lip texture, making it inflexible and weak.
2. Other embouchure difficulties where there is not sufficient control in the center of the lips.
3. The attempts of young students, whose lip muscles are not sufficiently developed even though they have correct embouchure formation, to play in high register before they are physically capable of it. One word of warning: the pressure habit, once started, is most difficult to break! 56

The player should be able to play the cornet or trumpet with very little mouthpiece pressure, if the player is taught properly and understands

54 Farkas, p. 53.
55 Ibid.
the function and the correct formation of the embouchure. Clarke writes, "never hold the lips rigid, keep them soft and pliable, using only enough pressure to keep the mouthpiece firmly against the lips without any air escaping outside the mouthpiece."57

The slight pressure that is used to keep the lips firmly against the mouthpiece should be distributed evenly over the embouchure if sufficient endurance is to be obtained. If the player is not playing with equal mouthpiece pressure on both lips, the mark which the mouthpiece makes on the player's lips will be more distinct at that point where the most pressure is being applied.

**Extending the range**

Much has been written about the different methods one should use to develop the embouchure for the upper register, and some even guarantee that if such and such a method is followed one can become a high note artist in twenty-five lessons or so. Broiles writes, "every young player has to learn, and many massacre the flesh trying to play too high, too loud, too soon."58

Range must be developed with consistent, intelligent practice. The beginning player should not only worry about the upper register, but also the

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57 Clarke, p. 4.

58 Broiles, p. 359.
middle and lower registers which are equally important. Dale writes concerning the development of all registers, "the main thing is systematic training of the lip muscles and embouchure formation." 59

The students should not attempt to extend his range until he is able to play the middle register (approximately C below the treble staff to F, the top line) with ample control in all volume levels. "Any practice of concern of these extreme registers without an adequate foundation and preparation will prove useless and occasionally disastrous." 60 There is basically no change in playing the extreme registers. Farkas claims the corners of the mouth do not change, as some people think, while the pitch ascends into the higher register. If the proper embouchure is used, the 'tug-of-war' mentioned earlier keeps the lips and cheeks in about the same position. "So the muscular feeling while playing throughout the instrument's range is one of varying degrees of tension and relaxation but not one of lip motion— or commotion." 61

One of the problems that students encounter when playing from one register to another is that the player uses a 'double embouchure,' that is using one shaped embouchure in one register, and resetting and forming

60 Bush, p. 67.
61 Farkas, p. 15.
a differently shaped and positioned embouchure for another. The double
embouchure is usually caused by the student's relaxing his embouchure
too much for the lower notes. The problem occurs when changing from
the lower register to the higher register. If the player allows his lips to
protrude too far while playing the lower register, he will be unable to con-
trol the aperture when playing the higher register without changing the
embouchure. 62

In playing in the lower register, the player has to be careful not to
relax the embouchure too much. The corners of the lips must retain some
tension especially if the note is to be tongued.

In order to play in the high register, the player's aperture has to
decrease in size. This causes the lips to vibrate faster.

Dale gives the following lip-movement formula for effecting the
necessary lip change to play in the high register.

1. A slight rolling in of the upper lip.

2. Pulling the upper lip backwards against the teeth (imagin-
ing that I am trying to push my teeth into my mouth with the lips--
but now by mouthpiece pressure).

3. A balanced tension of the muscles of both lips pressing
against each other--but still attempting to retain the basic reed-
shaped hole. When playing down a scale, there would be a gradual

relaxation of these basic lip movements.

The movement of the tongue also plays an important role in playing the extreme ranges. The inside of the mouth and throat cavity is similar to the organ pipe in its function. The organ pipe uses a "... large tone chamber for the lower notes and a smaller air cavity for the higher ones."

The tongue controls the size of the mouth and throat cavity by its arched placement. Many professional trumpet players state that to play high, one must think high. By thinking the vowel "eeh" as in "tea," the arch in the back of the tongue is raised sufficiently to play in the higher register. The exact placement of the tongue is very important due to the fact that the tongue can control the mouth and throat opening which, in turn, controls the air stream. The player can produce a brilliant resonance in the tone if sufficient amounts of air are allowed to flow freely into the horn.

The vowels used in helping the tongue placement are, "aah" as in "father" for notes starting with low G below the staff up to G second line on the staff; "ooh" as in "two" for notes ranging between G second line up to E fourth space on the staff; and "eeh" as in "tea" for notes from E on up.

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63 Ibid.
64 Ibid.
Rockwell claims with the use of syllables a beginning student can generally develop his range much faster. He suggests when playing lip slurs or tonguing from C on the staff down to G below the staff to use the syllables, "ta," "tow," using "tow" on the low notes. This will facilitate an easier and more controlled change. By using the vowel "euh," plus proper breath support the player will usually be able to minimize mouth-piece pressure while playing in the high register, which will aid in producing a clear, open tone. Practicing the use of the syllables, both vocally and on the instrument, will help the player to train the muscles in the lips to "... recognize tension-to-tone relationships and will minimize pressure and suppression of tone quality through excess pursing of the lips." 65

Gibson suggests singing to develop the proper tongue action when using vowels. He writes "... the resonance produced by vowel singing will produce a quality that cannot be matched by the non-vowel players." 66 It takes time to develop the correct qualities; but if these are achieved, a beautiful resonant tone will result that flows from one register to another.

The diaphragm plays an important part in the extension of the range by supporting the air column as the player moves from one register into another. There can be no gap between notes, as far as support is concerned.


More will be presented concerning breath support in the next section of this paper.

Tetzlaff conducted a symposium entitled "The High Register," for The Brass World magazine. The symposium members consisted of professional trumpet teachers who have played or are now playing with famous stage or symphony orchestras. Most of the players involved are now brass specialists at colleges and universities throughout the United States. A list of the ten "What & Whys" for Trumpet High Register Practice, was included as follows:

1. **Mouthpiece alone test.** Play every phrase, any phrase—slowly, carefully. Just listen! Be sure the ear is acting "as boss" to the efforts of the lips and lungs.

2. **Long glissando slides.** Play as high as you can, without force; and then, down as far. Test for the evenness of the exhale stream by listening for an equally solid tone throughout all the pitches; while either descending or ascending.

3. **Lots of good patterns.** All kinds of music use these, so you are actually prepracticing the control of accurate intonation as your lip muscles flex for the minute changes you must feel for each of the different notes. Repeat measures of phrases, tongued and slurred, to develop an equal skill and equally controlled sound in both processes.

4. **Ascending intervals larger than a third.** Delay these until the chords roll smoothly and without force. Then these more challenging tests of controlled flexibility can give variety to your practice.

5. **Rest, repeat, and run one note higher.** The goal is extension, but without loss of beauty, or tone, or control of sound.

6. **Lip slurs while holding the instrument with the left hand only.** This encourages the development of flexible lip points, rather than a reliance upon forceful abdominal or arm movements.

7. **Short, staccato starts.** Play two or three short, tongued test notes on any high note. This will teach you
the fast aim and hold the necessary lip closing and set to be ready for isolated high entrances.

8. **Lip trills from slow to fast.** Start deliberately (to allow for listening and feeling) and then (maintaining all control of the sound) accelerate to your maximum speed. This builds up the strength and firmness of the corner muscles. If you feel a slight ache at first, that is good. It signals an awakening of previously unused muscles that are not developing more strength. Give a little rest, there, too.

9. **End drill on their highest note.** Play the last tone as a hold to use up any remaining breath supply. It is not a crime to recompose an etude in the interest of further muscular development and control and endurance.

10. **Tongue two notes for each single one you see.** Select phrases that ascend into the upper register. You will note that this places a little extra demand on the strength of the corner muscles to hold the aperture throughout this extra activity.  

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**Breath support**

How breath support affects the tone. Breath for the brass player is the origin or beginning of tone. Breath is to the cornet or trumpet player what a bow is to the string player. The string is caused to vibrate by the bow rubbing across it, and the faster the bow moves the louder the sound produced. The lips, of the trumpet or cornet player, are set in motion by the moving air column that rubs against them as it passes through the aperture. Therefore a steady tone requires a steady air column; a loud tone requires a big air column moving at a fast rate of speed; a soft tone requires just as big an air column but moving at a slower rate of speed.

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67Tetzlaff, p. 369.
Primarily, any good sound on a wind instrument is controlled by the speed with which the air column passes through the lips into the instrument. Many brass players try to produce a big tone by tensing their embouchure, but all they accomplish is a distortion of the tone. Farkas sums up the importance of breath support by stating, "a pure tone will be obtained with a properly formed embouchure, but a big tone cannot be formed, it must be blown."\(^{68}\)

**Procedures to improve breath support.** Breathing is a normal process which students have been doing for several years before they decided to play an instrument. It is the purpose of the teacher to simply remind the students how to use their breathing equipment properly.

Breathing is simply a matter of inhaling and exhaling. By observing a sleeping baby one can see the correct natural breathing process. Notice how the abdominal muscles expand when the baby inhales and contract when the baby exhales. This is the process a student should use when playing a trumpet. By expanding the abdominal muscles, the diaphragm, which is a dome-shaped muscle at the base of the lung cavity, is allowed to stretch out flat like a drum head, which in turn allows the lungs to expand and fill with air.

The trumpet player should inhale through the corners of his lips, by stretching them slightly, and not through the nose alone. The throat should

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\(^{68}\) Farkas, p. 57.
remain open, and the tongue should be in the bottom of the mouth. The chest should not rise but should remain fairly stationary allowing the movement to be in the abdominal muscle.

