An Approach to Standardizing Pedagogy for Extended Techniques on Tuba

By

Sean M. Kennedy, BM in Music Performance and MM in Music performance

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Approved

Dr. Kevin Wass
Chair of Committee

Dr. Andrew Stetson

Dr. Lisa Rogers

Accepted

Mark Sheridan
Dean of the Graduate School

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TABLE OF CONTENTS

ABSTRACT

The purpose of this document is to examine and attempt to standardize a pedagogical method for extended techniques for the tuba. This document will pull from various source materials including repertoire for the tuba and an examination of various documents on extended techniques for other instruments. This document will include common existing extended techniques for the tuba and will attempt to introduce new extended techniques that can be adapted for the tuba. Each technique will be described from a proposed sound concept. Notational examples from the repertoire will be included to aid in understanding the function of the sound concept. Then the technique will be discussed from a pedagogical standpoint, to create the proposed sound concept. Added pedagogical ideas will be included to discuss any helpful hints to aid in learning how to execute any and all of the included extended techniques. These pedagogical ideas will range from how a performer can learn a technique to how a performer can utilize the body to make a technique easier to perform.

The document is divided into five chapters, with the three inner chapters discussing extended techniques and the pedagogy of extended techniques. Chapter two discusses extended techniques that are extensions or modified versions of standard playing technique. The third chapter examines extended techniques that create musical shapes and gestures. In the fourth chapter, extended techniques that alter the timbre of the tuba will be discussed and new extended techniques are presented in this chapter.

The outer chapters show the methodology, limitations, and structure of the document and present ideas for further research.

This document is intended for the use of pedagogues and students of the tuba. The focus of the document is to give pedagogues and students a starting point for experimentation. Composers may find this document helpful as well because notational examples are pulled from the tuba repertoire and sonic properties are discussed from a pedagogical standpoint. The sonic properties may give composers an idea of the function and possible sound manipulations on the tuba. This document does not contain any extended techniques for the euphonium, even though some of the pedagogical ideas may work on euphonium, the euphonium and the tuba are two separate instruments.

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Justification for the Study

The aim of this document is to start the discussion of pedagogy for extended technique. In the tuba pedagogical lexicon, there is an established pedagogical format for almost any standard playing technique. Regardless of what pedagogical pedigree any tuba player studies under, the pedagogy for extended technique either is not well established or do not exist at all. Students are often instructed to figure out on their own how to accomplish very complicated techniques that appear in pieces within the standard repertoire. Students should not have to guess at these extended techniques. Extended techniques are now part of the tubas' standard repertoire, and this document aims to generate a pedagogical standard for extended techniques.

Review of Existing Literature

The only publication based entirely on extended technique for the tuba is *The Contemporary Tuba* by Barton Cummings, first published in 1984. This publication was a catalog of extended techniques and the pieces that contained these extended techniques. The main function of the publication was to provide some descriptive elements for the existing extended techniques. This publication is primarily geared for composers, but does not provide any pedagogical elements and offers only a small

number of extended techniques. This publication was never expanded upon as the extended technique portion of the tuba repertoire grew. To date, there is only one document that utilizes extended techniques within its pedagogical function. That work is *The Brass Gym,* by Sam Pilafian and Patrick Sheridan. The work utilizes pitch bending as a tool to aid in developing lip flexibility. So far in the author's research, the greatest concentration for all extended techniques on tuba lies within the solo literature for tuba, or mainly within the tuba alone and tuba and electronics repertoire.

Studies of extended techniques exist for other brass instruments, such as horn and trombone, yet this literature is geared towards cataloging and describing the extended techniques for composers. Like the Cummings, these documents list extended techniques and explain what the extended techniques sound like. Both of these documents also have a CD or LP that accompanied to aid the reader in how the techniques can sound. There are elements of pedagogical efforts, but these elements are scattered. The Douglas Hill, *Extended Techniques for The Horn,* and the Stuart Dempster, *The Modern Trombone,* are great resources of cataloged extended techniques on each instrument. For the students in search of help, little is offered from a pedagogical standpoint. Other instrumental books on extended technique serve a similar purpose of cataloging extended techniques. Robert Dick's book, *The Other Flute* is the exception to this cataloging methodology. Dick offers pedagogical advice on many topics throughout the book, as well as detailed descriptions of each extended technique.

Overview

The methodology in establishing a pedagogy for extended technique must be rooted in the repertoire, because the technical demands within the repertoire should drive the need for a new approach to both technique and pedagogy. With the repertoire as a foundation, experimentation for performance practice will help to establish a basis for the new technique. What steps led to an effective and consistent performance will help in defining what will become pedagogical ideas. A survey of existing literature will be needed to aid in establishing a comparative and pedagogical model. This was the method of construction for the basis of the document.

This document is broken into three chapters. The chapters house extended techniques of similar function, timbre, or overarching idea. Each chapter is further divided into sub-chapters that list each individual technique. Each extended technique is first described by its major timbral or production qualities. Notation is then discussed and modeled by figures from the existing repertoire. Finally, the pedagogical ideas needed for each technique are discussed in full.

Limitations for the Study

The scope for a project in creating a pedagogical technique should have a broad focus and contain as much depth as possible. For this document, a survey was done of the two most experimental genres for tuba players, solo tuba works and tuba with

electronics works. The repertoire was selected from the *Guide to the Tuba Repertoire* by Daniel Perantoni and R. Winston Morris. *Guide to the Tuba Repertoire* is a source book that lists pieces composed for the tuba before and within the publish date of 2006. This source book is divided by what type of medium the composition is, and then each piece is listed alphabetically by composer. Each piece is then listed with the composers name, the title, the publishing information, year of composition, instrumentation, and prose about different information on the composition. The repertoire was further refined by pieces available on loan through the International Interlibrary Loan program at most universities. The consortiums that are available at Texas Tech University are Amigos Resource Sharing, Amigos Western Resource, Canter for Research Library Group/ Linda Hall Library, Greater Western Library Alliance, Libraries very Interested In Sharing, Malamigos, TAE-Kansas, TAE Mobius, Texas Statewide ULS, Transamigos Express Courier Group, and RAPID. Surveys of the author's research of both the solo tuba and tuba and electronic repertoire are listed in Appendix A and Appendix B. There are also pieces within the appendices that cannot be found through ILL. These pieces were obtained from the authors' personal library and research conducted at various libraries across the United States. All compositions that are used in this document span from circa 1960 to 2006.

The extended techniques chosen for discussion within the document were selected because of their frequency of use within the repertoire. Some extended techniques mentioned in the appendices will not be discussed within the document, due

to their lack of description or use within only one piece. These specialized extended techniques will require more research and experimentation to properly discuss the required sound production and possible pedagogical ideas.

CHAPTER II

EXTENDED PLAYING FOR TUBA

This chapter will discuss extensions of standard playing techniques. These techniques utilize parts of the normal physiological functions for tuba playing but in new or different ways.

Vocal Extended Techniques

These techniques involve the use of the vocal folds resonating in the tuba. The seal of the horn will be intact for all of these techniques. Some of these techniques will be used in conjunction with playing, while others will be alone.

Multiphonics

Multiphonics are the double stops of the brass world, but unlike the string world, brass players can only produce two different tones at a time. The first tone is created from the buzzing of the lips, the first oscillator, or the common technique of playing the instrument. The second tone is created from the vocal chords, the second oscillator, or singing into the instrument.[1] Resulting tones can be produced, but those are only created by an interaction of the overtone series of first and second oscillators. By understanding the possible overtone interaction, chords can be created with only two pitches by the first and second oscillators. Multiphonics are the most common extended

[1] The terminology of first and second oscillator for played and sung pitch will be used throughout the document.

techniques for tuba to appear in the repertoire.[2] Listed below are seven categories of multiphonic types outlined by Hill. Each division of multiphonics appear within the repertoire, and each version of multiphonics offers its own set of challenges.[3]

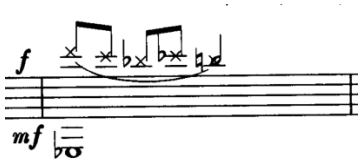

Figure 2.1 Multiphonic above the played pitch from *Encounters II* by W. Kraft

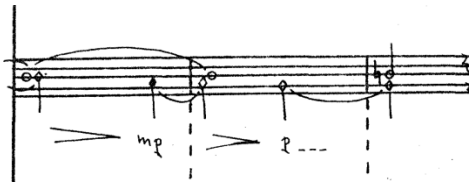

Figure 2.2 Undertone Multiphonic from *Cloudes* by D. Ernst

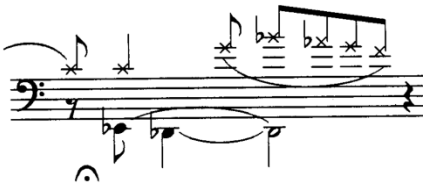

Figure 2.3 Melodic Multiphonic from *Encounters II*

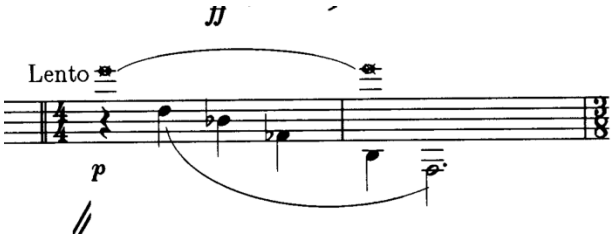

Figure 2.4 Pedal Multiphonic starting with voice alone from *Encounters II*

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[2] Barton Cummings, *The Contemporary Tuba* (New London, CT: Cimmarron Music Press, 2004), 1.

[3] Douglas Hill, *Extended Techniques for The Horn* (Eau Claire, WI: Really Good Music, 2010), 70-72.

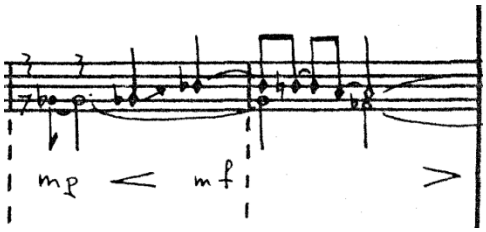

Figure 2.5 Multiphonic starting with Tuba alone from *Cloudes*

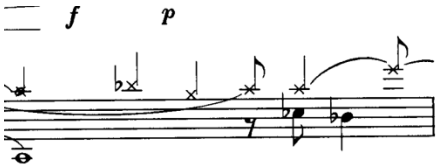

Figure 2.6 Multiphonic ending with voice alone from *Encounters II*

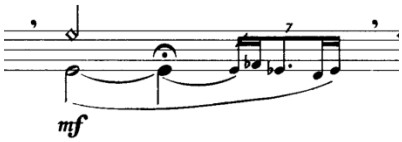

Figure 2.7 Multiphonic ending with tuba alone from Aria di Colortura by I. Lang

From a pedagogical standpoint, multiphonics can be a difficult concept to teach. Some multiphonics are feasible for some individuals whereas the same multiphonic can be a nightmare for another individual. One overlooked complication for this wide variation from person to person lies within the second oscillator production of the multiphonic. Multiphonics are created by using two lengths of tubes. The first oscillators' tone is created at the lips, which is in the pitch of the bugle used to play the note. The second oscillators' tone is created in the vocal cords, which is a longer tube. The average length of the vocal tract in males is 16.0 cm or 6.6 in and in females the

average length of the vocal tract is 14.1 cm or 5.6 in.[4] This added length now puts the vocal tone in a bugle between a quarter step to half a step down from the lip buzzed tone. Adding 5.6 in to 6.6 in to a 192 in CC contrabass tuba can be a little more than adding a quarter tone difference in length between the bugles. With an F bass tuba, the addition of 5.6 in to a 6.6 in to the 144 in length can add up to close to a half step difference between the bugles. The closer the difference in length between the bugles, the more interference between the two bugles. With this information, tuba players can finally understand why some multiphonics are more difficult than others. The further up the overtone series, the more notes each bugle will share, allowing more possibilities. The further down the overtone series, the more conflicting overtones. With this information, basic limitations come to light for multiphonic writing within the same octave as the first oscillator.

Vocal type affects multiphonics on tuba, as not all tuba players are tenors, baritones, or basses. Within this modern era, women and men with higher-pitched voices now play tuba. Alto, countertenor, and soprano voice types could not perform any of the surveyed works with multiphonics because of the limited vocal range written for tenors, baritones, and basses. A method that could alleviate this problem is to transpose the second oscillators' lines at the octave. Purists will state that this takes away from the original concept of the composer. Changing the octave of the second

[4] Ursula Gisela Goldstein, "An Articulatory Model for the Vocal Tracts of Growing Childern" (Ph.D. diss., Massachusetts Institute of Technology, 1980), 186.

oscillators' lines does change the "basic" concept of the piece. The resulting tones will differ because different overtones will be interacting with the change in the second oscillators' line. Unless the composer shows the desired resulting tones, then the notated concept of the piece is not in jeopardy. With regards to "undertones," as exhibited in figure 2.5, the transposition of the techniques at the octave must change. When a composer wants the second oscillators' tone to be under the first oscillators' tone, the performer must transpose both lines to fit their vocal range. This technique has a very particular sound and texture that cannot be replicated if the tones are inverted. So the first oscillators' tone must be transposed as well in order for the second oscillators' tone to still be under the first oscillators' tone. This may take the first oscillators' tone out of the performer's available playing range. In that case, work must be done by the performer either in lowering their vocal range or increasing the upper range of their playing.

In the author's own experience, many performers find that the hardest multiphonic technique to perform is the use of independently starting and stopping each line. A multiphonic needs a certain amount of air pressure for each oscillator to work in tandem. Outside of the multiphonic technique, both buzzing and singing can use different amounts of air to function. When starting with the voice, performers naturally use either less volume of air or less pressure of air than needed to create the buzz. When starting just with buzzing, a performer can start with too much air volume or air pressure for singing. To correct this issue, the performer must practice with starting the

multiphonic with each line. The performer may start with easy intervals that are comfortable or intervals that are easy to identify, starting with the buzz and then gradually adding the singing line above the buzz to create the multiphonic. By gradually incorporating the singing line, the performer can establish a basis to start from. To practice ending with the buzz, the performer possibly should do the opposite, by gradually stopping the voice by just slowly removing the voice from the multiphonic. Starting with the voice alone is more difficult, but with time, can become easy. The performer may start with a strong voice, by using the same amount of volume and pressure of air used for buzzing. This will allow an easy platform to build upon for the multiphonic. Once the voice has started its tone, the performer may slowly bring the lips together into the needed aperture for playing, making note to never fully close the lips, but rather allowing the air to start the buzz of the lips. After the technique is established, then the idea of control can be formulated. For finishing a multiphonic with voice alone, the performer may slowly open the lips allowing the voice to continue, stopping the buzz by separating the lips. At first, any combination of notes will work. This pedagogical technique is about experimentation, rather than "getting it right" the first time.

Importantly in executing multiphonics, the air needed for this technique should be based on the lowest note of the multiphonic.[5] The slower air stream will allow both notes to vibrate as equally as possible. If the player tries to use the air stream for the

[5] Robert Dick, *The Other Flute,* 2nd ed. (New York: Multiple Breath Music Company, 1989), 83.

upper note, the lower note will be sharp and out of focus while the upper note will be unstable. Dynamic control will also be easier if the player uses the lower pitch air stream. By increasing or decreasing the dynamic of a multiphonic, the slower air stream will allow both pitches to move freely. If the air stream is increased or decreased too fast, the upper note will become unstable, and either raise or fall in pitch.

For any performer to learn how to execute multiphonics effectively, consistent and productive practice is key. The performer possibly should play both oscillators' lines on piano in order to hear the combined texture of the multiphonics. Singing each line while playing the other line on the piano, this basic step allows the performer to fully understand the interaction and sound of each multiphonic. Then the performer may record the second oscillators' line with a handheld recording device, such as a "Zoom-like" product or a "smartphone." The track can be created from either the performer playing the line on their instrument or the performer singing the line. The most important aspect of this technique is being able to hear the line while the performer is playing. The performer may play the track with either headphones or speakers, but headphones can be easier to hear because the sound source is located closer to the ears. The performer possibly should play with the track while playing their horn, getting a feel for how the multiphonics function. If certain notes are difficult or will not speak clearly, the performer may change the fingering to see if longer fingerings will help. The end goal possibly should be eventually working back to shorter fingerings once control over each line has been achieved. Like any technique, multiphonics take time to learn.

Experimentation is key as well to learning how to effectually create multiphonics on a performer's respective horn.

Singing into the Horn

Singing into the horn utilizes only the vocal tract to create the notated tones. A seal is maintained from the lips to the horn for this extended technique. No buzz in needed from the lips, because this technique only utilizes the second oscillator. Composers can preface sung vowel shapes, but if no vowel shapes are discussed within the score then [a] or [oʊ][6] can be utilized.[7] Singing into the horn can use entire words or notated phonic sounds, and that should be notated very clearly within the score as well.

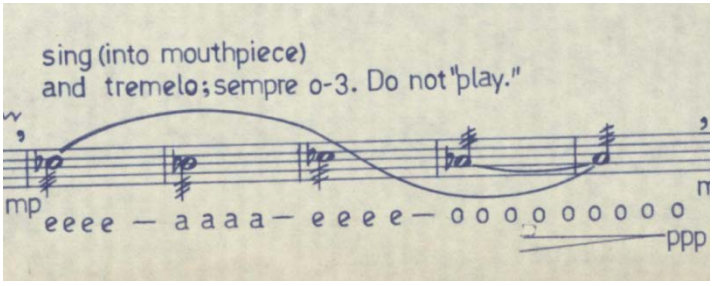

Figure 2.8 Singing into the horn with only vowels from *3 Essays for Solo Tuba* by W. Penn

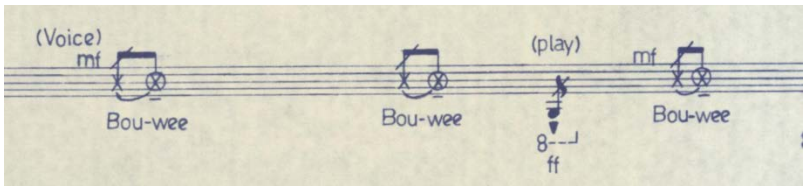

Figure 2.9 Dictated singing into the horn from *3 Essays for Solo Tuba*

[6] Adrian Akmajian, Richard A. Demers, Ann K. Farmer, and Robert A. Harnish, *Linguistics: An Introduction to Language and Communication*, 6th ed. (Cambridge: MIT Press, 2010), 86.

[7] For more on the IPA sound translations, please reference Appendix C.

In the author's research, this extended technique often is overlooked as an easy concept, since this technique can be produced by simply creating a seal with the lips and engaging the vocal tract for whatever the composer notates. A performer will soon find out that this is not the case, and that more experimentation is needed to create an effective sound concept. Like multiphonics, the tuba still will only easily resonate tones within the bugle that is engaged at the time. Chromatic or linear singing is easiest when the voice is high enough to use the closer partials of the overtone series. The lower the tones sound, the further away the partials become. Sometimes the need for a change in bugle to reach certain tones is necessary, but the change in bugles can result in a change in color for the overall sound. Prior experimentation is needed to figure out what fingering is best suited for each sung passage. As outlined above, the length of the vocal tract changes the pitch of the "total instrument."

With dictated singing or consonance singing into the horn a composer must remember that some consonances are easier than others. In just singing into the horn, consonances that utilize the lips can be hard to create. Consonance such as [b], [f], [m], [p],[v], [w] and [ʍ][8] all use the lips in some manner to create the consonances' sound. As long as the lips are free within the mouthpiece, and the seal is created with the face, these consonances can be utilized. The overall sound may be quieter, but the diction of the consonance will be greater in this manner.

[8] Adrian Akmajian, Richard A. Demers, Ann K. Farmer, and Robert A. Harnish, *Linguistics: An Introduction to Language and Communication*, 6th ed. (Cambridge: MIT Press, 2010), 75- 81.

Speaking into the Horn

Like singing into the horn, a performer can speak into the horn like a megaphone. The speech will be slightly distorted due to the length of the instrument and the confined speech patterns needed to maintain the seal with the horn. Like singing into the horn, a seal between the mouthpiece and the lips must be maintained. This technique can offer an “other-worldly” or “distant sound” to speaking. This technique can also be used as a colorist or texture change. By using only consonance inside the horn, new sound worlds and textures can be created for a composition.

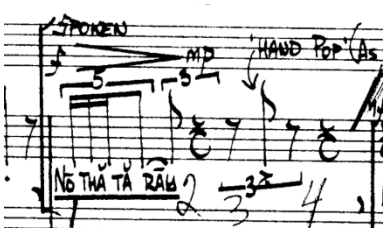

Figure 2.10 Dictated Speaking into the horn from *Spirals* by D. Cope

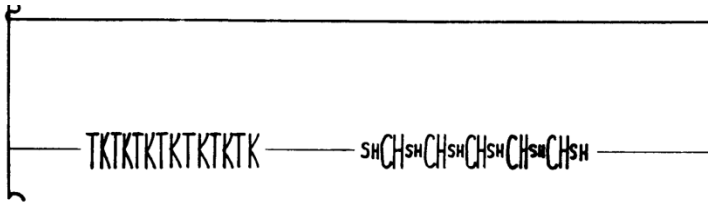

Figure 2.11 Consonance only into the horn from *Midnight Variations* by W. Ross

This technique shares many qualities with singing into the horn. Since the seal remains intact, the performer will still be using different bugles to create the sound. The performer will notice that the voice resonates more easily in particular tones denoted by the key of the bugle. Unless the pitch for the speech is notated by the composer, the

performer can only worry about the sound characteristics wanted for that performance. Each bugle or fingering of the horn will give different lengths, and different sounds. The longer the tubing used in the horn, the greater the change to the overall sound of the speech. As a suggestion, the performer must use clear diction to obtain an effective sound concept. Hard and precise consonance will offer a clearer and easier sound concept to follow performance for this technique.

Tone Extended Techniques

These techniques act as extensions of the normal tone and sound production of the tuba. Some techniques will use standard buzzing techniques while others will create sound with other physiological functions.

Wind Sounds

Wind sounds are created when air is blown through the tuba. The column of air inside the instrument is excited by the friction created within the horn and occlusion points within the vocal tract. The sound can then be manipulated by both vowel and consonance sounds within the vocal tract. Other variants to the sound include the length of the horn, fingering used, and half-valve effects each of which can alter the timbre of the wind sound by creating more or less friction within the horn. The position of mouthpiece or even type of mouthpiece used also affects the timbre of the wind sound. This technique can be articulated as if the performer is playing to create rhythmic motives. Flutter tongue can be used with wind sounds to create new textures

and sound worlds within a piece. Pitch of the wind sound can be manipulated, but the pitch of wind sounds will not be as defined as buzzing the pitch. The air of a pitch can come close to replicating the sound of the desired tone for wind sounds.

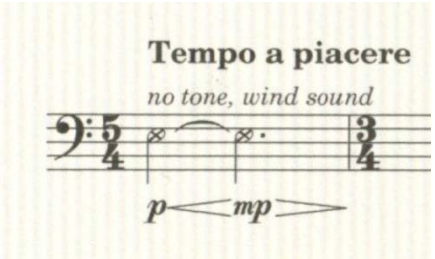

Figure 2.12 Air alone from *Boreas* by A. Masson

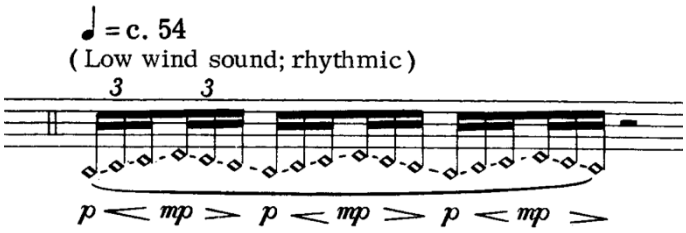

Figure 2.13 Tongued air from *3 for Barton* by A. Blank

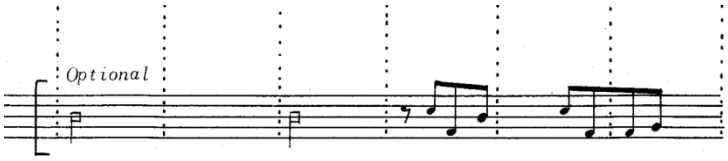

Figure 2.14 Pitched air from *Breath and Sounds* by B. Witkin

Wind sounds are the extended technique with the most cross over to traditional playing. Pedagogically, teachers use this technique to see a students' air usage for passages of music. This technique is discussed in multiple routine and method books which are used in many studios across the country. Typically, the student is asked to

"blow" into their horn, exactly like they were playing the horn. For the basic wind sound, this example is perfect. A seal is needed from lips to the horn, and air is blown into the horn as various speeds and pressures. To get more sound out of this technique more friction and resistance must be created at some point in the air stream. Length of the instrument can have a huge impact on the overall sound of the technique. Usually, the longer the bugle, the more surface area within the horn is assessable for friction, creating more sound. Half-valving the horn also creates more resistance and friction within the horn, creating a higher availability of sound.

Both vowel and consonance voicings will create different sound colors in wind sounds. More open vowels such as [a], [aʊ], [oʊ], [ɔ], [ɑ], and [ə][9] will all produce an open and resonant sound. The brighter vowels, [ɪ], [ɛ], [ɨ] [ʊ], and [ʌ][10] can produce a slight buzz in the air as well. The closer the tongue is to the hard palate, the more opportunity for a buzz to the air stream or even a slight buzz with the tongue. Consonance voicings contain a vast palette of colors. Any consonance used in speech can be used within the tuba. Lip articulated consonances such as [b] and [p][11] give a violent front to the note. Tongue articulated consonance such as [d], [l], [t], [ð], and [θ][12] range from a hard articulate front to a soft and fuzzy start to the note. Glottis articulated or back of the throat consonances such as [g], [k], and [ɹ][13] also have a broad

[9] Adrian Akmajian, Richard A. Demers, Ann K. Farmer, and Robert A. Harnish, *Linguistics: An Introduction to Language and Communication*, 6th ed. (Cambridge: MIT Press, 2010), 83-83, 86.

[10] Ibid, 82-83, 86.

[11] Ibid, 75, 77.

[12] Ibid, 77-78, 80.

[13] Ibid, 77, 81.

range of defended articulation to a very soft and fuzzy quality to the articulation. The buzz articulated, or fricatives consonances such as [f], [h], [s], [v], [z], and [ʒ][14] give different colors of a "white noise" effect. The trilled consonances, [r] and [ʀ][15] are what are known as flutter tongue and growl. Each of these articulations can be used with wind sounds to create a creepy or eerie sound. The more friction within the air stream, the more prominent the wind sound will be.

Vowel Formations[16] or Vowel Shaping

Vowel Formation or vowel shaping is the use of different vowels while playing the tuba. The composer will indicate which vowels to use, and when to use the vowels. Typically, four basic vowels are used within the repertoire; "a," "e," "o," and "u." There is some confusion over two of the basic vowels, the differentiation between "a" and "ah" as well as the differentiation of "e" and "i." Each of these variations shows up within the repertoire, and in some cases, both variants show up within a single piece. The difference between each vowel shape is varied by the language spoken by the composer and performer, the dialect of the language, and even the region of a particular country. All of these basic modifiers have a huge impact of how language is pronounced. This is where the usage of IPA, or the International Phonetic Alphabet, can be very useful. There are two common versions of how this technique of vowel shaping

[14] Adrian Akmajian, Richard A. Demers, Ann K. Farmer, and Robert A. Harnish, *Linguistics: An Introduction to Language and Communication*, 6th ed. (Cambridge: MIT Press, 2010), 77-78.

[15] *IPA Chart with Sounds*. http://www.internationalphoneticalphabet.org/ipa-sounds/ipa-chart-with-sounds/. 2015 (accessed 3/18/2016).

[16] Barton Cummings, *The Contemporary Tuba* (New London, CT: Cimmarron Music Press, 2004), 14.

is used within the repertoire. The first is sudden and rapid changes, where the composer wants a large change between two contrasting vowels. The other is slow and gradual, where the composer wants a gradual shift from one vowel to another.