To help the student develop an understanding of and feeling for deep breathing, the teacher should have him concentrate on a spot deep in his body, below the rib cage and just above the belt. Then have the student very slowly draw in a breath to this point as if he had just stepped out on a cabin deck overlooking a beautiful lake to view an early morning sunrise. Have the student do this several times. His breathing will be correct because his body is relaxed. 69

Inhaling the air properly is a matter of breathing through the mouth in as relaxed a manner as possible and carrying the air deep into the body by expanding the abdominal muscles down and out. The amount of air the player needs to inhale will be determined by the length of the phrase to be played. Mueller writes, "... fresh breath should be taken before the supply is completely exhausted." 70 Therefore, the amount of air inhaled should be geared to the length, loudness, and tessitura of the phrase played.

When exhaling the air, the function of the abdominal muscles is very important. These muscles have to remain in a contracted state to maintain

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69 Mueller, p. 3.

70 Ibid., p. 4.
the velocity of air needed to sustain the desired tone. The velocity of air
is the rate of speed at which air passes through the lips.\footnote{Bush, p. 20.} By keeping the
abdominal muscles in a contracted state, the lungs will apply pressure to the
air being exhaled causing the breath support.

Mueller gives the following "Tips on Breath Control."

1. Release all the air from the lungs. Wait as long
   as possible. Now take a quick breath. It will be correctly
   placed.
2. Pant as though you had just completed a mile race.
   Please note carefully your muscular sensations.
3. Visualize and simulate sniffing the fragrance of a
   beautiful rose.
4. Inhale and exhale two incorrect high chest breaths.
   Now take a third breath, placing it deeply and correctly.
5. While sitting, lean as far forward as possible,
   placing your head between your knees as you practice breathing.
6. Using a wide belt around your rib cage (higher
   than normal belt placement), draw it tightly during a short
   portion of your practice session to serve as a reminder
   of correct breath placement.\footnote{Mueller, p. 4.}

Important to good breath support is good posture. Dale writes,
"it is virtually impossible to obtain a good breath and dispose of it cor-
rectly unless the body is erect, whether in a sitting or a standing position."\footnote{Dale, p. 33.}

The placement of the tongue and its effect on an open or closed throat.
The tongue should remain in the bottom of the mouth while inhaling or exhaling

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\footnote{Bush, p. 20.}
\footnote{Mueller, p. 4.}
\footnote{Dale, p. 33.}
so that the air stream can press freely in and out through the mouth and throat. In tonguing, the tongue should move in an up and down motion instead of a straight-on movement, which obstructs the air stream. Dale writes, "... the lower the tongue lies in the mouth, the larger the air passage in the throat and mouth, the broader the tone should be."\(^{74}\)

Vibrato

**Vibrato** should not be introduced to the student until he is capable of producing a good straight, solid tone, without having to resort to *vibrato* to cover up some deficiencies in tone quality or intonation. "Vibrato is to enhance and beautify an already good tone, and thus *vibrato* alone must not be considered as an end in itself."\(^{75}\)

**Vibrato** is usually used only in solo work and *legato*-type passages where such a tone is desirable. **Vibrato** is never used in fast passages. In most countries, other than France, "the use of *vibrato* in purely classical music is out of place, and at best, it should be used sparingly."\(^{76}\)

The style of *vibrato* will vary with all types of music. For example, the *vibrato* used in jazz work is wider and faster than the *vibrato* used in the typical symphony orchestra.

\(^{74}\) Ibid., p. 43.

\(^{75}\) Ibid., p. 35.

\(^{76}\) Ibid.
According to Dale, vibrato should be played evenly at about four to five vibrations per second. 77 Wardle stated in a personal interview that, "the standard vibrations for vibrato are seven." 78 The important thing is that vibrato must be kept under control, or it sometimes sounds like a nanny goat.

There are three methods of producing vibrato: (1) lip or jaw, (2) hand or finger; this is the most common and is produced by a back and forth movement of the hand and finger tips on the valves, and (3) throat or diaphragm.

Andre, Trumpet Specialist for Paris Conservatory of Music, recommends the hand vibrato. He suggests the following vibrato be used on the various styles of music. "Very light vibrato for baroque; heaviest for quasi-jazz; intermediate for general playing, concertos, etc." 79

Rockwell sums up the necessary elements needed to produce a good tone in his article entitled, "It's the Tone that Counts."

1. Keep the mouth open, as though repressing a yawn.

2. Blow through the instrument.

77 Ibid.

78 Interview with Alvin Wardle, Brass Specialist, Utah State University Staff, July, 1968.

3. Support the tone with the diaphragm, keeping it tense as you would in shouting.

4. Slightly 'pouch out' the lips on lower tones.

5. Maintain equal quality of tone in all registers.

6. Listen to yourself by playing near a wall or other reflecting surface.

7. Use a system of syllables, (two, tu, ta, tee).

8. Practice all rules diligently every day.

To be successful, a player must possess the following: "... diligent practice, the will to improve and critical listening on the part of the performer."80

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80 A. A. Rockwell, 'It's the Tone that Counts," The Instrumentalist, XVIII, No. 2 (September, 1963), p. 9-10.
CHAPTER III

THE INSTRUMENT AND HOW IT AFFECTS TONE

A musical tone is a composite of simple tones called partials. "The number of partials present in a tone depends upon three things: the instrument producing the tone, the location of the tone within the compass of the instrument, and the loudness of the tone." 81

Most brass (cup-mouthpiece) instruments are able to produce a wealth of upper partials. According to Dale, "the prevalence (or absence) of upper partials in a given tone distinguishes one tone colour from another." 82 This is why one is able to distinguish the sound of the trumpet from the trombone.

The construction of the instrument, its size and shape, has a great deal to do with the tone colour the player can produce on the instrument. This can be understood by realizing that many changes in size and shape have been made in the construction of the instrument throughout history. The first form of the trumpet was probably the horn of an animal, developed into a straight length of tubing, and finally the present trumpet design with many varied sizes

82 Dale, p. 3.
and shapes used in between. The instrument used today is not completely perfect but it is superior to any that have been built up to this time.

Total qualities of the trumpet and cornet

According to Kent, "the basic physical difference between a trumpet and a cornet is in the calibration of the bore, and the calibration determines the formant of the tone produced." 83 Back wirtes that, the tubing in the trumpet is curled only once and offers very little resistance to the air passage which allows an "... open, clear, penetrating tone of the heroic quality needed in symphony, opera and other kinds of orchestral performances." 84

The cornet is designed to produce a tone with a mellow, dark timbre. It is constructed with two curls, instead of one, plus a smaller conical mouthpipe, which offers more resistance than the trumpet.

The rich, singing voice combined with easy response and flexibility places the cornet in the first rank as a solo instrument, especially for colorature work. This is why it is often used in concert band in preference to trumpet. 85

There is some controversy over the idea that more cornets than trumpets should be used in the concert band. Mueller writes that with some of the

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84 Ibid., p. 18.
85 Ibid.
changes manufacturers are making in both instruments, the colour sound of either trumpet or cornet depends a great deal on the concept of the sound in the player's mind and ear. "The trumpet can be played smoothly, and the cornet can be played brilliantly and piercingly, depending upon the desires of the player." 86

Andre, the famous French trumpet and cornet artist, describes the cornet tone as a "cantabile style." He states, "one should never force the sound of a cornet, or attempt to sound like a trumpet . . . . Technique and flexibility are easier on the cornet than they are on the trumpet." 87 It seems the final decision as to the number of cornet or trumpet players to be used in the concert band will depend on the director's taste.

Because the cornet is somewhat more flexible, and responds easier, plus being slightly smaller and easier to handle, most beginning students are encouraged to start on the cornet. 88

The importance of selecting a good instrument

Much consideration should be used in determining the quality of an instrument purchased for a student. Many students, who have the ability to become competent players, become discouraged because of poor or faulty instruments.

86 Mueller, p. 35.
87 Weast, p. 355.
88 Mueller, p. 35.
Dale writes,

The only function of the trumpet and mouthpiece in tonal production is to amplify the result of three factors . . . ; breath, tongue, and lips. It need hardly be mentioned that one may purchase either good or bad "amplifiers." 89

In selecting an instrument, it is wise to have a trumpet or cornet specialist check the instrument. His judgment will determine the following:

. . . tonal quality, light or heavy sound, brightness or darkness of timbre, intonation in all registers, response, ease of production of the low and high register, the "feel" for bore size, fluency, and agility. 90

Mueller refers to this as the subjective test.

By using the subjective test mentioned by Mueller, the quality of the amplifier, of which Dale spoke, can be determined.

Some of the outward features to check on an instrument, especially if buying a used one, are as follow:

1. Check every slide to see if it fits tightly and the tubing is not rusted through, as a leaking slide will greatly affect intonation and interfer with response.

2. Check to see if the valves are air tight by running water through the instrument. If the portholes in the valves are aligned properly and the valves fit tightly in their casing, water should run

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89 Dale, l. 46.
90 Mueller, p. 33.
from the leadpipe to the bell without leaking out any valve slides when the slides are removed, unless a valve is depressed.

3. Check to be sure that the metal used on the valve slides and crooks is different from the outer tubes and casings they slide into; one should be of hard metal and the other of a soft metal, preferably one of brass and the other nickel. Bach writes for perfect valve action the pistons and the casings also have to be of different metals.

The co-efficient of friction between two different metals is much smaller than if two parts of the same metal are rubbing together. Nickel silver, nickel plating, or monel metal have proved to be best for pistons. All are hard and peculiarly resistant to the acid in saliva.

4. Check to make sure there is adequate bracing, especially in the areas where the instrument is apt to get bumped, around the mouthpiece, the bell, and between valves and slides.

5. Check for tubing that has rusted through or areas where the lacquer gun may have missed.

6. Check for sluggish valves because of weak springs that allow the valves to bounce instead of stopping at their full height after being depressed. Valves can be checked by sliding the finger off the side of the valve buttons and letting them spring up. The

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91 Ibid., p. 34.
92 Bach, Selmer Bandwagon, p. 17-18.
slightest bounce will affect the tone and pitch, especially in fast passages.