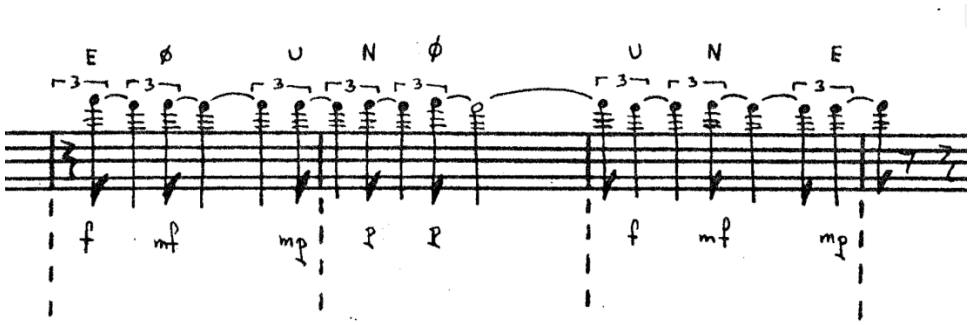

Figure 2.15 Sudden and rapid vowel shaping from *Cloudes*

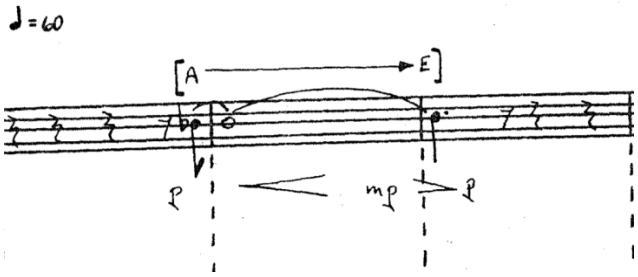

Figure 2.16 Slow and gradual vowel shaping from *Cloudes*

In the authors experience, vowel formations/shaping or vowel color change is possibly the hardest extended technique to bring out in performance. Most tuba players take years to learn how to master only one vowel shape for their standard playing. This extended technique of vowel shaping makes a tuba player master all vowels capable within the human vocal tract. The standard vowels used within the tuba repertoire are “a,” “e,” “i,” “o,” and “u,” for the western speaking world. The IPA variants for each one of these vowels can help a performer find the particular vowels that would work best

for this technique. First, the performer may want to examine what vowel is utilized for their standard playing technique. This vowel can be fully experimented with until the performer feels that they have exhausted each variant of the vowel. This will allow for the performer to build flexibility in their own musical making process. Most tuba players use a variant of the "oh" [oʊ] and the "ah" [a]. Typically the [oʊ] would take place for the "o" vowel within most of speech. On tuba, this vowel shape may not be exaggerated enough to hear a difference between standard playing and a vowel shaped timbre. The [o] or even the [ɑ] or the [ɒ] "o" sounds are much more open and relaxed within the vocal tract. The "o" sound may be the darkest within the vowel palette. It is the most open, dark, and round sound that can be made by humans. The "a" or the "ah" vowel may be the next darkest within the vowel palette sound. If a performer uses the [a] for playing, then the [æ], [ɔ], [ə], and [aɪ] may offer you a new sound for the "a." The [æ] being the darkest "a" vowel and the [aɪ] being the brightest "a" vowel, and all the gradients of the "a" vowel in between.

The brighter vowels, "e," "i," and "u," can be some of the hardest to create for tuba players. In most pedagogical lexicons, these are the vowels that are typically never used to play. With the creation of these vowels, back pressure can be created for the performer. The back pressure is created within the oral cavity and not from the interaction with the tuba. This kind of back pressure is very unusual for low brass players and is very uncomfortable as well. These vowels are created by raising the tongue within the oral cavity which interrupts or impedes the air stream. The "e" or [i]

vowel has the most back pressure because this vowel has the most obstructed air column. The [i] also has two less stressed versions, [ɨ] and [ɛ], but these vowels sits slightly lower in the oral cavity. The difference between the vowels is how much buzz is created within the tone. The [i] has a lot more buzz to the sound because the amount of friction within the air column. This is because the placement of [ɪ] and [s] are very close, giving this vowel an almost consonance sound. The "i" or [aɪ] vowel is an odd vowel. It is a diphthong that lies between the "e" and the "u" sounds within the American dialect. From the author's research, production of this vowel within the tuba can be easy, but this is the least used vowel within the repertoire. Often [i] is used as the high or bright vowel and the [ʊ] is the middle bright or "u" vowel. The [ʊ] vowel uses the back of the tongue to create the sound of the vowel. This gives the vowel sound a tense but open sound to the tone of the tuba. The [ʊ] is the most stressed version of the "u" vowel, with [ʌ] being more open in the front of the tongue.

To make this technique easier to learn, the performer may first work away from the tuba. The best way to learn vowel formation or shaping is to sing the passage of music, giving the performer a better understanding of how to shape the inside of the oral cavity. This technique calls for the performer to learn how to choreograph their tongue to shape each vowel in time, as opposed to standard tonging, where the tongue remains in one position to produce rhythms. Like any technique in brass playing, the performer must learn this technique slowly and in a relaxed fashion. This will allow the body to become accustomed to the new movement being called for while playing.

Tongue Extended Techniques

These techniques utilize the tongue in more varied roles than just articulative functions. Some of these functions will create new methods of sound production and tone color variations on the tuba.

Flutter Tongue

Flutter tongue is the rolling of the consonance "r," creating an intensity and harshness within the tone. There are multiple ways in which this technique is notated. There are a few examples below. Keep in mind that the re-articulation of notes within a fluttered passage is difficult. Flutter tongue can be treated like a slurred passage.

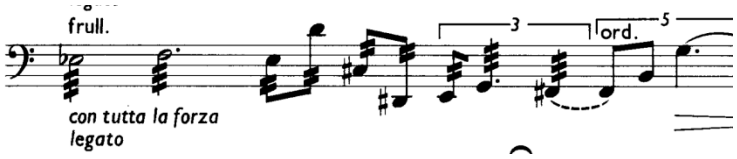

Figure 2.17 Standard flutter tongue notation method from *Aria di Colortura*

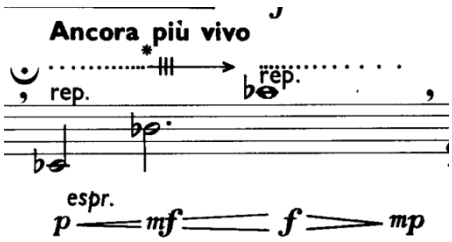

Figure 2.18 Lesser used notation for flutter tongue from *Aria di Colortura*

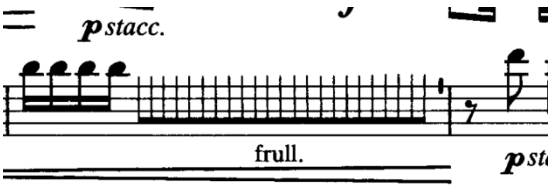

Figure 2.19 Odd notation for flutter tongue from *Studie V fur Tuba* by S. Geissler

This technique possibly has the most misconceptions that surround the common pedagogical ideals for this technique. This technique is either very easy or very hard for players to produce. When easily produced, the player can naturally vary the sound in a very wide spectrum. If the player cannot produce the flutter tongue at the time, this technique can be learned like any other playing technique or linguistic sound.[17] Often, instrumentalists are told that someone can do this technique or they cannot. This technique can be learned like any other playing technique capable on any instrument or any linguistic sound. The first idea that a player must grasp is how and where the sound is created. The [r] consonance or the "rolled r" is created by trilling the tongue. The actual articulation of the trill can vary from the middle of the tongue to the tip or blade of the tongue. The tongue must be tense and engaged to create this sound. Tension is held in the tongue because the tongue is fighting against the air stream within the oral cavity. The second step in learning how to create this is sound is creating a seal within the oral cavity. The seal needed for this technique usually lies in the dip of the hard palate. This dip in the hard palate is where people often burn themselves with hot coffee or pizza. The performer can create a seal between the tongue and the dip in the

[17] Robert Dick, *The Other Flute,* 2nd ed. (New York: Multiple Breath Music Company, 1989), 136.

hard palate, trying to blow past the tongue. Often this will result in a loud [t] articulation. The performer possibly should then learn how to keep the tension in the tongue while blowing past the tongue.

Some instrumentalists will use growling in place of flutter tongue. Instrumentalists must understand that the friction in the air stream is in the mouth and not the throat, and the sound concepts are different. Techniques may not be interchanged because these extended techniques sound different. Since flutter tongue is an unvoiced trill, only two distinct sounds are being created for the sound concept, the oscillation at the lips and the trill of the tongue. Growling is a voiced trill and has three distinct sounds, the oscillation at the lips, the trill of the uvular region of the tongue, and the use of the second oscillator to create the voiced element of the trill. Flutter tongue will take time to learn. Instrumentalists must practice the technique of creating the seal inside the mouth and blowing past the tongue first off the horn. Once the technique is established off of the horn, then the technique can be put into the horn.

Once a foundation has been established for the flutter tongue technique, a performer can expand and vary the technique. Variations of this technique are established on how much tongue is touching the hard palate, the position of the tongue within the oral cavity, and the type of air stream being used for the playing of the horn. The first variation of flutter tongue is more noticeable in the tuba rather than in normal speech patterns. How much tongue is touching the hard palate changes both the speed

of the flutter and the intensity of the flutter. With the middle of the tongue, the sound of the flutter may be darker and rounder because the tongue is moving slower. When the tip of the tongue is used, the speed of the flutter intensifies, and the tone of the flutter may be brighter. The second variation of flutter tongue is dependent upon how much tongue is touching the hard palate. The position of the tongue within the oral cavity changes the focus of the flutter. The further back within the oral cavity, the more defined the flutter is. As the flutter moves forward, the sound tends to become fuzzier. The air stream being used to play has the most effect upon flutter tongue. This is because of the actual action of the technique is created by the interaction of the tongue and the air. Both the velocity of the air and the placement or direction of the air stream changes the sound of the flutter. When the velocity of the air increases, both the dynamic and the intensity of the flutter tone increases. When the velocity of the air stream decreases, the intensity and the dynamic of the flutter tone decreases as well. The placement or direction of the air stream deals with where the performer is actually "blowing to." If the performer blows to the tongue, the flutter tone will be round and consistent. The overall tone will remain intact, and compact even when the velocity of the air and tongue position is changed. When the player blows past the tongue, the flutter tone becomes more intense. The intensity of the flutter comes from a higher level of tension within the tongue, which will cause a more erratic tone. More air will be needed to create a more intense and erratic sound within the flutter tone.

Flutter tongue in the low or even the pedal register can be quite difficult. This is due to the slow vibration of the lips and the fast vibration of the tongue. Often the flutter of pedals notes sound like a multiphonic. There are two possible solutions for this problem. The first deals with the tension and placement of the tongue. If a performer creates more tension within the tongue, with a further back placement of the blade of the tongue within the mouth, the sound may be very clear and higher timbre flutter. This placement of the blade of the tongue can be hard for the pedal register, because the higher tongue can obstruct the large air flow needed for pedal notes. The other solution deals with the air flow of the note and flutter relation. If the performer blows past the tongue with a faster velocity of air, the flutter will be tenser, giving more definition to the actual flutter. The problem with this solution is that the pedal will become sharp and bright because the velocity of the air is fast for the pedal register. Either way, a player needs to experiment to find the correct solution for themselves, and the possible desired sound concept for the composition. Sometimes a fuzzier or less defined flutter can be easier to pair with certain pedal notes. Other times a more relaxed flutter can sound with a pedal note. Options will always vary from performer to performer.

Growling

Growling is the other tongue trill within the brass extended technique world. This trill is located in the uvular region of the vocal tract[18]and is known as the glottal "r" or the [ʀ]. The uvular region of the vocal tract also contains the hard [ɢ] consonance and the "h" or [χ] as well. This technique has a primal or uncontrolled sound concept, which coincides with its given name. The notation of the technique is still very unclear. Some composers use the "common" notation of flutter tongue, with a note above or below starting to growl. Other composers use graphic nation to depict a possible sound concept to be executed by the performer. Other composers use creative descriptions to show a literal technique that is wanted. An example of each type of notation is shown below from the repertoire.

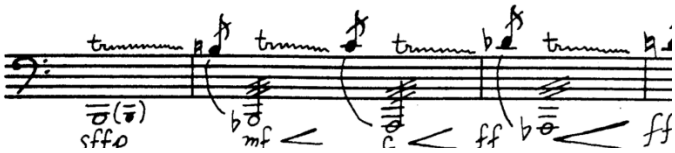

Figure 2.20 "Common" flutter notation for growl from *Elegy for Unaccompanied tuba* by R. Chamberlin

[18] *IPA Chart with Sounds*. http://www.internationalphoneticalphabet.org/ipa-sounds/ipa-chart-with-sounds/. 2015 (accessed 4/4/16).

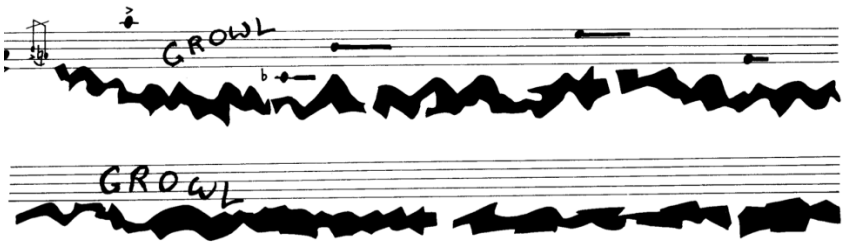

Figure 2.21 Graphic notation for growl from *Drones IV* by L. Cresswell

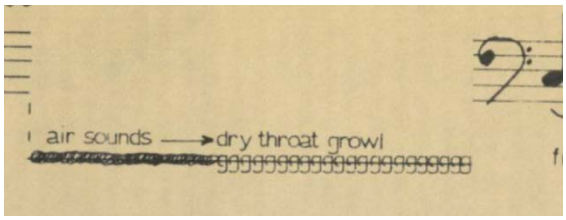

Figure 2.22 Descriptive notation for growl from *Interim Structures*by A. Brown

Unlike flutter tongue, this technique does not have many variations. The placement of the actual articulative friction is very hard to move. Usually, if a player tries to move the placement of articulation, another type of trills will happen within the vocal tract, or the sound will fail. The main variation that can be applied to this technique is the velocity of the air stream. When the velocity of the air stream is increased, the tone of the growl increases in both intensity and dynamic. The erratic sound of the technique increases as with the increase in velocity as well. Likewise, when the velocity of the air stream is decreased, the dynamic and the intensity of the growl decreases. There is threshold of air needed for this technique. If there is a small velocity of air, the technique will not function. Adversely, this technique does not have an upper threshold, by providing more air into the vocal tract, the louder and more intense the technique will be. The only drawback of this technique is the strain on the throat. When

this technique is used in excess, the strain on the throat can be very tiring for performers.