7. Check the gauge of metal used in the bell by striking the bell with the fingernail. If the bell produces a "thud," the metal is thin. The thicker metal will give a "ringing" sound. Mueller writes that,

The thicker bell will have a more centered and compact sound. It will also withstand more reconditionings and buffings. However, the thin bell will respond more readily to soft attacks, and will offer a brighter tone. Take your choice!\(^\text{93}\)

The cornet and trumpet are built in such a manner that the air column must pass from the mouthpiece through to the bell without being obstructed by an air leak, a dent in the tubing, or sluggish valves which do not respond properly. If the air flow is distorted in any manner, the tone is affected. Redfield writes that,

It ought to be better understood by players of brass instruments that the conditions necessary for an easy blowing instrument are an air column with walls that are absolutely air tight and as smooth as glass; that the conditions securing correct intonation are an air column unconstricted throughout its entire length by anything in the nature of a dent or an obset.\(^\text{94}\)

Another question is how does plating affect the tone? When the trumpet or cornet is played, it transmits its vibrations into the atmosphere

\(^{93}\)Mueller, p. 34.  
\(^{94}\)Redfield, p. 234.
through the walls and outer surface of the tubing as well as through the bell. "Sound waves are partly transmitted and partly reflected by this bell. The plating alters the thickness of the metal."\textsuperscript{95} The three different metals that are generally used in the valves are: (1) copper or brass which is 3558 meters per second (about ten times as fast as through air), (2) silver, 3285 meters, and (3) gold, 1744 meters. Because the difference between brass and silver is only 273 meters per second, the difference in the sound is hardly audible; but gold plating does affect the sound slightly. Bach writes that, "a trumpet in plain brass will always give a more brilliant, freer tone of somewhat metallic timbre, while a plated instrument will sound more mellow and slightly heavier according to the thickness of the plating."\textsuperscript{96}

The plating usually is not thick enough to distort the sound a great deal, and some plating increases the instrument's durability.

The size of bore

The size of the bore is misleading in some cases because the size of the metal in the tubing is not considered. The bore size given should be the inside diameter of the tube.\textsuperscript{97}

\textsuperscript{95}Bach, Selmer Bandwagon, p. 18.
\textsuperscript{96}Ibid., p. 19.
When one is selecting the size of bore in the instrument the student will play, the student's capabilities should be considered first. A large bore instrument will require a larger air column than a smaller bore instrument. Dale writes that,

> Even many physically mature players cannot cope with an over-large horn [referring to the instrument's bore]. Thus a medium bore, or at most a medium-large bore, should be selected for the beginner.  

According to Bach, the German Symphony musicians prefer a large bore, so they can produce a rather dark colour, but with tremendous volume. The French like a small bore, and their musicians usually use a C trumpet to produce a brilliant, bright tone. Previously the English used a smaller bore than the French, but today their bell bore size is in between the American-made and the French. The standard American-made bore today is smaller than the old German trumpet but quite a bit larger than the French and English instruments. Bach writes that, "a trumpet with an inside bore between .453 inches and .462 inches is usually best for general professional use."  

Along with the size of the bore, the weight or thickness of the metal should be considered. A light-weight instrument may respond well at a medium forte but may rattle at a fortissimo. The light-weight instrument warms-up quicker but tends to go sharp. "A medium-heavy instrument

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98 Dale, p. 5-6.

will have a more compact tone, which—in musician's language—will not spread so much." In this writer's opinion, the medium-heavy instrument is best for general use.

Cleanliness

The trumpet or cornet should be thoroughly cleaned at least once a month. The student should use lukewarm water and a mild dish soap or baking soda because hot water will sometimes remove the lacquer finish. An instrument brush or small swab should be run through all the tubing of the instrument, especially the leadpipe, as water alone will not always flush out the foreign matter that collects in the tubing.

Mouthpiece and how it affects tone

The parts of the mouthpiece which affect the tone quality, and which will be discussed in this paper are the rim, cup, throat, backbore, and shank. Figure No. 3 points out the parts of the mouthpiece to be discussed.

The rim. The width of the mouthpiece rim helps or hinders the flexibility of the player's embouchure. If the rim is too wide, it has a tendency to clamp down on the lip muscles which will slow down the lip response for quick changes from high to low tones and vice versa. The player generally applied pressure to overcome the lack of flexibility. Only players with very soft, thick lips should use a wide-rimmed mouthpiece, because a

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100 Ibid., p. 18.
medium-rimmed one might dig into the soft flesh, affecting the blood circulation.

If the rim is extra narrow or has too-rounded an edge, it may also cut into lips, diminishing the blood circulation. The narrow rim allows more flexibility in playing intervals; but if the blood circulation is cut off, the player loses endurance.

The suggested rim for most players is a medium-wide rim with a fairly sharp inner edge. ¹⁰¹ If the player places this mouthpiece on the lip

¹⁰¹Bach, Embouchure and Mouthpiece, p. 10-11.
so the pressure is evenly distributed, the player should have adequate flexibility to play in all registers.

The cup. The inside diameter plus the depth of the cup determines the volume and breath of the tone. A large diameter plus a fairly deep cup allows a large volume of sound, especially in the lower register; but the player may have problems in the higher register until his embouchure becomes accustomed to a mouthpiece with a larger diameter and deep cut. A mouthpiece with a small diameter and a shallow cup will aid in playing the high notes but will allow the player to split the tone more easily because sufficient room for the lips is not allowed inside the cup. If the lips are cramped into too small a cup, the lips do not have room to vibrate properly and a shrill, nasal tone may result.

The depth of the cup determines the timbre of the tone. A deep cut will have a darker, fuller tone than a shallow cup. The depth of the cup also affects the pitch; a deep cup lowers the pitch and a shallow cup raises the pitch. The depth of the cup the student uses should be determined by the student's ability to play his instrument up to pitch.

The mouthpiece cup can be purchased with a variety of inside-cup shapes. Most professional players use a concave design because it allows the lips to vibrate freer than a 'V' shaped cup, giving a richer and clearer tone.

Bach suggests, and most trumpet specialists agree, that the player should use the largest cupped mouthpiece he can control while playing. The
large mouthpiece requires a bigger air column than the smaller mouthpiece, but the quality of tone makes up for the extra effort. 102

The throat. The size of the throat of the mouthpiece will also have an effect on the volume and colour of the tone that the player can produce. Some players have the erroneous idea that a mouthpiece with a small throat will aid in producing notes in the high register. Usually the results of a small mouthpiece throat are just the opposite with the tone being choked off; also a small throat causes intonation problems. The high tones are usually flat, and the low tones are usually sharp. Kober, in his thesis entitled Effects of Mouthpieces on Trumpet Tone Quality, referred to Schiles's statement to the effect that a sharp shoulder of the mouthpiece throat aids the attack more than a rounded shoulder and produces a piercing tone. If the walls of the throat are straight for too long a distance, the tone will be sharp; if too short a distance, the tone will be flat in the upper register. 103

The player can determine if the size of the mouthpiece throat is correct by playing the instrument. If the throat is too small, air will back up when the player attempts to play a fortissimo. If the throat opening is too large, the tone will become breathy and the sustaining power of the breath will be reduced. The standard mouthpiece throat

102 Bach, Embouchure and Mouthpiece, p. 12.

103 Raymond Patrick Kober, Effects of Mouthpieces on Trumpet Tone Quality, a thesis study used in fulfillment of the degree of Master of Science, Illinois State Normal University, (1957), p. 8.
size used in a Bach Mouthpiece is a 'medium.' If a player needs a larger size throat opening or backbore, the mouthpiece can be sent back to the factory to have the size adjusted.\textsuperscript{104}

**The backbore and shank.** The backbore of the mouthpiece is very important to the make and bore of the instrument on which the mouthpiece is to be used. The backbore has a great deal to do with the intonation of the instrument. According to Bach, some instruments may be very flat or sharp in the upper register and can be compensated for, to some degree, by adjusting the size of the backbore.\textsuperscript{105}

Mr. Schilke writes that,

> If the backbore flares out rather rapidly, the tone will be full but slightly more difficult to control. If the backbore becomes straighter, with less flaring out, the tone becomes thinner but more easily controlled.\textsuperscript{106}

According to Weast, many mouthpiece shanks do not seat correctly up against the end of the leadpipe. Weast writes,

> ... do not assume that mouthpieces made by the instrument companies will fit their own instrument. Sorry to say, this simply does not hold in most cases ... The mouthpiece itself must be made to be an integral part of the leadpipe.\textsuperscript{107}

\textsuperscript{104}Bach, *Embouchure and Mouthpiece*, p. 16-17.
\textsuperscript{105}Ibid., p. 17.
\textsuperscript{106}Kober, p. 8.
If the mouthpiece shank does not butt up against the leadpipe in the mouthpiece receiver, a gap in the leadpipe will be left which will impair the tone quality and intonation of the instrument as would a dent or foreign matter in the leadpipe. The player should have a repairman check the instrument and adjust the mouthpiece to fit the leadpipe. The shank of the mouthpiece is not always seated up against the leadpipe just because the mouthpiece does not wobble in the mouthpiece receiver.

Cleanliness

Dirt or foreign matter in the mouthpiece affects the tone quality and pitch of the instrument the same as dirt in the leadpipe. Any foreign matter which collects in the mouthpiece changes the size of the throat and backbore opening and affects the tone and pitch like changing the size of the bore. A small brush or a piece of pipe cleaner should be put through the mouthpiece at least once a week, oftener if necessary.