Many instrumentalists feel that this technique can replace flutter tongue. That should not be the case because each technique offers a different timbre. Instrumentalists should possibly learn how to flutter tongue properly, and then have proper control over both flutter tonguing and growling. These techniques may not be treated as interchangeable sound concepts. Composers choose to use certain sound concepts, and instrumentalists should do their best to replicate the notated sound concepts.

Clicks

Clicks are a sound produced by creating a vacuum between the hard palate and the tongue. Clicks in the tuba repertoire are very rare, because the sound is very soft and does not project well out of the instrument. When used in solo repertoire, the technique can offer a whole new texture to a composition. The click motion within the mouth is similar to the motion of slap tonguing on a reed instrument.[19] There are two common methods of notation for this technique, and both are very easy to read. Both offer unique ideas about how the click fits into the texture of the piece. The first example shows the click within the staff and offers an idea of a pitched sound concept. The second example shows the click represented by graphic notation, offering an idea that the click is a type of punctuation.

[19] Phillip Rehfeldt, *New Directions for Clarinet* (Berkeley: University of California Press, 1977), 65.

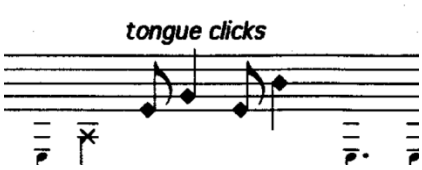

Figure 2.23 Clicks within the staff from *Aboriginal Voices* by N. Corwell

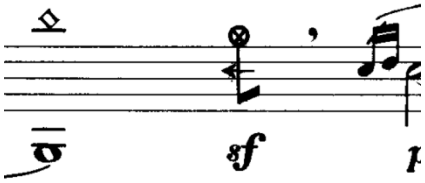

Figure 2.24 Graphic click notation from *Aria di Colortura*

The actual click sound is usually created by a vacuum between the tongue and the hard palate, [ǃ][20] this is called the alveolar click. The oral cavity must be very open, but the tongue might be in a forward position. With an open oral cavity and forward tongue position, this will allow the actual click sound to be projected into the horn. The best oral cavity vowel for projection of this sound is usually the [oʊ] vowel shape. This vowel shape gives the oral cavity both an open resonating chamber but also a slight forward nature to the oral cavity as well. There are many options for the oral cavity in the execution of this technique. A player should experiment will all possible vowel shapings to obtain the desired sound wanted for performance.

There are other types of clicks that can be created by the human vocal tract, and these clicks can be used in future compositional efforts for the tuba. The bilabial click,

[20] *IPA Chart with Sounds*. http://www.internationalphoneticalphabet.org/ipa-sounds/ipa-chart-with-sounds/. 2015 (accessed 4/4/16).

[ʘ][21], sounds like kissing or lip smacking, but this type of click is relatively quieter than the other two possible clicks on tuba. The bilabial click needs the lips and tongue to be free to create the vacuum between the lips, the teeth, and the tongue. The other possible click is created within the throat. This click is rooted in the [q] consonance, and is the loudest of all of the clicks but is an unvoiced uvular articulation. The use of the unvoiced "q" consonance gives a deep timbre and a stopped sound concept. The click is created by forming the consonance "q" and pushing or sucking air though the vocal tract, creating the unvoiced consonance.

Stop Tongue

This technique is also known as split tonguing.[22] For this document, the term stop tongue will be used because the technique can be used with or without buzzing the lips. The sound is characterized by its heavy thumping nature and is created by obstructing the air stream with the tongue. This technique appears very rarely within the repertoire. The example below shows pitched unbuzzed stop tongue. The notation calls for two different "pitches" or sounds to replicate the sounds of two different drums. The composer for the example below lists the use of "lip beats" within the composition. The description of the sound concept wanted by the composer fits within the description used to create the sound of stop tonguing.

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[21] *IPA Chart with Sounds*. http://www.internationalphoneticalphabet.org/ipa-sounds/ipa-chart-with-sounds/. 2015 (accessed 4/4/16).

[22] Douglas Hill, *Extended Techniques for The Horn* (Eau Claire, WI: Really Good Music, 2010), 33.

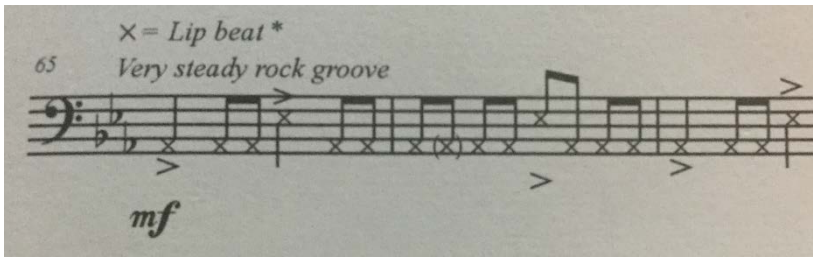

Figure 2.25 Lip beats or stop tongue from *Fnugg* by Ø. Baadsvik

In the author's research, the wind sound version of this technique is very easy to execute. First, articulate the air stream, and then stop the air stream with your tongue. The sound of the second articulation can range from very soft to very loud. The player can aim for a loud second articulation. The more forward the tongue is within the oral cavity can lend to a louder "plop" sound for the second articulation. Some of the best places for the second articulation lie where the performer naturally articulates in the performer's playing technique or natural speech pattern. When the performer creates the technique where they naturally articulate, the technique has a clear, defined, and natural sound with a sharp start and end. When the performer creates the technique between the lips, the sound becomes harsh and uncontrolled. The buzzed lip version of the technique can be more difficult. In some cases, the tongue can split notes because the tongue is separating the lips. This note split can be very odd and unsettling at first. As brass players, standard pedagogy states that notes should not split. This technique is refining the skill of splitting notes, and can be controlled by alternating the balance of lip tension between the upper and lower lips.

CHAPTER III

SHAPES AND GESTURES FOR TUBA

This chapter deals with the fluctuations of pitch and timbre focusing on finger work and lip movement.

Pitch Alterations and Gesticular Elements

These extended techniques center around the usage of altered pitches and large musical gestures to create altered coloristic musical effects.

Lip Bends

Lip bends have many functions within the brass world, and many of those functions translate directly into the tuba. Lip bends are characterized by bending notes down or up in pitch at the lips. This technique is often found in the jazz idiom and is also found in the current basic pedagogy for tuba. In the standard methods of brass playing, lip bends can be the basis of fine tuning. A lip bend that starts a note is called a scoop and is usually a bend up into the desired pitch. Lip bends at the end of a pitch are usually called falls and are usually a bend down from the pitch. There are variations on both of the techniques. Pitch bends in the middle of a note can be notated to either specific or indeterminate pitches.

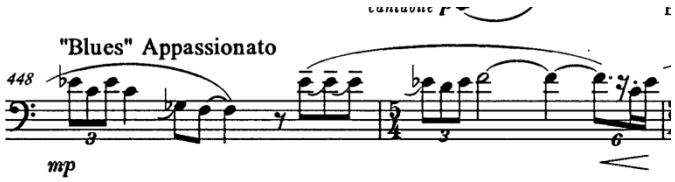

Figure 3.1 Scoop from *Songs of Asecnt* by R. Kellaway

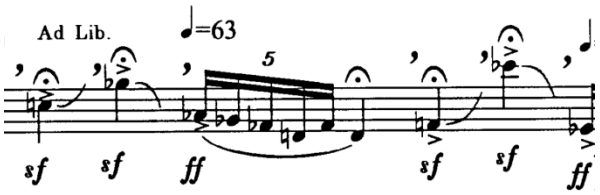

Figure 3.2 Fall from *Songs of Ascent*

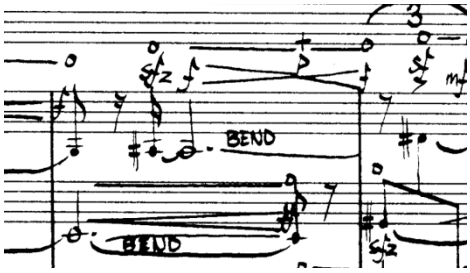

Figure 3.3 Indeterminate pitch bend from *Spirals*

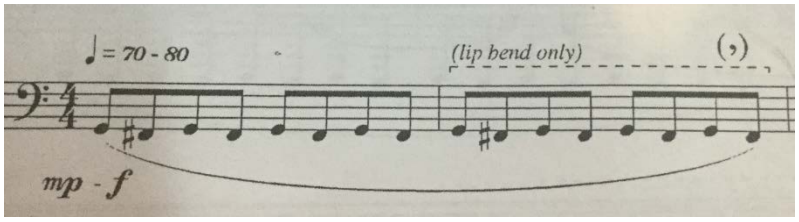

Figure 3.4 Determinate pitch bend from *The Brass Gym*

There are different theories regarding the “correct” production for this technique. Some say a performer should lead with the air stream; while others say lead with the lips. The true mechanics of this technique allows both the lips and the air stream to work in tandem, where the lips are controlled by the air stream, and the air

stream is regulated by the lips. Each element must have an equal function for this technique to happen effectively and with the least amount of tension possible. For both scoops and falls, the performer may need to have a target starting and ending note. The target note method will help the performer determine if half-valving is needed to execute this technique. By determining starting and ending pitches, this gives the player more stability for consistent performances.

The major limitation that brass players must understand about this technique is that a player can only bend pitches within a partial. When the next partial is approached, the lips will automatically move up or down to the next resonating pitch. This shift is part of the natural function of brass instruments. A performer must understand how the partials on their horn work, and where the actual partials lie. If a performer wanted to bend pitches further then the next resonating partial, half-valving must be used.

Glissandi

Glissandi are elongated musical gestures[23] that extend through various ranges. Often glissandi, more commonly referred to as a "gliss," are lip slurs that extend across various notes from one pitch to another pitch. Composers can either leave the end of glissandi open-ended or notate the ending point. Due to the mechanics of valved brass instruments, there are limitations of how many notes that can be played within a glissando. There are two larger categories of glissandi; they are the graphically notated

[23] Douglas Hill, *Extended Techniques for The Horn* (Eau Claire, WI: Really Good Music, 2010), 43.

glissandi and the pitch notated glissandi. Graphically notated glissandi include the valve flutter glissando and the half-valve glissando. The pitch notated glissandi include the harmonic glissando and passages of music that have the term “gliss” notated above the musical gesture.

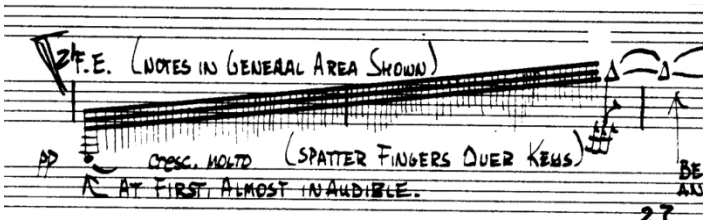

Figure 3.5 Valved Flutter glissando with an indeterminate end point from *Spirals*

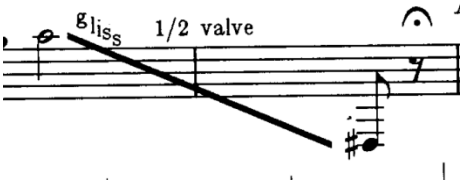

Figure 3.6 Half-valved glissando with a notated end point from *Encounters II*

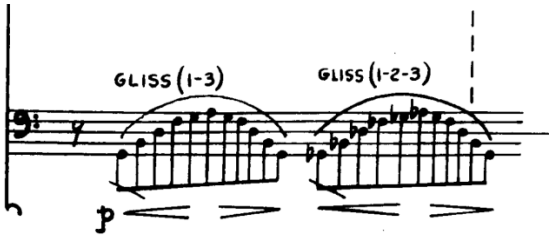

Figure 3.7 Harmonic Glissando from *Midnight Variations*

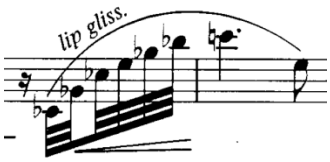

Figure 3.8 Pitch Notated Glissando from *Parable XX* by V. Persichetti

For all types of glissandi, the performer possibly should have a relaxed approach to lip slurs. Glissandi are often large gestures that move into the extremes of a performers' capable range and require the ability to rip easily through the entire range of the tuba in the quickest and most efficient way possible. Lip slurs exercises can help with building an effect approach to lip flexibility. The focus of the glissando is to create a large musical gesture that is either indeterminate or determinate. The players' job is to create this musical gesture and to make the gesture sound easy.

The valve flutter glissando is possibly the noisiest glissando because it allows the performer to blow through multiple bugles in a short about of time, giving the glissando a "frantic" feel to the musical gesture. The use of key clicking for this glissando also adds to the frantic feeling for this gesture. The half-valved glissando is a very smooth gesture because the use of half-valve on tuba allows the performer to move throughout the horn with the use of one continuous bugle. The half-valved glissando requires that the performer must find the "hook," before doing the lip slur. The "hook" is where the half-valve portion of the horn has the most response. This "hook" allows the performer to move easily through the horn without having to fully engage the valves. The "hook" needed for the half-valve glissando is usually right in the center of the half-valve. Performers will need to experiment to find where the optimal placement of the valve for the best half-valve "hook."

Harmonic glissandi contain only notes that exist within a bugle. Each fingering on tuba establishes different bugles, and the longer the bugle, the more partials that are

available to be played. Different fingering lie in different portions of a bugle, and can produce different overtone series. The composer should notate each partial wanted within the glissando and the possible fingering that will make that glissando function. Different keys of tuba will need different fingerings to make a harmonic glissando happen. By notating the wanted harmonics, this allows the performer to figure out what fingering will work best for their tuba. Notated glissandi can be a string of any notes wanted by a composer. This type of glissando can be very hard to make a smooth musical gesture. Often, these types of glissandi contain large and unusual interval leaps. The performer possibly should first establish an easy fingering pattern for the glissando. Here alternative fingerings can give the performer more options, and allow for easy finger motion. The performer may work out the glissando very slowly, learning where each note falls within the gesture. Playing through each note correctly, and be able to move to the next note easily, giving the musical gesture an easy flow from the start of the musical gesture to the end of the figure. The last step is to speed up the figure until the line moves at the correct speed needed for the piece.