Because the size and shape of the mouthpiece affects the tone colour and pitch of the trumpet or cornet, trumpet and cornet specialists recommend that all members of this section of the band or orchestra use the same type of mouthpiece to achieve a better blend and more nearly uniform tone quality.
PART II

INTONATION
CHAPTER IV

INTRODUCTION

Pitch is described by Redfield as the number of pulsations (vibrations) produced by the player. Redfield further states, "... that the pitch of a note may be indicated either by giving the length of its pulsation or by stating its frequency, i.e., the number of its pulsations reaching the ear per second." 108

Playing in tune, according to the preceding statement, is the condition which exists when two or more players produce the same number of pulsations per second.

Good intonation has to be considered among the aspects of importance if a trumpet or cornet player desires to become a competent performer. Hover writes that, "... nothing detracts from a satisfying performance more than faulty intonation." 109

There are many factors necessary for good intonation. Bach writes that

108 Redfield, p. 44-45.
109 Nile Hovey, "Intonation Problems in Group Performance of Wind Instruments," A Bulletin (Published by H. & A. Selmar, Inc.), No. 4400 (a).
Moreover, no two players will obtain from an instrument exactly the same timbre, the same intonation or pitch . . . The question therefore arises: what does control the intonation? Does the instrument control the frequency of the vibrations of the lip—in other words the intonation of each tone—or do the lips of the player control the intonation of the instrument? The answer is: the control is mutual.¹¹⁰

Therefore, in this paper the basic intonation problems students encounter while playing the trumpet or cornet will be presented.

¹¹⁰ Bach, Selmer Bandwagon, p. 10.
The acoustical properties that affect pitch

The control of intonation by the instrument is determined by the length of tubing and the size of bore attached to the mouthpiece and by the mouthpiece. The theoretical length of the brass instrument is about the wave length of a single vibration of the instrument's fundamental tone, which is pedal Bb concert for the trumpet and cornet. The trumpet and cornet will be slightly shorter than the theoretical length because of the spread or flare of the bell.\footnote{Ibid.}

Because the length and the size of tubing determines the pitch, manufacturers of valved instruments have found that it is impossible to make an instrument which will produce a perfectly tuned scale in all keys. To build an instrument that would be able to play all scales perfectly in tune would require approximately six valves and a separate bell for each valve combination used. A compromise accomplished by the taper of the bell of the Bb trumpet and cornet so that the open tones in the concert key of Bb are
fairly well in tune and the other notes requiring the use of valves are as close as possible to the required pitch was made by the manufacturers. This compromise made it possible for the player, through the use of alternate fingerings and by humoring the pitch, to produce a fairly accurate scale. 112

For a trumpet or cornet to be played in tune, the player must understand first, the intonation problems typical of his instrument, and he must remember that the instrument alone does not produce the pitch.

The tempered scale, which is a division of an octave into twelve equal semi-tones, is the scale manufacturers of valve instruments have tried to match in the adjusting the various pitches to be played on the trumpet or cornet. The tempered scale, at best, is a theoretical compromise and is of such a complex nature that absolute intonation is impossible. Sweeney writes that "no two makes of instruments are identical in their scales, nor are absolutely in tune with the scale of the piano." 113

Because trumpet and cornet players overblow the natural harmonic series and play in the tempered scale, certain harmonics have definite pitch problems. To demonstrate these problems, Figure 5 shows the overtone series produced by one fundamental and the tendency to be sharp

112 Ibid., p. 12.

or flat on certain partials. To build an instrument perfectly in tune, the instrument would need a different size bore and bell for each valve combination.

![Figure 5. Fundamental overtones](image)

The player should note in Figure 5 that the 5th and 7th harmonics are flat, the 3rd has a slight tendency to be sharp, and the 6th is sharp. The 7th harmonic is too flat to be usable.

Gibson has made the following comparison between the frequencies of the open tones on the trumpet and pitches based on the tempered scale.

<table>
<thead>
<tr>
<th>Trumpet</th>
<th>Tempered</th>
</tr>
</thead>
<tbody>
<tr>
<td>C 4 233 - 08</td>
<td>233 - 08</td>
</tr>
<tr>
<td>G 4 349 - 62</td>
<td>349 - 23</td>
</tr>
<tr>
<td>C 5 466 - 16</td>
<td>466 - 16</td>
</tr>
<tr>
<td>Trumpet</td>
<td>Tempered</td>
</tr>
<tr>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>E 5 582 - 70</td>
<td>587 - 33</td>
</tr>
<tr>
<td>G 699 - 24</td>
<td>699 - 46</td>
</tr>
</tbody>
</table>

According to the above figures, G the second line above the staff is 0 - 39 vibrations sharp, and G top space above the staff is 0 - 78 vibrations sharp. E the fourth space in the staff is extremely flat by 4.63 vibrations.

Seven different harmonic series are used in playing the cornet and trumpet. One series is used for each valve combination; i.e., the second valve lowers all the pitch of the open-tone series by one-half step or semitone; the first valve lowers the pitch by one-whole step; and the third valve lowers the pitch by one and one-half steps, etc. The preceding figures showing the discrepancies of pitch between the open tones of the trumpet and the tempered scale show the same tone in each of the various harmonic series as compared to the tempered scale.

Gibson writes that, "obviously, the use of more than one harmonic series will involve greater and sometimes unbearable out-of-tuness."\(^{115}\)

In order to help the student understand the use of the various valve combinations and some of the pitch problems inherent in each, Redfield writes the following:

\(^{114}\)Gibson, p. 10.

\(^{115}\)Ibid.
At least this much should be known about valve brass temperament by every player of the Bb trumpet, the cornet, . . ., who would like to escape criticism of his playing because of faulty intonation: (1) any note produced by a combination of valves will be sharper than the same note produced with one valve or produced open, and the greater the length of tubing that is combined to produce a note the greater the inaccuracy due to excessive sharpness; (2) in choosing between a larger and a smaller number of valves for the production of inharmonic notes, the smaller number of valves should be chosen to produce the note if the signature of the note is flat and the larger number of valves should be chosen if its signature is sharp. 116

One cannot always follow the preceding rule because the awkwardness in fingering would make it impossible to play some passages. If speed is desired, the player will have to resort to the principle of least effort and the use of the fewest number of valves. When one is sustaining a tone or playing a slow passage, the valve combination which is easiest to play in tune should be employed.

Figure 6 shows the common pitch tendencies of the notes played by skilled professional cornet players in a chromatic scale by a random selection of twenty cornets. This data was reported by Stauffer. The pitch tendency of the note will be indicated by arrows pointing up if the pitch is usually sharp and down if the pitch is usually flat.

116 Redfield, p. 237.
The preceding study of the pitch tendencies of notes in the chromatic scale is based on the findings of Stauffer and his colleagues making the study. The cornet or trumpet player must realize that all the pitch problems indicated in this study will not be present in every instrument.

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The use of the third valve tuning slide should be employed when using the valve combinations 1 - 2 - 3 or 1 - 3 by pushing the slide out as far as necessary. By lengthening the tubing of the third valve, the sharp pitch usually present on notes played with 1 - 3 or 1 - 2 - 3 valve combination can be put in tune. The use of the third valve tuning slide is especially necessary for the C# and the D below the staff. In addition to the use of the tuning slide, an understanding of the use of alternate fingerings is necessary to aid in correcting intonation problems.

The following are problems common to most cornets and trumpets:

1. E (first line) is usually sharp. The pitch can be lowered by using the 3rd valve instead of 1 - 2.

2. E (fourth space) is usually flat and can be raised by using 1 - 2 instead of open (no valves).

3. A (first line above the staff) is usually sharp and should be played with the third valve only, instead of 1 - 2.

4. E flat (fourth space will sometimes be flat and can be raised by using 2 - 3 and adjusting with 3rd valve tuning slide instead of 2nd valve only.

5. High C sharp (two lines above staff) should be played with the 2nd valve instead of 1 - 2 combination and the quality as well as intonation will generally be improved.

6. For high D (third space above the staff) use open tone instead of first valve and the result will be the same as stated
in number 5 above. 118

Again, the above suggested alternate fingerings will not be needed on all instruments but have been found to help the intonation in most instances.

Two other causes of faulty intonation are: (1) a mouthpiece cup which is too shallow or a bore which is too small, causing the player to play sharp and (2) a cup which is too deep and a bore which is too large, causing the player to play flat. 119

The pitch has a tendency to rise when a player attempts to increase the volume on a trumpet or cornet, and the pitch drops when the volume is decreased. The player has to compensate for the pitch change in the following way:

1. On all tones one must keep the air moving through the instrument.

2. On full (loud) tones one must pour the air through the horn, or drop the jaw and form the "oh" vowel; i.e., stretch the lips apart. One must listen and practice for as round and full a tone as possible without cracking.

3. On soft tones one must keep the intensity, vibrancy in the tone by forcing air through the instrument in a fast, pointed stream. 120

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118 Gibson, p. 11.
119 Ibid.
120 Doug Peterson, "Intonation and Brass Instruments," The Instrumentalist, XXI, No. 7 (February, 1967), p. 44-45.
The effect of temperature on pitch

Brass instruments are definitely affected by the change in temperature, and the player should be aware that as the temperature goes up the pitch of the instrument also rises. Some suggestions for keeping the pitch constant during a performance are:

1. The player should be sure the instrument is warmed to playing temperature before tuning.

2. The player should be alert to the fact that the pitch will rise on an enclosed stage during a rehearsal or concert due to the increase in temperature from the heat of the stage lights.

Muting as a cause of pitch problems

Corcoran in a personal interview concerning mutes said:

The main problem players have is getting the proper size mute that fits the bore and bell of the instrument in which the mute is to be used. There is no one mute that will fit all trumpets or cornets. The player should be careful to buy a trumpet mute for a trumpet and a cornet mute for a cornet. Mute manufactures advertise that their mute will not affect the pitch, but most mutes have a tendency to make the horn sharp. 121

Goldman writes, "when brass instruments are played with mutes they are frequently thrown out of tune. In most instances they become sharp!" 122

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121 Interview with Fay (Hanson) Corcoran, Cornet Specialist, Weber State College Staff, July 30, 1968.

Mutes have a resonance of about 247 vibrations per second when one blows across the neck of the mute. The inserted (in bell) resonance of the mute must be lower than the lowest note played on the instrument.\textsuperscript{123} The mute's size, shape, and material affect its resonance and pitch. Olsen found that a mute with a cylindrical section in its shape tends to lower the pitch making the instrument-mute combination closer in tune. The placement and thickness of the mute's corks also affect pitch. The corks should be placed about one-half inch down from the mute's neck and generally the corks should be about three-eights of an inch thick.\textsuperscript{124}

In order to find how a certain mute affects the intonation of the instrument, the player should use a stroboscope, a well-tuned piano, or electric organ. The sound and the pitch of the mute can be varied by sanding down or increasing the size of the corks on the mute. Gibson writes that, "the sanding down of the corks will change its (mute) quality and sometimes its pitch because it changes the distance which the mute enters into the bell of the trumpet."\textsuperscript{125}

The standard mutes used by a trumpet or cornet player are as follows: the Straight mute, which produces a strident, harsh, and brilliant


\textsuperscript{124}Ibid.

\textsuperscript{125}Gibson, p. 47.
quality; the Harmon mute with which the player can produce special effects by covering the small cup of the mute with his hand and moving it back and forth. If the cup is pulled out, a better blend of the instrument is possible. The cup mute is usually used in ensemble work and sometimes for a muted solo. The solotone mute is used for solo-muted passages usually melodic in characteristic. This mute is seldom used in ensemble work. 126

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126 Ibid.
CHAPTER VI

THE PLAYER

The most important element in achieving good intonation is the ability and desire of the player; all other technical points discussed are merely aids and can be applied only by the player. If an instrument could be built perfectly in tune in all respects, the player would still have to apply the physical discipline, such as proper embouchure and adequate breath support necessary to produce the desired tone and pitch.

The aural ability of the player

Seashore describes the importance of the human senses and their function in regards to pitch in the following manner:

Pitch is the raw material of music. The function of the higher capacities, such as memory, imagination, and feeling, or playing and singing, is limited by degree of sensitiveness to pitch. . . . according to actual measurement, one person may be two-hundred times as sensitive to pitch as another of equal age, social standing, and general intelligence.127

Most teachers realize that some students are more pitch sensitive than others; the question is can students increase their sensitiveness to

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correct pitch? Hovey writes, "... there is some evidence that most players can improve their pitch sensitivity if they have the desire and are given the proper training."¹²⁸

Before a student becomes sensitive to pitch, he must understand the basic principles of intonation and have a concept as to what a player or players should like when playing in tune and out of tune. The student must become aware of the phenomenon of beats and their relationship to faulty intonation.

Pearce describes beats as the loud and soft effects, including both the strongest and the weakest parts, created when two frequencies of sound differ in the number of vibrations they produce per second.¹²⁹ Beats may be any speed and may be on the sharp side or flat side of a reference note. The student can learn to recognize if the pitch is higher or lower than the reference note by listening to two or more pitches and determining which pitch is higher or lower and how far by the number of beats. The speed of the beats determines how far out of tune a player is: the faster the beats are produced, the farther away a student is from a given pitch, the slower the beats are produced the closer to the given pitch.

¹²⁸Hovey, "Intonation Problems," No. 4400 (a).

¹²⁹Wesley Pearce, The Teaching of Intonation, Part One: Perfect Unison (Not Published), 1968, no pagination.
Beats are used to determine if two or more players are out of time or in tune. This can be two players of like or unlike instrument, e.g., the trumpet and the clarinet. The player can be playing the same note or other notes of a chord, and the beats can be used as the tuning guide.

Stegeman writes that, "the presence or absence of beats is a reliable guide in producing good harmony."\(^{130}\)

Another facet of intonation to be considered is the condition which exists when a student plays a solo without accompaniment or another player to rely on for the pitch. This is known as melodic progression or sequence in which only one tone is produced at a time. "The quality of intonation in the melodic line depends on the pitch memory ability of the ear."\(^{131}\)

The player is given more freedom when playing the melodic line alone than when playing harmony with others. The ear has to be relied on to determine if the pitch is too high or too low. Only rigidly pitched instruments (piano, bells, etc.) use the same scale for both harmony and melody.

Research has shown that musicians whose tones are free in pitch consistently use many notes in melodic


\(^{131}\)Ibid.
progressions that are unbelievably at variance with the tempered, just, or any known scale. 132

The player has to develop the ability to recognize the various intervals, which is the distance from one pitch to another. A stroboscope is very useful in teaching the student not only to recognize pitch problems by listening alone, but to actually see whether he is playing sharp or flat. With the aid of the stroboscope, the student should first play the chromatic scale throughout the total range that he is capable of producing on the instrument, making a note mentally and on paper of the notes that he has most problem playing up or down to pitch. Then he must practice both major and minor scales and arpeggios in the same manner with a full consistent volume and a characteristic tone.

There are many electrical devices such as the Multituner, Peterson Tuner, and the Johnson Tuner that can be used in teaching students to recognize the size of intervals and what they sound like. These devices should be used only as aids. The final test will be if the student plays in tune by himself and with an ensemble.

Heim states that,

The ability to anticipate correct pitch, analyze reasons for pitch discrepancy, and apply results in a tone of characteristic and pleasing quality all relates to this most important factor in achieving good intonation. 133

132 Ibid.

133 Norman Heim, "Concept of Intonation," The Instrumentalist, XX, No. 6 (January, 1966), p. 62.
Good intonation is achieved by good pitch discrimination, which is, "... the ability to remember and compare different pitches or frequencies in melodic succession. . . ." 134 Good pitch discrimination is achieved through careful listening.

Player tendencies

Tone Quality and intonation. If a player can produce a centered or focused tone characteristic of his instrument using correct playing procedures, many of the intonation problems are solved before they occur. The problems arise when the student tries to get more edge or brilliance in his tone by favoring the pitch up; when trying to produce a more mellow, blending sound, the student favors the pitch down. Peterson suggests for correction of this problem to have the student: (1) consciously favor the tone up by forming the vowel sound "ee;" (2) then favor the pitch down by forming the vowel sound "ah;" (3) then have the student form a centered or focused tone in the middle, and this should be the correct pitch. "The focused tone can be achieved by forming the vowel "oh," keeping the yawning, open feeling, then balancing the air and embouchure for a natural, ringing tone." 135

Many players develop the wrong pitch concept of a tone by practicing the same incorrect pitch until they are convinced it is right. The teacher

134 Pearce, The Teaching of Intonation, no pagination.

135 Doug Peterson, "Intonation and Brass Instruments," The Instrumentalist XXI, No. 7 (February, 1967), p. 44
must be careful to listen for this incorrect pitch and call the students' attention to it as often as necessary. Also, students may play up to pitch while tuning but let their embouchure or breath support relax allowing the pitch drop while playing a selection of music.

Many students feel that they have fulfilled the requirements of good intonation by simply playing the correct fingering for the prescribed note. Also, lazy finger action and lack of coordination affect both the ability of the student to produce a clear tone and good intonation. The valves must be completely depressed for the tubing of the instrument to be open and clear from the mouthpiece to the bell.

Intonation and dynamics. Revelli writes,

Much of the faulty intonation of our brasses is due to the failure to open and close the aperture in accordance with the dynamic level involved in the passage.

The tendency of the novice is to go sharp when playing forte--this is due to his failure to open the aperture sufficiently to compensate for the amount of wind passing through the lips. Likewise the tendency to flatness when playing pianissimo, because the aperture is too much open to compensate for the lack of wind. These tendencies must be overcome through study of sustained tones played with gradual crescendo or diminuendo. 136

Pitch problems encountered in changing registers. Players have a tendency to relax their embouchure too much when playing in the lower register, allowing the pitch to drop. The student should be careful to keep some tension

in the cheek muscles and to let the center of the lips relax slightly in
playing the low notes from C below the staff down.

Players seem to pinch off the tone in the high register, causing
the pitch to be sharp. The player can usually correct this intonation
problem by either less mouthpiece pressure or opening the aperture
more, or both. The player should practice playing from the low register
up to the high register, keeping a steady air flow and the open feeling used
in the lower register as he plays up into the upper register.

Students have a tendency to start notes in the upper register under-
neath the pitch when slurring from a note in the middle range up into the
high register. The student would do well to practice playing octaves on
each note of the scale starting with C (below the staff) and playing up to C
(3rd space) making the top note of the octave high C as illustrated in
Figure 7.

Figure 7. Lip slur exercise.
Either use the stroboscope or try to match the pitch of another player already playing the top note, being careful not to slide up into or down into the pitch. Again, careful listening is a must.

Many students start playing a note and then try to analyze what the note should sound like. The old saying "put your brain into motion before you open your mouth," holds true for brass players. Players should always play a note mentally before producing the note on their instrument. A very successful exercise that many teachers use to accomplish this purpose is have the student sing the pitch before he plays it.

The position of the back of the player's tongue will also affect the pitch. Faulkner writes,

The position of the back of the tongue makes a difference in the column of air which reaches the lips and thus changes the pitch accordingly. If the tongue is high the column will be more thin and the consequent sound will tend to be sharper. If the tongue is lower and the column of air thus larger as it strikes the lips the pitch tends to be slightly flatter.

If the player uses the correct vowel formations, which were discussed in Chapter II of this paper, when changing registers the tongue will not usually get in the way of the air stream; but there are always exceptions.