Vibrato

Vibrato is a standard technique for solo playing on tuba, where a performer can fluctuate a pitch at or before the lips. This technique can give any performance depth and vibrancy, allowing the tone of the tuba to have a motion and color to any note or passage. There are many non-established rules for how vibrato should be used on tuba,

which can include how to produce vibrato, what ranges should vibrato be used, and how much vibrato should be used within a piece. Of course, all of these rules are centered around personal artistic ideals. Within the extended technique side of tuba playing, vibrato can be used in any fashion by a composer or artist. Composers can give specific directions of how and where vibrato can be used. Composers can notify the tuba player that no vibrato should be used within the composition or a particular passage of music. In addition, composers can notate what kind of vibrato as well as the speed and width of the vibrato.

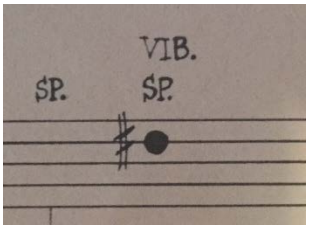

Figure 3.9 Notation for wanted vibrato from *Solo for F and Bb tubas* by J. Cage

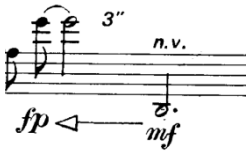

Figure 3.10 Notation for no vibration from *Eria* by R. Creuze

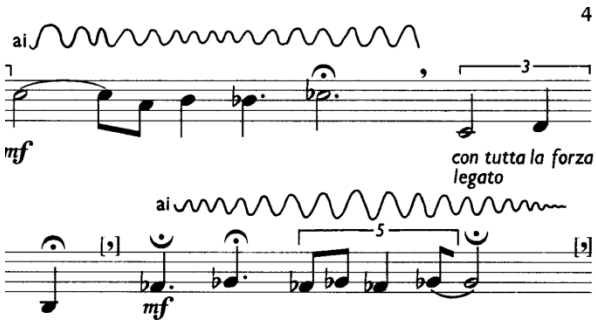

Figure 3.11 Notation for dictated speed and width of vibrato from *Aria di Colortura*

For the use as an extended technique, performers will need to create all types of vibrato in every range. There are four methods of creating vibrato, and each method produces a unique sounds concept. The most common form of vibrato production is created by jaw movement. This method is the most accepted within pedagogical circles because this method has the least effect on the needed physiological functions required for playing the tuba. Jaw vibrato also has the largest variation of speed, width, tone color, and pitch levels. This is due to the amount of space a tuba player can move their jaw. As long as a seal is held between the lips and the mouthpiece, and the lips are close enough to buzz, the varying width of the jaw a tuba player can move is from completely closed teeth to the teeth opening to the edge of the inside rim of the mouthpiece. These variations allow the pitch level differences to be very wide, both above and below the established pitch. With such wide variants in pitch, there will be large tone color variants as well. The tone color variants will range from an open and dull sound to a pinched and bright sound. The change in sound color will also be directly proportional to the change in pitch tendencies. The speed of the jaw movement depends on how much tension the tuba player can create within their jaw. Like flutter tongue, the speed of the

movement is dependent on the force of tension within certain muscle groups, all while still trying to remain relaxed as possible. The fastest jaw movement a player can be produced is similar to chattering teeth, or shrivering when cold. The width of this type of movement is small, but the speed is relatively quick. The wider the movement of the jaw, the more work is needed by the player to generate speed. A wide and fast vibrato is possible for most players, but the movement will be taxing.

The following types of vibrato are less commonly found methods for producing vibrato on the tuba, which also maybe more controversial in pedagogical circles. The first vibrato production technique is created by pulsing the air column within the body. The “air vibrato” technique is a discouraged method because of the needed manipulation of internal air column, which within tuba pedagogy is often the blame for many early tuba player problems. When this technique is utilized by a mature player, the effect of this vibrato is striking. The pulsing of the internal air column gives the tuba a pulsing effect as well, exhibiting a Doppler-like effect. This vibrato production technique can vary in both speed and width. The sound production variations will depend on the performers overall comfort with this manipulation of the internal air column. The more tense a performer is the less movement that is possible with the internal air column.

The second type of vibrato production is the movement of both the front and back portions the tongue. “Tongue vibrato” is the smallest vibrato capable by tuba players. This vibrato production method involves moving both the front and back

potions of the tongue for different sounds. The front and back portions can move together or independently for different effects. The front tongue vibrato gives an odd wiggle to the overall tone production of the instrument, but the sound variation is small. Moving just the back portion of the tongue give a wider range of sound variants, but one could categorize this sound manipulation as vowel shaping. The back of the tongue is where the vowels [o] and [ʊ] are created.

An even less common form of vibrato possible on tuba is the shake vibrato. The production method involves physically shaking the tuba while still playing. This type of vibrato has the widest movement of pitch within the sound, giving the actual timbre of the vibrato an unstable feeling to the sound concept. The only possible method for use of this vibrato technique is to place the tuba on the legs or lap, and the performer then shakes the instrument in an up and down method with the use of the legs. This method is safe for the player, but can still be taxing on the player. Moving a large and heavy brass instrument at a rapid pace is tiring on the body.

Finger Work Extended Techniques

This section deals with finger work and the possible role of valve manipulations in extended techniques.

Half-Valving

Half-valving gives the tuba a narrow and demure sound, and is used with glissandi to give the tuba a smooth and even sounding gesture thought each register.

Half-valving suspends the partial “notches” within each bugle and creates a “bugle” of the total horn. The two possible variants of this technique depend on how many valves are in use for the sound. If all or most valves are in use, then this is categorized as half-valving or all valve half-valve. If pitches are fingered, then this is categorized as valved half-valve. Both techniques have a different timbre and quality of sound. The timbre of valved half-valve technique is more open then all valve half-valve. Often in valved half-valve, the sounding pitch is not always in the same key as the fingered pitch. Notations of these techniques are differentiated by how the technique is being used in that passage of music. The half-valve, or all valve half-valve, technique is often notated above glissandi, pitch bends, and some determinate or indeterminate played musical passages. Valved half-valve technique is rarely used, and is notated above a single pitch.

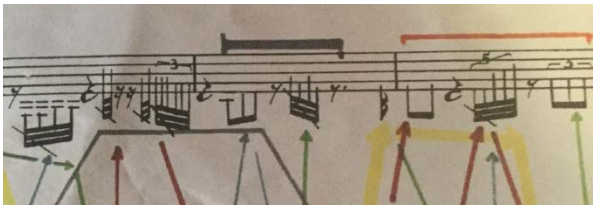

Figure 3.12 Indeterminate halve valved passage from *Post prae Ludium per Donau* by. L Nono

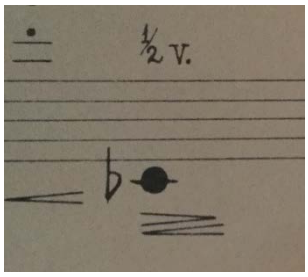

Figure 3.13 Valved half-valve passage from *Solo for F and Bb tubas*

As mentioned earlier within the document, the half-valve “bugle” has a “hook.” This “hook” is where the tuba can produce the most resonant tone for this technique. Subsequently, this “hook” is also the easiest placement to play within the half-valved section of the horn. Outside of this “hook,” a performer may encounter back pressure from the tuba. To find the placement of the “hook” within a performer’s tuba, slowly depress the valves while playing an open fingered note, making a note of where the back pressure starts to decline, and where the horn becomes free blowing again. This takes time and experimentation because the performer must utilize small or micro movements within the finger technique. Once the “hook” is found by the performer, the process can be repeated. Each time the process of finding the “hook” within the finger movement will be faster. Once the “hook” in the finger movement is established, the performer may then be able to have the muscle memory to return to that placement every time the half-valve technique is called for. The “hook” is where the half-valve technique or all valved half-valve can be played.

The valved half-valved technique takes more time to understand how to execute because every horn will react differently for this technique. Some fingerings will rise in pitch when half-valved, and some will fall in pitch when half-valved. Range, dynamics, air pressure, how much the half-valve is engaged, and even the partial of the intended fingering have an impact of where a note will sit within the valved half-valve. The performer must take the time to experiment with each valved half-valve pitch. Often, a performer has to change the fingering used for the valved half-valve to play the notated

pitch. Longer fingerings tend to have more possibilities and may work better, but may need more air to produce the upper partials of the bugle and most times will blow flat or sharp. Each bugle may have a tendency, but the tendency will change when any variable is changed for the technique. The performer may want to try to find the most consistent placement of valve depression, air pressure, the dynamic of playing, and fingering for consistency for the technique. Having multiple options for performance will give a performer more comfort when executing this technique. When performing the valved half-valve technique, the player will need to test out the perceived fingers before a performance to make sure that the fingerings will still work. Consistency for this technique comes from daily experimentation.

Trills and Tremolos

Trills and tremolos are rapid fluctuations of varied pitches.[24] These fluctuations of varied pitches can give composers new color palettes to choose from. Trills typically are embellishments that fluctuate between pitches under a whole step.[25] Tremolos are embellishments that fluctuate between pitches above a whole step.[26] For this technique in the modern era, a pandiatonic[27] approach is often the correct method of figuring out where to trill to unless otherwise notated. Trilling up in the modern era is also within the standard approach unless otherwise notated. If a composer wants the performer to

[24] Douglas Hill, *Extended Techniques for The Horn* (Eau Claire, WI: Really Good Music, 2010), 36.
[25] Ibid, 36.
[26] Ibid, 36.
[27] Or within the use of all “white” or natural notes.

trill to an altered note, the composer should notate the pitch desired with grace note notation, or place a flat or sharp sign on the right side of the starting pitch. If the composer wants the player to trill down, the composer may create a note within the score that states to trill down, or possibly notate the lower pitch with grace note notation. Tremolos should be notated with both notes in the same rhythmic duration, and with standard tremolo notation of three bars between the pitches. This notational style shows that each note is equal in the gesture. Both trills and tremolos can have varied speeds. To notate variations of speed, a composer may either use graphic notation or create a note above the musical passage.

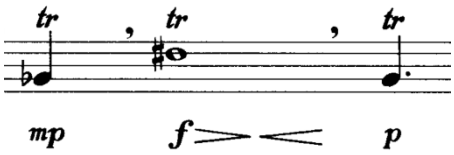

Figure 3.14 Standard Trill notation from *Aria di Colortura*

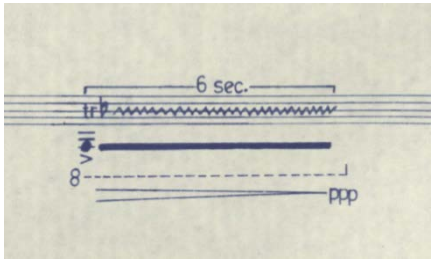

Figure 3.15 Standard trill notation to an altered pitch above from *3 Essays*

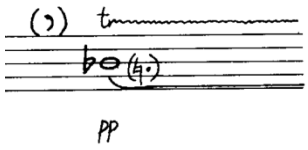

Figure 3.16 Trill to a note below from *Vox Superius* by M. Poore

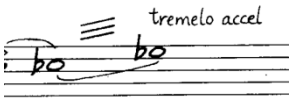

Figure 3.17 Standard tremolo notation and speed variation from *Vox Superius*

The technique needed for trills and tremolos is established within the standard pedagogy for tuba players. For extended technique pedagogy, trills and tremolos can be treated as musical elements within a piece, and not just as ornaments. Trills and tremolos can "resolve" but most times trills and tremolos are treated as coloristic effects within a piece of music. These coloristic effects may have their own shape, and the performer needs to learn how to create many shapes with the direction of the musical line and speed of the trill or tremolo. By being able to freely alter the shape of these elements, a performer can give more musical direction to every detail of a piece. The performer possibly should figure out the function of the trill or tremolo to start to define what shapes could work for that element. Experimenting with each shape, altering the musical line and the speed of the element independently for each other which can new textures can be created by a single voice instrument.

The finger technique needed for trills and tremolos can be rather extensive. Some trills and tremolos written with one key of tuba in mind can be difficult on another key of tuba. Having multiple alternate fingerings for every pitch on each key of tuba is an essential skill needed for playing modern music. Having multiple fingering options gives performers the ability to have a wide skill set to choose from. This skill set can aid in learning quarter tones, color fingering trills, and easier fingering work for difficult technical passages. In trills and tremolos, finding fingerings where the player has to move one finger makes this technique much easier. The less motion from a player, the greater the possibilities of alterations increases. If more than one finger is needed to create a trill or tremolo happen, then the performer can use the forearm to help free up tension in the hand. By utilizing the weight of the hand and forearm, in a relaxed motion, multiple finger movement can become easier. Tremolos that span between the fourth valve and the first or fifth valve may require the need to engage the forearm motion. By applying natural body reactions to playing technique may help in reducing the amount of muscular tension in the body.

For some performers, finger work away from the horn can be helpful in establishing nonidiomatic finger patterns. Doing piano finger technique exercises can help aid performers in establishing a better control over finger dexterity. The more refined finger dexterity a performer can exhibit, the easier finger technique becomes. Having the ability to move each finger independently, or as close to independent as possible, gives performers open possibilities to do any fingering option possible on their

horn. Building finger independence may happen off the horn. By creating small exercises that make the performer can learn to use each finger equally. Building muscle memory takes time and should not be rushed. Many musicians throughout time have damaged their hands by overextending or over exerting their fingers. Go slow and take time to build independence in each finger.

Color or Alternative Fingerings

Color fingering technique is characterized by playing the same pitch with two different fingerings in rapid succession for a duration of time. This technique is similar to the trill or tremolo, but there is no movement between two separate pitches. The pitch should stay the same, but there may be slight pitch variations between the two fingerings. The composer may notate in the score what key tuba the fingerings were intended for, and show what fingers were specified. If not possible, the performer will be able to easily figure out what fingerings would work best for the perceived sound concept. Some fingerings are very close in tone color, and working with alternative fingers will give more variation of tone color. For the greatest variants in tone color, the composer can look for the common fingering for the pitch, and then the long fingering for the pitch. The long fingering corresponds to the pedal fingering for that pitch. Other fingerings can be used depending on how many valves a particular tuba has. With the addition of the fifth and sixth valves, more alternative long fingerings can be created. Notation for this technique should be in depth as possible, and the composer should

explain the desired sound or element on a separate page or at the bottom of the score. The performer can figure out the necessary elements to create the described sound concept. This technique can either be free, like a trill, or rhythmically notated.

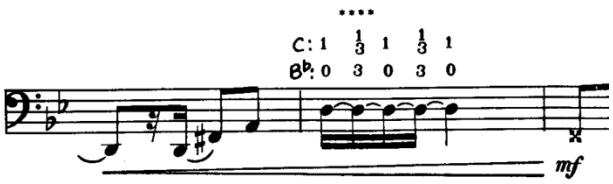

Figure 3.18 Color fingering rhythmically notated with listed fingers from *Tuba Tunes* by A. Frackenpohl

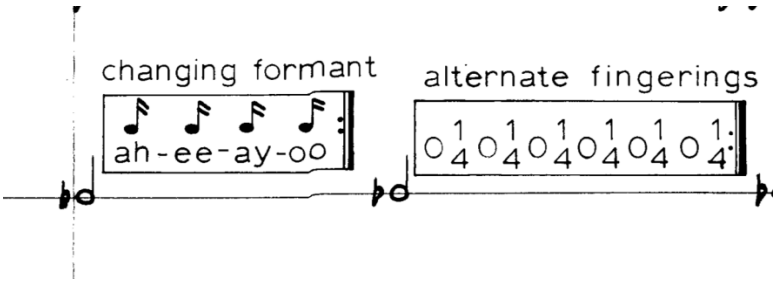

Figure 3.19 Color fingering free notation with listed fingerings from *Patterns III* by J. Fulkerson

The main concept for color fingerings is to create the widest color variation between the two fingerings utilized for a particular musical passage. Often the common fingering used for standard playing, and the long or pedal fingering will be sufficient. The goal for this technique is to start with a shorter fingering and move to a longer fingering. Sometimes, in the upper registers, moving from a long fingering to a shorter fingering can be easier. The longer fingerings offer more resistance when the upper partials of the long fingerings are played. If the performer has a fifth and sixth valve, then more alternative fingerings can be generated. The fifth valve is usually utilized in the pedal register of the tuba and is a long whole step. The sixth valve is also used more in the

pedal range to bridge the gap between the use of all the valves and the fundamental of the horn. The sixth valve is typically a long half step. With these two valves, a performer can create more alternative fingerings allowing less finger movement.

The air needed for this technique is possibly more than what the performer will be used to. For this technique to happen effectively, the performer must blow through both fingerings. The color fingering technique needs enough air so that both notes can equally speak. With the long fingering, more air is always needed to allow the note to speak. When alternating between a long and short fingering, the air stream velocity and amount of air possibly should be that of the long fingering. By using the long fingering as the base measurement for the air stream, both fingering elements will speak more equally. This will also allow the natural pitch fluctuations to be more prominent and give more colorist sound to each fingering.

CHAPTER IV

ALTERNATIVE TIMBRES FOR TUBA

This chapter shows the function of a modified tuba and timbre of a tuba in extended techniques. These techniques utilize the tuba in a modified format. These modifications will include added or subtracted elements to how the tuba is played or put together.

Percussive Elements

This section explores using the tuba as a percussive instrument. These techniques will create sounds both outside of the horn and inside the horn.

Key Clicking

Key clicking utilizes the percussive sound made when the tuba's valve are engaged. This technique is often used without tone, but can be used in conjunction with playing and can be both in time and out of time. Key clicking in time can help establish a groove, by adding a "high hat" element to the line. Out of time, key clicking can yield a percussive flutter effect that can lead to a cadence like or punctuating element. Composers should know that rotary valves and piston valves create different sounds, and even not all piston and rotary valves make the same sound. Every horn produces different key clicking sound depending upon the wear of the valve components, how hard the player is striking the valves, and how many valves are being used for the

technique. Notation of this technique varies, and the notation is often driven by what the composer wants the element to function as. If the technique will be part of a groove, then the "X" head notation will work. If the technique is more for a percussive effect, then graphic notation will work. This technique is not used while playing due to the need force needed to engage the valves, and that the sound of key clicking is not loud enough to compete with standard play on the tuba.

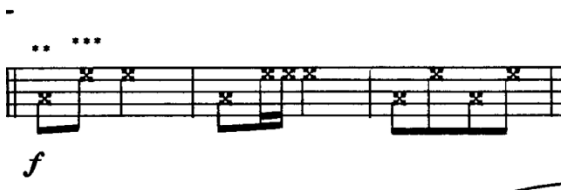

Figure 4.1 key click "X" head notation in time with leg slap from *Tuba Tunes* by A. Frackenpohl

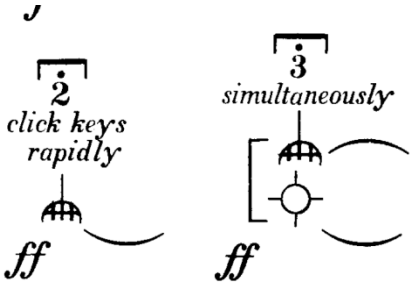

Figure 4.2 Graph notation for key click from *3 Abstracts* by J. Ha

Key clicking needs to have different elements of sound depending on how the composer notates the wanted sound concept. If the technique is out of time and written with graphic notation, possibly there may be a lot of valve flutter, and as much clicking sound as possible. The speed and dynamic of the key click will depend on how much force will be needed to depress the performer's valves. The force needed to engage the valves can inhibit the timing of this technique. If a lot of force is needed to depress the

performer's valves, then even more force will be needed to bring out this technique. To possibly lessen the need for force, the performer may need to have some work done on the valves of the tuba to make the valves move easier. Easier moving valves can make more sound, because less force is needed to create the click.

If the technique is not loud enough for the desired sound concept, then elements can be added or changed on the horn. For piston valves, the player can loosen either the finger button or the valve cap just a little and the clicking sound will become more pronounced. On rotary valve horns, either the bumper can be replaced by something harder or by adding a metallic object by the "catching" bumper. The metallic object needs to be small enough to not obstruct the movement of the valves, and the object will need to be attached to the bumper material because of how most rotary valves work. By doing either of these modifications to a horn, the sound will be prominent until the modification is removed or changed back to the normal position.

Hitting the Horn

As the term suggests, this technique deals with the hitting or the striking the outside of the horn for a percussive effect. The sound of the technique varies from metallic dings to dull thuds, and the entire tuba can be struck which can produce some type of percussive sound. The percussive sounds may be similar from tuba to tuba, but because of variations in manufacturing each tuba may have slightly differences in

percussive sounds. When composing for this technique, the composer must preface what the striking object will be and where to strike on the horn.

Notation for this technique should be as clear as possible. The composer should note where the performer needs to create the technique on the horn, and what object is to be used to strike the horn. Both of these elements can be written above the musical passage. This technique can be rhythmically notated or graphically notated. The notation should reflect the function of the technique. If the rhythm is important to the structure of the piece, or is mirroring an element within the piece then the composer should use defined notation. If the technique will be more of an effect or an indeterminate element of the piece, then graphic notation will work.

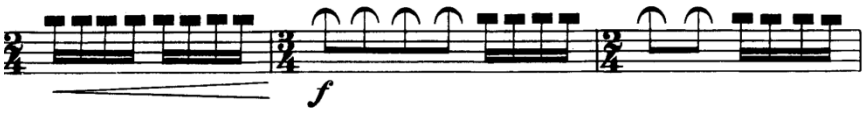

Figure 4.3 Defined horn hitting notation from *Canto VII* by S. Adler

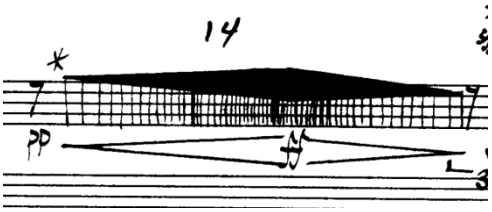

Figure 4.4 Graphic notation for hitting the horn from *Spirals*

One of the keys to making hitting the horn an effective performance practice is figuring out how to hit the horn for the best sound and developing choreography[28] needed for the technique. Figuring out how to hit a tuba to create the most resonance sound takes time and experimentation. Some tubas are more resonant than others and give a more ring to the percussive sound. Other tubas are slightly dead and give more of a thump percussive sound. Knowing what percussive sound the performers' tuba will make is part of knowing how the horn works. Each area of the tuba has a "sweet spot," and will take some time to find. The performer may start experimentation with the edge of their fingernails on the bell. This technique tends to produce the brightest percussive element from the instrument. The "sweet spot" is usually somewhere between the lead pipe and the rim of the bell. That is where the bell is the most free to vibrate. Once the spot is discovered, then the performer can test if the resonates extends around the bell. Finding a "sweet spot" for both the right and the left hand sides of the bell gives the performer options for choreography. Typically the "sweet spot" will also be the best place to strike for almost any other portion of the hand. For the open slap of the whole hand, the placement can change depending on the desired sound wanted by the composer. If the composer wants the slap sound to ring, then the "sweet spot" can work, but the hand possibly should be pulled off the horn right after the strike of hand on the horn. If the composer wants a hard thump, then the player may want to possibly

[28] This term was used to show the importance of the idea of movement being a part of a musical performance.

move further down below the lead pipe, and once struck, leave the hand on the horn. This area of the horn will produce a lower and more defined sound.

Other areas of the tuba will produce different sounds when stuck. The rim of the mouthpiece when struck with the fingernails and metallic objects will create a high pitched “ding.” The top bow and left side of the tuba will produce various knocking sounds that have a metallic character to the percussive sound. When struck with a small piece of jewelry, this area of the tuba tends to have a “hollow” ring to the sound. If no jewelry is present, a small coin can be used, but if the horn is struck too hard, the brass of a tuba can be easily dented. The bottom bow of the horn can be hard to access in performance. When struck with a small piece of jewelry or a coin, the percussive sound produced by the tuba can be very intense. Around the valves, the sound can produce a “dull” knock, and even with a small piece of jewelry or a coin, the knock can be “dull.” Percussion mallets generally will leave dents in horns, and might be avoided. If a composer discovers that a particular mallet will not dent a horn, then the mallet manufacturer and type can be indicated within the score. Within the repertoire, fingernails, finger tapping, knuckles, and the whole hand are generally what is called for to execute this technique. The composer will need to preface what portion of the fingernails that is needed to create the desired sound. Both the edge of the fingernail and the body of the fingernail create different timbres of a similar sound. The composer needs to preface which knuckle group should be used for the desired sound. Each knuckle group makes a different timbre when striking the horn. The knuckles located at

the base of the fingers, where the fingers are attached to the palm, create a darker and thicker sound. The middle knuckle group makes a higher pitch and aggressive sound, which is similar to knocking on a door. The knuckles located next to the fingernails produce a lighter and quieter sound. The use of the whole hand gives the technique either a thud or a slapping sound. The sound production will depend on if the hand stays on the instrument or if the hand is taken away after the impact. Small jewelry can be used for this technique, such as rings. The small metal object will not damage the horn if the player utilizes a lighter strike.

It is important to know that the performer will need to have long enough fingernails to do some of these techniques to create the needed sound concept. Fingernails should not be cut too short, and need to be slightly longer then the pad of the fingertip for an effective sound. The longer the fingernail, the better the percussive sound can be. If the performer has issues with weak fingernails, there are many over the counter treatments for strengthening fingernails. If the performer's knuckles or hand start to hurt, that may be a sign that the performer may be striking the horn too hard. Choreography may need to be practiced to ensure that the performer is in an effective and comfortable position to effectively produce any and all percussive elements asked for by a composer. Creating choreography for a performance may sound like a lot of work, but often will help in establishing muscle memory needed for performance. Writing the choreography within the score will help in cement the actions for an effective and consistent performance.

Mouthpiece Pops

Mouthpiece pops are a percussive technique that utilizes the palm of the hand striking the mouthpiece, and vibrating the column of air inside the horn. The technique involves creating a seal between the mouthpiece and the palm of the performers' hand. When the mouthpiece is struck in this manner, the resulting sound is low pop within the horn. Sometimes this technique can be referred to as hand pops. The notation for this technique can use the "X" head notation, and must be noted above the possible effect in the score as to what technique should be played.

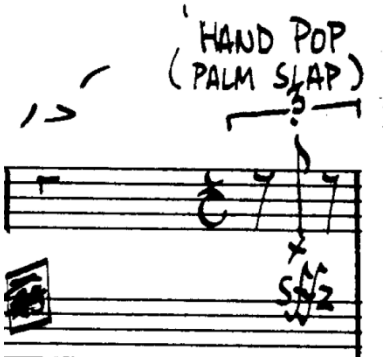

Figure 4.5 "X" head notation for mouthpiece pop from *Spirals*

To create this technique, the performer needs to ensure that the middle of the palm is taut like a drumhead. For the middle of the palm to be taut, the fingers can be pulled back slightly to create tension in the hand. When striking the mouthpiece, the tuba player may want to make the hand parallel with the rim of the mouthpiece for the easiest execution of this technique. Then move the forearm and the hand at the elbow, by striking the mouthpiece creating a seal between the taut palm of the hand and the

mouthpiece rim. Then after the strike, the hand can be pulled back to allow the sound to resonate. The performer should not strike the mouthpiece too hard, to ensure that the mouthpiece does not get jammed into the lead pipe. After striking the mouthpiece, the performer can turn the mouthpiece either counter clockwise or clockwise to make sure the mouthpiece is not jammed. If the mouthpiece does get stuck in the lead pipe, then the performer needs to take the horn to a professional instrumental repair technician to remove the mouthpiece.

Altered Tuba sounds

This section shows new possibilities of timbres capable on the tuba, and also features the modifications that can be done and the tuba.