Sometimes other physical characteristics also affect intonation.

Heim writes,

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The shape of the player's teeth, inner mouth cavity, and jaw contribute both to resonance, tone and projection, as well not readily observable--can have a definite effect on the general tuning on the instrument.¹³⁸

Sustaining a phrase or a note. Students have a tendency to let the pitch drop while playing sustained tones or phrases, the reason being that the players do not inhale sufficient air to sustain the tone, or that the players let their embouchure relax at the end of the phrase or the note. Many singing instructors encourage their students to lift their eye brows or think of lifting the pitch as they sing to the end of a phrase or begin to run out of air. This same method works for cornet and trumpet players because it keeps them mentally alert. Students must realize that the end of the phrase or sustained tone is as important as the beginning, and the breath support must be used accordingly.

Fatigue. Many students, especially young beginning players, do not allow sufficient resting time for the amount of playing they do. When the lips become over fatigued, they tend to get soft and flabby and then the player loses control of the embouchure which in turn lets the pitch drop.

The wise cornet or trumpet player will budget the amount of actual playing time in such a manner that the player has complete control of his embouchure throughout the entire concert. A player should not be too proud to "lay out" or rest during soft passages or unison playing if the

¹³⁸ Heim, p. 62.
lay-out period will allow him to be able to play the loud high passages with assurance and proper pitch when needed.

**How to humor the pitch.** Hawley writes of the great difficulty of playing in tune in the most emphatic terms.

No wind instrument of any kind can be played in tune with any other instrument of any kind except by main force of the performer. Every note on all wind instruments must be carefully tempered by use of breath and lips so it will sound in tune with the general ensemble. 139

Tempering the pitch is referred to as "humoring" by most musicians. Humoring the tone is the process of knowing "...how to favor notes that are sharp or flat on your instrument." 140 Hovey writes that humoring the pitch is accomplished by sometimes "...relaxing or tightening the embouchure or by changing the direction of the air column, sometimes by increasing or decreasing the amount of breath that is used, and sometimes by using an auxiliary fingering." 141

The pitch of a cornet or trumpet can be changed by the use of all or any of these methods. Faulkner writes that every brass player should be able to produce at least two or three good pitches on every tone. 142

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140 Hovey, *Selmer Band Manual*, p. 5.

141 Ibid.

So possibly all of Hovey's suggestions for changing pitch will have to be used.

When relaxing the embouchure, the player has to be careful not to lose the quality of the tone. The pitch may also be lowered by opening the aperture slightly through lowering the bottom jaw.

In tightening or making the lips more tense, the player should be sure to use the embouchure muscles and not the strong arm method of applying more pressure. Lips take enough beating in normal playing without adding more pressure to change the pitch.

Probably the most effective way to humor the pitch is by re-directing and changing the size of the air column. The air column can be changed by arching the back of the tongue in forming the vowel "ee." If the back of the tongue is arched high, the air column will be more thin and tend to raise the pitch. By forming the vowel "ah," the tongue is lowered and allows a larger air column which tends to lower the pitch. 143

Suggestions for changing the pitch with the use of alternate fingerings and the use of the third valve tuning slide were discussed in chapter 4. The use of alternate fingerings and tuning slides is very valuable and should not be forgotten when humoring the pitch.

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143 Ibid., p. 72.
To help the student develop the ability to play three different pitches, he should practice striking the tone with a broad flow of air with the tongue lower in the mouth (ah), then in the center (oh), and then in the top of the mouth (ee) as shown in Figure 8.

The student should begin by starting the tone at mezzo forte, then forte, fortissimo, piano, and pianissimo and should use all three tongue positions on all dynamic levels and in all registers. The teacher should use the stroboscope to let the student visually see how far the pitch can be altered. 144

\[144\text{ibid.}\]
Figure 8. Tongue positions.
PART III

TECHNICAL DEVELOPMENT
Leacock, in his book, *How to Write*, made the statement "... writing is essentially thinking, or at least involves thinking as its first requisite." The same process applies to the development of trumpet or cornet techniques. Developing technique is a process of developing and acquiring good playing habits which require many hours of diligent practice, patience, and much thought.

When one is learning to play a difficult passage, one would do well to analyze the problems that will be encountered before trying to play the passage on his instrument. Players often have the erroneous conception that playing a passage over many times will cause problems to solve themselves. If the passage is being played incorrectly and bad habits are being used, no amount of repetition will solve the problem. Once an incorrect habit is formed, it takes about twice the amount of effort to change and form the correct habit. Dale writes that,

A little rest from blowing, and a great deal of patient thought and reason, will cure many difficulties more rapidly than a thousand repetitions. Since the trumpeter must learn

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145 Dale, p. 59.
to play rapid and difficult passages fluently and effortlessly, any signs of struggle will simply be amplified by the trumpet and a musical performance will not result. 146

Technic is often thought of by many as the player's ability to execute a scale or musical passage with great speed and with no regard to the musical aspects, such as good tone and clear enunciation.

The symphonic trumpeter receives his weekly remuneration because his general musical ability, his sureness of attack, and his general reliability and dependability in hitting a few easy notes the same musical way every time. 147

The preceding statement is not entirely true, but it points out that in order to be a successful trumpet player more than speed alone is required.

In the development of technic, the student must realize that the regularity of practice is a must. A student cannot expect to build up his embouchure and finger facility without a daily practice routine, just as a boxer cannot expect to go fifteen rounds in the ring without a daily workout. Good practice habits are a must and should be formed early. Broiles writes that

Without good practice one's performance will steadily decline as surely as the sun goes down. A successful trumpeter is made painfully aware that if he maintains a high standard of performance he cannot leave his horn in its case for more than a day. 148

146 Ibid.
147 Ibid., p. 60.
It was once stated that "if a cornetist loses an hour of practice, he
notices it; if he loses two days of practice, other musicians will notice it;
and if he misses more than that, everybody will notice it."\textsuperscript{149} Technic
can only be developed through diligent, thoughtful practice.

This section of this paper will deal with articulation, finger facility,
developing the upper register, and suggestions for a daily practice routine.

\textsuperscript{149}Loyal West, Basic Problems in Playing the Cornet, Unpub-
lished Masters Thesis, Utah State University, Library, Logan, Utah
(1965), p. 50.
CHAPTER VIII

PROCEDURES TO IMPROVE TECHNICAL FACILITY

Articulation

Two important factors are necessary in executing good articulation: they are the breath and tongue action. The term commonly used in music for starting the tone is "attack." To execute a precise attack, a sufficient air column and the proper tongue action are needed to start the lips vibrating.

"The tongue determines the manner in which the tone starts—pointed or smooth. It does not determine loudness or softness; the volume of air does this." 150

In analyzing and determining the procedure and some of the problems students encounter, the action of the tongue will be discussed first.

Tonguing. The purpose of the tongue is to act as a valve which works similar to a water faucet. When the water faucet is opened, the water runs out; when the tongue is released, the air flows through the lips into the instrument. Mueller writes that the connotation of the word attack is misleading. "Attack normally means go forward, but for the brass player it means to drop

150 Mueller, p. 18.
the tongue, working it across the column of air."\textsuperscript{151} The action of the tongue should be an up and down motion, not straight on. The old idea, taught by some teachers, that the tongue action is similar to spitting a crumb off the tip of the tongue is misleading for cornet and trumpet players. Tonguing in the above suggested manner places the tip of the tongue between the teeth and against the lips. To tongue between the teeth the player has to use a straight-on motion which lengthens the tongue’s stroke and cuts down on the tongue’s speed. The shorter distance the tongue has to move, the more efficient it will be. Also, by parting the lips, the tongue interferes with the vibrating surface of the lips.\textsuperscript{152}

When tonguing is performed properly, there should be no visual movement of the lips, cheeks, or lower jaw. If movement is visible, improper tonguing action is taking place, and most often the tongue is being placed between the teeth.

If there is chin or lip movement, the tone and pitch will generally be distorted every time the player tongues a note. This improper movement can usually be corrected by having the student change the tongue action to an up-down motion and practice tonguing exercises on his instrument in front of a mirror.

\textsuperscript{151} Ibid.
\textsuperscript{152} Ibid.
Hovey writes that, "most teachers recommend a tongue action which is similar to the tongue used in pronouncing one of the following syllables: too, tah, tee, tuh, or doo, dah, dee, duh." The use of syllables aids in the placement of the tip of the tongue and in the arch of the back of the tongue.

Mueller writes,

For general playing, the point of contact for the tongue should be in the center of the upper front teeth. After all, this is the natural spot in pronouncing a T or D sound. For high-note attacks, the tip of the tongue should be higher, at the base of these same teeth, where they join the gum line. For fluent legato work, tonguing even higher is necessary. One might compare this latter tonguing to touching a very hot stove, and the sudden, quick recoil. The air column keeps moving in a succession of legato notes, and the tongue placement is very lightly with only the extreme tip of the tongue being used in all attacks.

There has been some controversy among trumpet teachers over exactly how high the tongue should touch on the front teeth; but all agree that the front portion of the tongue should make contact with the front teeth in the process of tonguing, except for legato tonguing which is done on the upper gum and roof of the mouth. The tonguing should not be done between the top and bottom teeth and not in front of the teeth except in rare instances.

In the previous paragraphs it was mentioned that the tongue placement was different for the legato tongue. This is due to the desirability

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153 Hovey, Selmer Band Manual, p. 10.

154 Mueller, p. 16.
of a smooth connected sound. The player can get the desired "smooth"
tongue action by using the syllable "doo" instead of "too" when tonguing.