Second End

Second end refers to the sound of the tuba being played out of another end. The sound of the tuba, when played, exits thought the bell. Second end utilizes the slides of the tuba or possibly other attached bells or slides to the tuba to become a “secondary” bell. This “secondary” bell then allows the timbre and pitch of the tuba to change, by shortening the bugle of the sounding “instrument.” This technique allows a single tuba to have multiple timbre possibilities during a performance. There are two possible variations for this technique. The first variation utilizes the slides within the instrument, where different slides may be pulled from the tuba before or during a performance to establish the second end. The second variation deals with attaching bells and slides from

other brass instruments to create different sounding second ends. When describing the technique within the score, the composer should notate which slides needs to be pulled and when to pull the slides. All tuba construction and slide placement is different, and on some horns, all slides are easily accessible by the left hand. With other tubas, certain slides cannot be pulled while playing due to placement in the horn or attached tuning attachments to certain slides. The composer possibly should notate alternatives to the technique that will be possible. By listing alternatives for this particular technique, the composers' piece will be more accessible to more performers. If the composer wants to utilize added bells, then a diagram needs to be included with the score. List all necessary items needed for the second end modifications; this diagram can help the performer replicate the wanted sounds and effects desired by the composer. Notation should be as clear as possible, listing what slides to pull and when within the score. Composers may need to know that some horns will create a popping sound as the slides are removed. Unvented horns will create this popping sound because of the release of air pressure within the slide, and vented horns may not create this popping sound.

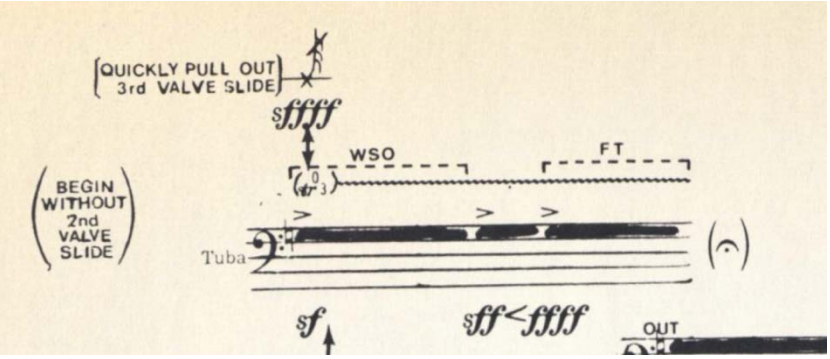

Figure 4.6 Second end with slides pulled out during performance from *Debussy Variations* by P. Kavanaugh

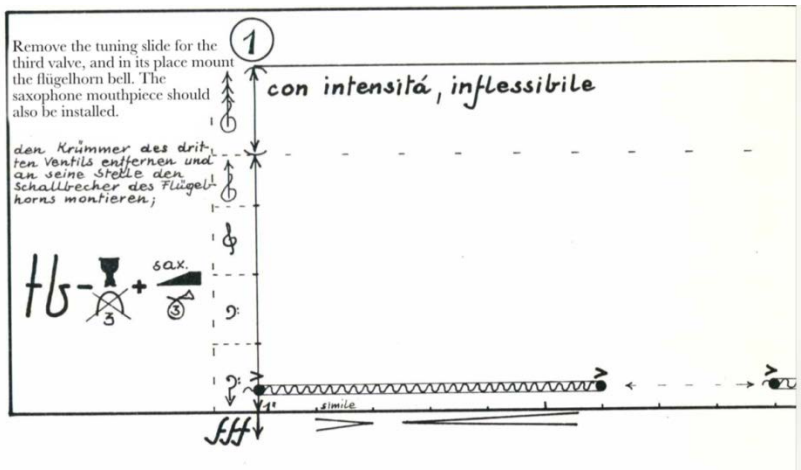

Figure 4.7 Modified second end with flugelhorn bell from *Pernikiana* by W. Szalonek[29]

The technique needed for this particular extended technique stems from building choreography around the horn and lip flexibility. Building choreography around the horn will involve having to practice the moving of one portion of the body while playing music. Playing any brass instruments involves elements of multitasking, and placing more tasks within a performance may be quite challenging. The performer possibly needs to practice every element needed for this technique to build enough muscle memory to free up the mind during a performance. Having the details of each movement that the performer's body will make during a performance will make this technique easier. The technique is about the coordination of left hand and arm while playing a phrase of music. The left hand and arm must move independently by pulling slides out, and placing slides on a designated slide holder or back into the horn. The slide holder needs to be clean, sturdy, and soft so that the slides cannot be dented or damaged when placed down. The slide holder can be adjustable so the performer can

[29] Translation of the score was provided by Aaron Hynds.

easily reach the slides thought the whole performance. A stand or a piano bench with a towel may work well for a slide holder, but stands can be precarious because of their intended articulation. Piano benches are sturdy, but they may be too low for an easy reach. The performer may need to use a specialized table for a sturdy and easily reachable slide holder.

The playing technique needed for the second end is knowing that the second end is much shorter than what a performer is used to. The performer will need to figure out what key the second end will be in to know what partials to use. Experimentation with the second end can help to make sure that the performer is not over blowing the shorter instrument. If the pitches notated by the composer cannot be made in the second end, using the slide as an extension can help. Placing one end of the slide back into the top end of the valve can give more length to the second end. The slide can be pushed all the way in, or even pulled back and forth like a trombone slide. The length of the slide can produce from a quarter tone pitch fluctuations up to a half step pitch fluctuation, which may aid in tuning the second end.

Different Mouthpieces

By changing the mouthpiece of the tuba, the timbre of the tuba can change but the fundamental pitch of the instrument will never change. The change in mouthpiece can be as small as changing to a different brand or a different size of mouthpiece. Changing from a bass tuba mouthpiece to a contrabass tuba mouthpiece can affect the

timbre of the instrument. The change in mouthpiece can even be across brass instruments, such as a euphonium, horn, or even a trumpet mouthpiece. When using a different brass instrument mouthpiece, the color and resonance of the horn changes drastically. As the mouthpiece decreases in size, the timbre becomes brighter, and the tuba can be played in different octaves because of the smaller available buzzing lip area within the mouthpiece. The euphonium and trombone mouthpiece will aid in putting the tuba up one octave and the trumpet and horn mouthpiece will aid in putting the tuba up two octaves. The pitch of the tuba will not be changed, but the smaller mouthpieces will help in playing higher because of the smaller available lip buzzing area. Each different brass mouthpiece will yield different color to the buzzed sound. The trumpet mouthpiece will be brighter than the horn mouthpiece. And depending on the makeup of the trombone and euphonium mouthpiece, the tone color will vary based on style and shape of the mouthpiece. For a completely different timbre family, a tuba can even use both double and single reed mouthpieces. The higher in pitch the reed or double reed mouthpiece is, such as an oboe, English horn, or clarinet mouthpiece, the thinner the texture of sound will be. Lower mouthpieces like bassoon, contrabassoon, and a bari sax mouthpiece can create a more rich sound texture.

Like any other technique that involves changing a part of the tuba, clear notation needs to be used by the composer. A page at the beginning of the score telling the performer what to do is good practice, and should be common place for any large modifying extending techniques. In the actual score, the composer needs to notate

where the change in mouthpiece takes place and what mouthpiece to use, and there needs to be time allowed for the change in equipment. For higher instrument mouthpieces, possibly use the sounding octave and staff. For the brass mouthpieces, chromatic pitches are possible due to the use of the lips to create the pitch. With the single and double reed mouthpieces, pitch will only change with the length of the tubing; that is, by using valves to change the length of the tube, the pitch will change proportional to the length of the engaged valve or valves.

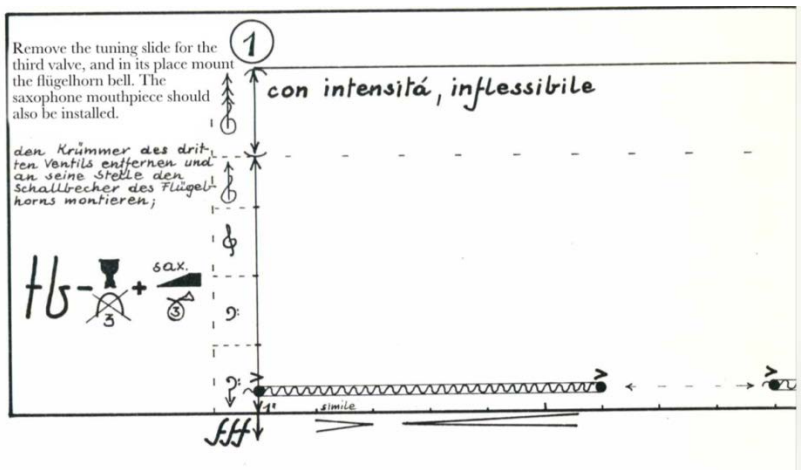

Figure 4.8 Bari sax mouthpiece notation from *Pernikiana*

When changing mouthpieces, the performer needs to make sure the new mouthpiece seals in or on the lead pipe, because the seal closes the vibrating tube of the instrument. With brass mouthpieces, the shank can be inserted into the lead pipe creating a seal between the mouthpiece and the horn. Cork can be added to the mouthpiece to help better the seal of the mouthpiece. For both euphonium and trombone mouthpieces, the seal usually happens at the base of the cup. For trumpet and horn mouthpieces, the seal happens at the top of the cup or even at the rim of the

mouthpiece. The buzz created by the player possibly should match the needed buzz for the mouthpieces instrument. Consult with other brass pedagogues for help with buzzing for the particular mouthpiece.

For the single reeds, some mouthpieces will fit right over the lead pipe, like a bari sax mouthpiece. Other single reed mouthpieces may require the performer to make a receiver for the lead piece and the mouthpiece. For the oboe and the english horn mouthpieces, the performer can fit the reed right into the lead pipe by adding more cork to the staple of the mouthpiece. For bassoon and contrabassoon reeds, the turban of the reed can be built with cork up to fit the performers' lead pipe. Specialized receivers can be built by the performer, but will most likely need the help of a local instrument repair technician or even an instrument manufacturer. The performer may want to consult local pedagogues for each respective wind instruments mouthpiece for help with proper playing technique.

Mouthpiece Sounds

This section deals with the mouthpiece as a musical instrument without the tuba.

Mouthpiece Alone

Mouthpiece alone utilizes the playing of the mouthpiece without the horn. Some performers utilize mouthpiece playing as part of their daily routine. For a piece of music, mouthpiece alone can thin out the texture of a piece, and give a new and interesting

sound concept to a composition. This technique involves removing the mouthpiece from the lead pipe and buzzing notes or gestures into the mouthpiece. Notation for this technique normally involves notation above the intended passage of music for mouthpiece alone. The "X" head notation, or different head notation, may also be utilized to show the wanted sound concept.

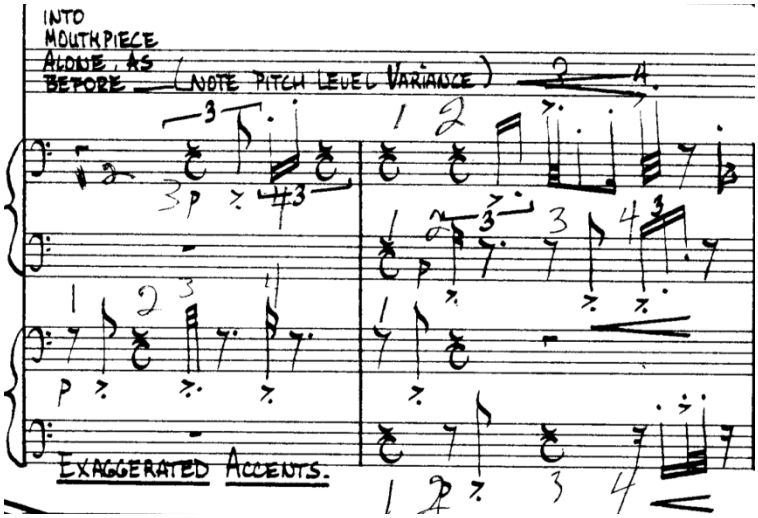

Figure 4.9 Mouthpiece alone "X" head or altered head notation from *Spirals*

Mouthpiece alone can be a standard technique for most tuba players. With this technique, mouthpiece playing becomes part of the performance practice. A performer may not need to change how the mouthpiece is played for a hall because the sound of a mouthpiece will carry within any hall. If a performer tries to "fill up" the hall with sound, the performer may overplay the mouthpiece and become lightheaded or even pass out. The aim of this technique is to create a new timbre and texture for the composition, and not to try and match the volume of the tuba.

Mouthpiece Whistle

This technique utilizes the mouthpiece alone to create a high pitched whistle. The mouthpiece needs to be removed from the horn, and a seal it to be made between the rim of the mouthpiece and the palm of the hand and the air stream is blown into the shank of the mouthpiece to create the whistle. This technique needs both hands to create the sound; one to seal the rim of the mouthpiece and one to hold the mouthpiece steady. Determinate pitch is possible for mouthpiece whistle but involves experimentation and practice by the performer. Composers will need to notate clearly within the score when the technique is used. Ample time should be given to the performer to set their tuba in a secure place, and establish the position of the hands and the mouthpiece. Both pitched notation and "X" head notation can be used to notate this technique. Pitched notation will show determinate pitches, and "X" head notation will show the use of indeterminate pitches.

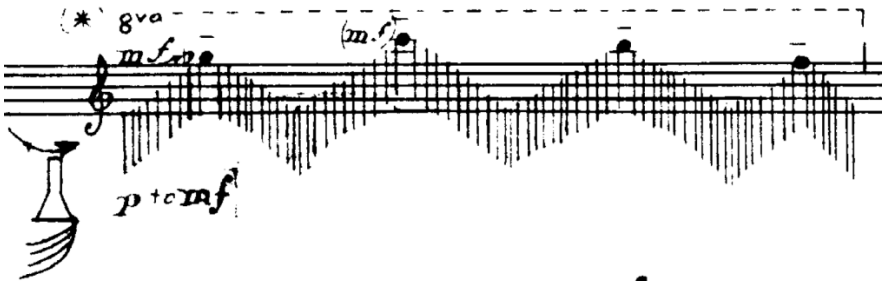

Figure 4.10 Mouthpiece whistle with notated pitches from *Beneath the Horizon III* by P. McLean

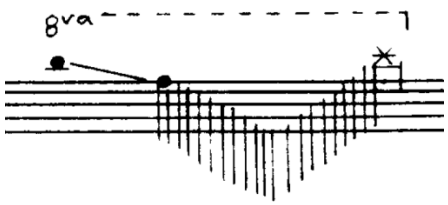

Figure 4.11 Indeterminate "X" head notation for mouthpiece whistle from *Beneath the Horizon III*

To learn how to create pitches with the mouthpiece whistle, the performer may want to work with drones or any other pitch sounding devices. By establishing the needed hand shape, the embouchure, and the needed air stream the performer can learn how to manipulate the pitch of the mouthpiece. Due to the need within the repertoire, a performer must learn to manipulate the pitch of the whistle. Manipulating the pitch of a mouthpiece whistle takes experimentation and practice. Tring to alter pitch in a fixed closed tube can be difficult. Each mouthpiece has a resonate tone, and will vibrate pitches within that harmonic structure. Outside of the harmonic structure, the performer will need to change the hand shape and the air stream. Due to the methods of mouthpiece manufacturing, every mouthpiece will have a different base harmonic, and mouthpieces that are the same size and model may slightly varying in the base harmonics for the mouthpiece.