Farkas writes that

\[ \ldots \text{for the doo attack, the tongue tip is pulled away more slowly and gently, and with less pent-up pressure behind it. This downward stroke is so gentle that it feels as though the tongue were being peeled away by an undulating motion which breaks the hermetic seal so quietly that there is not perceptible explosion.} \]

Sforzando or accented attacks are executed by keeping the tongue in position until sufficient air is built up behind it, and then suddenly releasing the air by dropping the tongue to the bottom of the mouth.

Staccato passages require a quicker action of the tongue than legato passages. Staccato notes are usually thought of as being played with a complete period of silence between each note, or that the staccato note should be held about half of its original value. Farkas writes that, "\ldots\text{when we consider the difficulties of producing a good staccato, we should be mainly concerned with the production of a very short note.}\" The length of the note will depend on the tempo and value of the note or notes to be played.

Bach states that "\text{the staccato may be compared with the strokes of a bell in that the tone starts with the biggest volume, referring to the volume called for in music, and immediately begins to decrease in volume.}\"

\[ ^{155}\text{Farkas, p. 47.} \]
\[ ^{156}\text{Ibid.} \]
\[ ^{157}\text{Bach, Selmer Bandwagon, p. 23.} \]
To play a staccato note in this manner Bach describes that the diminuendo comes right at the end of the note so that the note's ring is not cut short. Figure 9 shows the manner in which the diminuendo is used.

Figure 9. Ending a staccato note.

Notes played as shown in the preceding figure can make even the dullest room sound resonant.

The problem most students have in playing staccato notes is that they do not space the notes so a silent period is heard between each note or that they end the notes with the tongue by moving it back against the teeth with a "tut" or "toot." The notes which are stopped with the tongue leave a dead sound because they are ending too abruptly. Some students end staccato notes by using "tup" which stops the tone by closing off the lips. These students feel that by using "tup" they have ended the tone properly because the tongue was not used. Ending the notes with either the lips or

\[158\] Farkas, p. 48.
the tongue is incorrect. Farkas suggests that in all very fast staccato passages the tone should be ended by using the enunciation "tuh." The problem of ending the tone with the tongue (tut or toot) or with the lips (tup) can be corrected by using "tuh" and allowing the "tail-end wisp of air" to pass through the aperture, giving the ringing quality desired. 159

In staccato and fast tonguing passages, the stroke of the tongue should be very short for efficient tonguing. In fact it is not necessary to move the entire tongue. Bach states that, "... the slighter the movement of the tip of the tongue the better the results will be and the greater the speed." 160

Many method books for the cornet and trumpet introduce staccato playing too early. The wise teacher will have the student wait until he has sufficient control of the tongue to execute a clean attack and a proper release of the note. Dale recommends that

Since the staccato attack is infinitely more difficult to produce correctly and with a good sound, I believe that the single tongue study should first be practiced long and with good firm tone quality. The staccato can wait until this is already well developed. Tone, on any note long or short, is still the most important consideration. 161

159 Ibid.
161 Dale, p. 54.
Developing a good clean single tongue is one of the player's greatest assets. Single tonguing can be executed very rapidly if used in the proper way. Farkas suggests that for rapidly tongued passages the first note be tongued using the syllable "tuh" so the initial attack is clean, and for the following notes use the syllable "duh." By not making the hermetic seal too tight, which will permit the tongue to touch very lightly, tonguing the fast passages, "tuh - duh - duh - duh," will be much easier, faster, and less fatiguing. 162

There are basically five steps students should be aware of in making a good attack:

1. **Form the embouchure.** Unless the lips are in a position to vibrate properly any motion made by the tongue or breath will not start the tone.

2. **Place the mouthpiece.** Make sure the mouthpiece is in proper position for the lips to vibrate properly without excess pressure.

3. **Breath.** Inhale sufficient breath to produce an air column capable of starting and sustaining the tone with the desired volume.

4. **Set the tongue.** Remember the tongue is the valve that holds the air pressure until needed.

5. **Release the air.** Quickly release the air by lowering the tongue to the bottom of the mouth.

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162 Farkas, p. 48.
Double or triple tonguing. When a student has mastered a clear definite attack with the single tongue, one has about half the double and triple tonguing process learned. The remaining half is gaining control of the "ku" attack. "... the 'ku' is produced by building up the wind pressure behind the tongue, as if saying 'ku' without actually making the vowel sound."\(^{163}\) The student should practice the "ku" attack until he has as much control of the "ku" as he does with the "tu" attack. He should practice using the "ku" while playing one note at a time in the middle register, (e.g., play - rest - play - rest) then gradually increase the tempo and continue working for controlled, distinct tongue action. When he can control the tongue action on the same note, he should then practice tonguing the "ku" up and down the scale still using the play - rest method. The student must remember that he has been using the "tu" attack in single tonguing from about the day he began playing the instrument and developing the "ku" attack will take time and patience also. Mueller writes concerning double tonguing that

> Since the distance which the air travels to the juncture of the lips is somewhat greater than in single tonguing, this first step often takes considerable practice. When accomplished properly there will be no difference between the tu and ku attacks.\(^{164}\)


\(^{164}\)Mueller, p. 19.
After the use of the "ku" attack is mastered, apply "tu" before the "ku" giving "tu-ku" which is used in double tonguing, and either "tu-tu-ku" or "tu-ku-tu" for triple tonguing. The syllables "tu-ku" are only suggestions—other syllables may be used.

One should be careful when using syllables vocally because the teeth, jaw, and tongue are not in the same position as when actually playing. The syllables should be used, as a guide only, to give the students an idea of the position of the tongue. Haynie writes that "... in forming the embouchure and not making a vocal sound, the position of tongue for attack is almost identical with position of tongue while playing."165

One should be careful to practice double and triple tonguing very slowly, gradually increasing the speed as the player gains control. There is some controversy over which should be taught first, the double or triple tongue. In this writer’s opinion, the important point is to master one form of tonguing before going to the other.

A common fault in double tonguing is that students have a tendency to hold the first note longer than the second. In triple tonguing the third syllable is cut short and too much space is left between triplets. The student can overcome this habit by putting more emphasis on the second

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Mueller states that

The prime object in learning double and triple tonguing is to be able to play rapid passages which might be impossible with a single tongue stroke. Symphonic works, as well as solo literature abound in rapid articulation, particularly for the trumpet. 167

One has to be careful not to let the single tongue become sluggish by not practicing it after learning to use the double and triple tongue.

**Slurring.** Slurring is moving from one tone to another without a separation or space between the tones either by the tongue, the air column, or the lips. The first note in all slurred passages is attacked with the tongue and then the player moves to the other notes contained in the slur by simply pressing the valves and adjusting the embouchure and air stream for each succeeding note. Bush writes that "slurring in a correct manner is partially a matter of proper mental concepts." 168

In executing a slur, the use of syllables is very valuable. Syllables or vowels are used in slurring in about the same manner that they are used in changing registers while tonguing, except that the front portion of the tongue remains fairly stationary in the bottom of the mouth. The back arch of the tongue

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166 Mueller, p. 19.

167 ibid.

168 Bush, p. 54.
helps to make the pitch change. For example, when slurring from G (second line) up to C (third space), and all notes higher, the player should think "too" for the G and "ee" for the C. Slurring from G (second line) down the player thinks "too-ah." The "T" is used only on the first note of the slur.

Bush listed the following mental concepts which have proved to be advantageous to the proper execution of the slur in his book Artistic Trumpet Technique and Study:

A. When slurring, one should keep the air column moving steadily at all times.

B. When ascending from one pitch to another, one should try to stay down on the pitch (the tendency is to become sharp).

C. When descending in pitch, one should stay up on the pitch (the tendency is to become flat).

D. When changing the pitch, one should rely on the syllables and the air column.

E. One should hold the corners of the mouth in place.

1. When descending in pitch, one should not consciously relax the corners of the mouth.

2. When ascending in pitch, one should not stretch the corners of the mouth.

F. One should hold each note for its full value.

One should not prepare or anticipate the next note.
G. When changing from one pitch to another, one should not allow time between notes. The change must be instantaneous.

H. When slurring, one should connect every interval.

I. The syllables and valve action must be perfectly coordinated.

J. The bottom note of the slur is the foundation note, not the top note.

K. Keep each note of a slurred passage balanced in sound and volume.

L. Always maintain the concept of a continuous, even flow. 169

Releasing the note. Much has already been said about releasing or ending the note, but suffice it to say here that all notes are ended by stopping the breath similar to the manner used in talking. When the air stops passing through the aperture, there is no sound. The tone or note is never stopped with the tip of the tongue.

Development of finger facility

Before discussing exercises to develop faster response of the fingers, the hand position should be considered. The weight of the trumpet or cornet should be held by the left hand, leaving the right hand completely free. The

169 Bush, p. 55-56.
third finger on the left hand should be positioned in such a manner that it can move the third valve tuning slide easily. The thumb of the right hand should be placed between the first and second valve casing and allowed to bend only the amount required to have a slight arch between fingers and the thumb. The fingers should be placed lightly on the valve caps just back of the finger tips on the cushion portion of the finger with the little finger free of any finger ring to allow free movement.

Haynie states,

Caution should be observed in not pulling the valves down, not playing with fingers straight and stiff, not allowing a double-jointed action of the first joint of the fingers and not playing with the very tips of the fingers. 170

Fast passages, either tongued or slurred, often sound as if the notes are run together because of poor finger facility. Many players do not press the valves completely down, or their finger action is so slow that the notes have passed by before the valves are in the correct position. The valves must be pressed down firmly with a quick snapping motion and released with a quick lifting of the fingers. The action of the fingers must be a straight up and down motion to get proper response from the valves. To improve finger technique, Bach suggests,

... rest the fingers on the valve without pressing them down; then exercise one finger at a time, endeavoring to avoid the slightest movement of the other two fingers.

170 Haynie, "Brass Clinic," The Instrumentalist, p. 66-67.
After this, exercise the other fingers; do this with each piston. Finally press two pistons down and exercise the other finger. Where two fingers are exercised, the action up and down must be simultaneous.\textsuperscript{171}

While practicing the exercise prescribed above, remember the third finger, which is usually the weaker of the three, must receive special consideration to build up its strength and facility. Finger exercises can be practiced silently, to good advantage, while resting the embouchure.

Haynie writes that scales should be used as basic exercises in building and increasing finger facility.\textsuperscript{172}

One should practice the scales slowly at first making sure each note is played distinctly and cleanly. As the student gains control, he should gradually increase the tempo. The use of a metronome is very beneficial in helping to reach a degree of evenness and precision in playing scales. Scale practice should not be confined to the common keys only, but more difficult scales should also be considered. The chromatic scale is also essential and should be practiced regularly.

Developing the higher register

The first rule students must learn when trying to develop the upper register is patience. Before students should worry about playing in the


\textsuperscript{172}Haynie, "Brass Clinic," \textit{The Instrumentalist}, p. 67.
upper register, complete control of the middle and lower register is necessary.

The elements needed to play in the upper register are:

1. A good embouchure capable of keeping a balanced tension in both lips with complete control of the aperture opening.

2. Good breath support which can produce a strong controlled air column.

3. The ability to keep an open throat and mouth cavity while slurring from the low register into the middle register and up at less to an F (top line).

4. A desire to practice regularly and consistently.

If a student possesses the above four factors, he is ready to begin his practice to develop the high register. The student should understand in playing high notes that any pressure applied should be from breath support not from the mouthpiece.

To play high notes, the lips have to vibrate faster which is accomplished by a smaller aperture and more breath support. Scales, arpeggio, lip-slures, exercises from method books should all be a part of the high note practice routine. Practice exercises and scales can be played with the mouthpiece alone, playing only up to where the tone begins to crack and extreme pressure is required. Rest, then play the same routine on the instrument. Work to increase the playing range one note at a time and do not get discouraged if some
notes require more than a day to reach. Try to carry the open feeling usually experienced in the low register up into the high register. When the lips become fatigued, in the least degree, rest. Professional high note artists say the amount of resting time should be equal to the playing time while developing the high range.\textsuperscript{173} The ability to play high notes with a clear tone is not developed overnight but requires hours of diligent, thoughtful practice.

**What to include in the daily practice routine**

These five factors are a must for all effective practice sessions:

1. **Correct thinking.** The student should have a definite goal to accomplish in each lesson. The student should think through and organize practice time in a manner that will enable him to accomplish his goal. The player should approach each exercise with the question, "How is the exercise to be played and what elements are involved in playing it?"

2. **Listening.** The player should be his own most severe critic. One should listen carefully while playing each exercise to see if he is playing musically, with a clean distinct tone, good intonation, and playing correct rhythms. The player should listen to professional artists often and try to imitate what he hears.

\textsuperscript{173}Telzlaff, *The High Register.*
There is a saying to the effect that a musician who does not listen is like an artist who paints with his eyes closed.

3. **Analysis**. The player should continually analyze his playing throughout the entire practice session. The player should read mentally through the exercises first. Then play through the exercise with the instrument, analyzing mistakes that were made. Mistakes are easier to correct before becoming habits, continual repetition of the same mistake forms a habit.

4. **Repetition**. Repetition is important in developing skills and should be used in every practice session. Repetition is necessary to develop all physical aspects of playing, such as, finger technique and tonguing. When "... good physical control and accuracy are developed to a high degree by proficiency, the mind can then be freed to concentrate on music notation, music phrasing, and all the elements pertaining to an artistic performance."\textsuperscript{174}

5. **Consistency**. The player should consistently try to improve his musical and technical ability each time an exercise is repeated. The ability to consistently play a technical exercise builds the player's confidence in playing a similar passage during a concert or a solo.

\textsuperscript{174}Bush, p. 89.
Here is a suggested daily practice routine.

A. Warm-up.

1. Using the mouthpiece alone will massage the lips and get them vibrating correctly.
   a. Play long tones with the use of crescendos and diminuendos.
   b. Play lip slurs, scales, and arpeggios.

   -Rest-

2. Repeat the above routine with the instrument.

   -Rest-

   a. Practice flexibility exercises.

   -Rest-

   b. Practice tonguing exercises (single, double, and triple).

   -Rest-

   c. Practice range exercises.

   -Rest-

B. Practice exercises which will help the player to overcome his most outstanding problems.

   -Rest-

C. Practice technical studies.

   -Rest-

D. Practice artistic studies.

   Ballads should be included with études and other
studies. Ballads are very useful in developing endurance, phrasing, and tone quality.

-Rest-

E. Practice solos and ensemble music.

-Rest-

F. Memory work and playing by ear.

The preceding practice routine is intended merely as a guide. Each student with the aid of the teacher will have to determine what should be included in his own daily practice routine according to individual needs and abilities. The rest periods are very important and should be observed. Over-fatigue can destroy, in the lip muscles, all that the student gains during practice periods. Use the rest period to analyze what has been accomplished and to play silently through finger exercises.

In summing up the importance of and reasons for a good consistent daily practice of the various playing techniques, Altenburg, who compiled one of the first trumpet methods in about 1796, writes,

If one only understands his art theoretically—that is if he knows everything that pertains to it, but cannot perform on his instrument—he is no better off than the person who only knows how to criticize. On the other hand, if one is proficient on his instrument, but knows nothing about its theoretical basis, he is today numbered among the trade musicians. But who ever has learned his art theoretically as well as practically, of him it can be expected that he will continue to make great progress in it. 175

175 Dale, p. 65.
The first requirement of any successful performer is determination. Determination cannot be taught, sold, or given away, but must come from within the individual. The student must want to play the cornet or trumpet well and be willing to work and practice to master the basic techniques required to be a successful player.
CHAPTER IX

SUMMARY AND CONCLUSIONS

Teachers of cornet and trumpet are faced with diagnostic and prescriptive procedures used in the teaching-learning situation. To be an effective diagnostician, the teacher must be familiar with basic performance techniques in order that he may recognize the problems that students encounter in playing the cornet and trumpet. The teacher must also be able to prescribe procedures for correction of problems in such a manner that students will understand the necessary steps that must be taken to correct the problems.

The purpose of this study has been to provide information relative to solutions of basic problems encountered in teaching performance techniques to cornet and trumpet students. This writer has found that there is typically more than one solution to a problem, and that each solution given must be appropriate to the needs of each student. The solutions to problems cornet and trumpet students encounter while learning to play their instrument presented in this paper have been related to three areas of performance; tonal, intonational and technical development.
Tonal development

In the teaching of tone production, imitation plays an important factor. Students should be exposed to as many competent performances by trumpet and cornet artists as possible. If one has a correct concept of how a characteristic tone should sound, a correctly formed embouchure, and sufficient breath control, the problems encountered in producing a clear tone are minimal.

The quality of tone produced by a cornetist or trumpeter is largely determined before the player's lips contact the mouthpiece. The lips are the vibrating source for the cornet or trumpet player. The ability of the player to control the embouchure correctly is gained only after a long training period. The muscles used in controlling the embouchure must be developed through carefully organized daily practice routines.

The quality of the instrument one plays affects the tone. The student cannot perform proficiently without an instrument on which he can produce the desired tone and pitch. The instrument should be played and checked for response and intonation by a trumpet or cornet specialist before being placed in the student's possession.

The mouthpiece should also be considered, due to the fact that the size and shape of the cup and bore affect the tone and pitch produced by the player. A quality instrument is of little value to the player without a properly sized mouthpiece.
Obstructions in the mouthpiece or tubing of the instrument affect the sound and pitch by changing the size of the instrument's bore. The instrument should be cleaned at least once a month and the mouthpiece and leadpipe should be cleaned at least once a week. Dents in the instrument's tubing should be repaired by a competent repairman.

**Intonation**

Many cornet and trumpet players do not play their instruments in tune because they do not understand the principles of intonation. A student must be taught what pitch is and how he can control the pitch of the instrument. All instruments have certain notes that must be altered to be played in tune with the tempered scale. The student must understand the use of alternate fingerings, tuning slides, and how to detect pitch problems by careful listening. The player's ear is the final judge in determining if a pitch is too high, too low, or in tune during a performance.

**Technical development**

The action of the tongue plays an important part in articulating a note whether the note is tongued or slurred. When slurring from one note to another, the use of syllables or vowels in the arching of the tongue is very useful in changing registers. The back arch of the tongue aids the player to make pitch changes. The player should work to develop the tongue action in a manner that produces maximum efficiency with minimum effort.
To execute a clear, distinct attack, the player must be able to form a correct embouchure; have good breath control; and be able to bring an air column up from the diaphragm unobstructed into the mouth and release the air into the instrument by lowering the tongue quickly to the bottom of the mouth. Many students do not understand that the function of the front portion of the tongue in ending a note is simply to stay in the bottom of the mouth.

Double and triple tonguing should not be taught until the student has good control and can execute a good single tongue. The student should work to develop the "ku" attack first in double or triple tonguing. The use of syllables in double or triple tonguing should be used only as a guide. The position of the tongue while vocally saying the syllables is different from the actual tongue position used in double or triple tonguing. To execute a correct double tongue the student should form his embouchure and say "tu-ku" without any vocal sound.

In order for the student to develop the ability to perform the basic playing techniques with skill and confidence, a daily-practice routine should be followed. The practice routine should include scales, long tones, etudes, and technical exercises that will increase the player's facility in the use of all performance techniques. The use of these techniques coupled with assiduous practice and an unending determination are the elements necessary to produce a successful player.
BIBLIOGRAPHY

Books


**Bulletins and periodicals**


Clinics


Interviews


Unpublished material