New Sounds for Tuba

This section shows different sound worlds and sound-scapes capable with the tuba.

Sympathetic Vibrations

This technique is created when the sound of the tuba is picked up by other instruments, and the instruments respond by vibrating similar frequencies. Sympathetic vibrations happen easily with tuba because of the low frequencies and the large available overtones produced by the tuba, and almost every string or percussion instrument will vibrate sympathetically with the tuba. This technique can be used with almost any free vibrating instrument. As the performer plays, other instruments start to vibrate sympathetically with the sounding pitch and available overtones. For this technique to happen with a piano, the sostenuto pedal must be engaged or keys must be held down to release the dampers. As the performer plays, the strings of the piano will naturally vibrate with the sounding pitch and the available overtones will engage the corresponding strings within the piano. Harps can work for this technique as well, but multiple harps may be needed to make this technique effective for live performances. Drums, cymbals, and gongs work for this technique, but each percussion instrument will only vibrate with a select number pitches. So the composer needs to list what type of instruments, what size of the instruments, and how many of those instruments will be needed for the performance.

Notation of this technique will depend on what instruments will be used within the performance. The composer must list what instruments will be needed for the composition, and where the instruments will need to be located according to the performer, both on stage and within the hall. Consideration for how long instruments will be allowed to vibrate for the composition will need to be notated within the score. For sympathetic piano, the composer will need to indicate if the piano's sostenuto pedal needs to be held down for the entire piece or for a certain passage of music, or if the pianist should only depress the notated keys. All of these descriptive elements should be written on a separate page prior to the score, fully describing every element of the desired effect. Within the score, the composer needs to relate timing information for any change in the sympathetic vibrating instruments. For piano and tuba solo works, the composer will need to indicate clear pedaling for the sostenuto pedal or key depression.

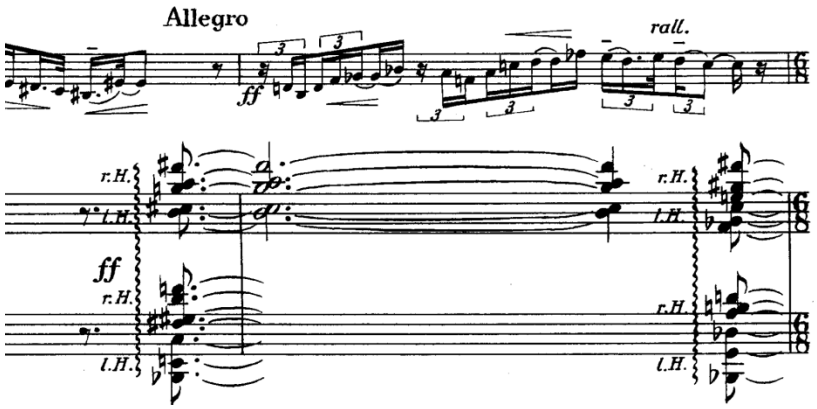

Figure 4.12 Notation for sympathetic vibrations from the *Sonate fur Basstuba und Klaiver* by P. Hindemith

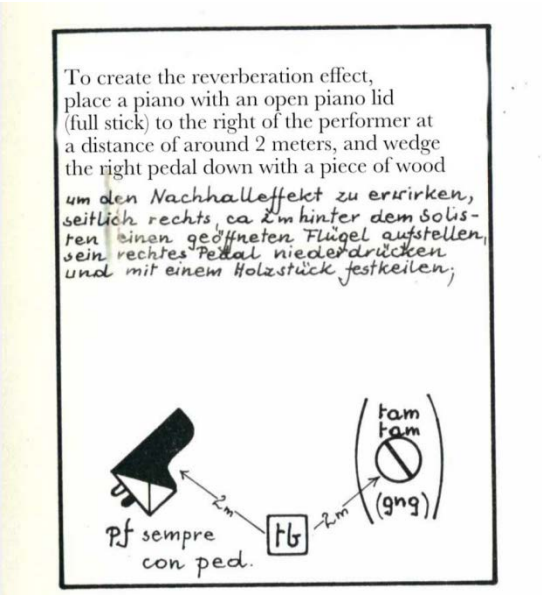

Figure 4.13 Notation for sympathetic vibration for piano and tam tam from *Pernikiana*

The pedagogy for this technique involves the performer experimenting with the instruments involved for the performance. By practicing around the instruments involved in creating the sympathetic vibration soundscape, the performer will become accustomed to the new sound. This sonic texture will depending on which instruments will be used in creating the sound scape. The performer possibly should know what to expect in performance to create a convincing sound world. Since the sound world is part of the composition as a whole, the technique can be influenced by the performers' own musical ideas by altering musical elements in performance. The performer can start to alter elements to create a deeper musical effect, allowing for a more convincing and effective performance.

Mutes

Mutes act as a high pass filter for brass instruments, altering the timbre of brass instruments by only allowing higher overtones to pass through the “filter” or mute. The repertoire has started to create a need for the manufacturing for better mutes and more types of mutes. Within the tuba community there is one mass manufactured mute, the straight mute. Some mute manufactures are creating and developing new mutes, but the consumption of these new mutes is slow. Schlipf mute manufacture in Austria is leading the charge in making new and high end mutes. More mute types need to be developed, because the tuba community has the least muted sounds available for the repertoire. Some performers are creating new mutes on their own, and creating new sound possibilities for the muted tuba sound. When writing for muted tuba, the composer needs to indicate what type of mute is wanted, possible mute material, when to put in the mute, and when to remove the mute. Because of the size of the mute, ample time is needed for mute changes.

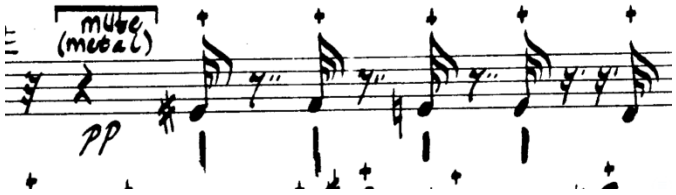

Figure 4.14 Tuba straight mute, metal mute from *Tuba Sontata* by C. E. Potter

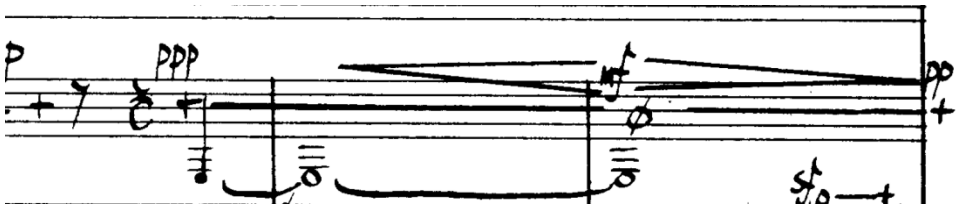

Figure 4.15 Drape mute notation (+-o) from *Spirals*

In the authors' experience, mute development for performance can be quite rewarding. For Copes' *Spirals,* the drape mute is called for. The drape mute was developed with a curtain, or a heavy or thick piece of fabric is used as a dampening surface for the sound of the tuba. The original directions for the composition called for the performer to lean the bell of the tuba into a hanging curtain. For the author's live performance, the curtain was attached to a metal rod so the performer could manipulate the mute without having to move the body or hang a curtain in the hall. The author also developed a stop mute for tuba by combining and modifying various objects to create a stopped sound. Mute development can be done by any performer. Experimentation and research is key in developing a final usable product.

Bowing of the Horn

This technique cannot be found within the tuba repertoire yet. Bowing of the tuba will be adapted from the Hill. Hill describes the sound of bowing of the bell as an ethereal ringing tone.[30] The tuba can be bowed in many places, but every tuba will create different sounds. The manufacturing of a tuba has a lot to do with what portions of the tuba will ring when bowed, or what portions of the tuba will not ring when

[30] Douglas Hill, *Extended Techniques for The Horn* (Eau Claire, WI: Really Good Music, 2010), 82.

bowed. To test the “ring- ability” of an area on a tuba, the performer can tap with a fingernail or a metallic object on that area lightly. If the area rings, then the same will be true for the bowing. When composing for this technique, the composer may note what type of bow might be used, and where to bow the instrument. A description on a separate page before the score will help to explain what the technique should involve. The composer may indicate when and where to bow the instrument by marking “arco” in the score. Bowing the tuba does produce pitch, but the pitch will vary from tuba to tuba. The pitch produced by the bowed sound will also depend on the type of bow used and the force of the bow. Harmonics are very easy to produce with this technique.

The use of bowing on the horn may result in the removal of lacquer. The performer and the composer should both be aware of this danger.

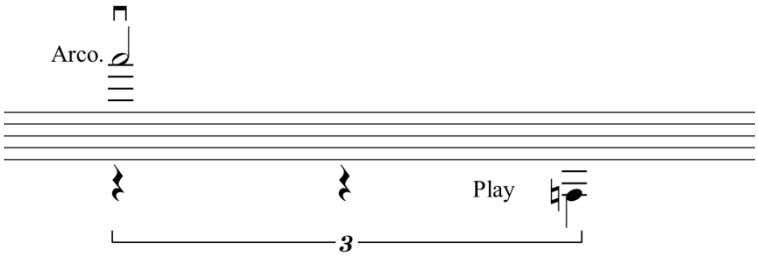

Figure 4.16 Bowing of the tuba from a made Sibelius example by S. Kennedy

The performer may need to experiment with this technique first to understand what portions of their horn will ring. Tuba makeup has a large impact on what portions will ring. Bowing the tuba gives a wide array of sounds, such as a bowed crotale-like sound by bowing of the smaller components of the horn to a deeper and more resonant

bell-like sound for the larger components of the horn. On some tubas, the bell rim rings and can produce harmonics, and may produce a bell-like or singing bowl timbre. On less resonant tubas, only the sound of the bow dragging across the bell may be produced. If the tuba has a bell wreath, the tuba may be difficult to go to vibrate, because the bell wreath deadens the ring of a bell due to the extra weight and less flexibility. The mouthpiece and the thumb ring may be able to vibrate the most on the horn, and may produce a higher pitched ring close to a crotale timbre. Harmonics may be hard to produce on these areas because too much force on the bow will cause the bow to slip or stop the vibration of the metal. Other areas of the tuba can be bowed as well, but can be awkward for the performer to reach during performances, such as the valving section and the main slide section of the horn. These areas may have some areas that can ring when bowed, and may produce a deep vibrating sound with the possible production of harmonics. The outside bows on a horn can ring as well, but may be difficult to make ring. The probability of these areas ringing in performance will be determined by the technique developed by the player.

Bow types do affect the ability and sound of the technique. Violin and viola bows work well at producing the fundamental of the bowed tone. Bass and cello bows work well at producing the harmonics of the bowed tone. Bass rosin may work well for this technique because this rosin is more sticky, allowing for a higher coefficient of friction. The performer can experiment with different rosins and bows to produce the desired sound. Bow hold will also affect the sound of the technique, and the performer should

consult string pedagogues for the proper bow hold technique. Percussion pedagogues can give very insightful advice on how to bow metal, and the possible variations of bow holds.

Since this technique is new, experimentation is the key to finding out the possibilities of pedagogy. This technique needs to be written for, so a larger group of performers can try this technique. The need for experimentation will allow the pedagogy and the technique of bowing the tuba to grow.

CHAPTER V

CONCLUSION

In most pedagogical circles, the need for mastery of standard technique is what drives the ideals of a teacher and student. The teacher must establish and demonstrate effective models in how to execute any technique at the highest level possible. Students then take those models and try to replicate or surpass the established standard. This ideal of building a model has long been overlooked for extended technique within the modern era. The goal of this document was to establish a base pedagogical ideal for extended technique for tuba. The base idea for any technique is always to start with experimentation. After the base for any technique is established, then expansion of pedagogical ideas can take place by students, performers, and pedagogues. This document starts the discussion of experimentation for establishing a base for extended technique.

Further Research

Further research for this topic now involves experimentation on each pedagogical model by the author and other tuba players. This experimentation will lead to new models and ideas that can expand the pedagogy for extended techniques. With these models, an etude and method book can be created geared towards teaching extended techniques in an accessible manner to college-aged students. Another etude and method book can be created for high school and even younger students if a

demand is established. Models can then be established for single pieces if needed, such as *Encounters II* and *Post Praeludium per Donna,* making these pieces easier to teach and learn within the tuba community.

Further research needs to be done on some of the surveyed pieces with specialized extended techniques. These pieces contain extended techniques that only appear in that single piece and are vaguely described. Possibly, the composer of the piece should be contacted to further assist in describing the wanted sound concept. If the composer has died, then performers that premiered the piece should be contacted about the wanted sound concept. If both of these individuals are deceased, then source recordings of the premier may offer primary accounts of the wanted sound concepts for these specialized extended techniques. Then a document with all of this updated information should be published.

The enclosed databases need to be expanded to include all pieces for solo tuba and tuba and electronics available for purchase by all publishers. Then more databases can be created to show available extended techniques within pieces for tuba and chamber ensembles, tuba in large ensembles, and tuba and piano. New extended techniques should then be researched and experimented by the author and other tuba players. Then the new techniques can be added to a later and expanded version of this document.

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APPENDIX A

DATABASE OF SOLO TUBA WORKS

This appendix contains works from the tuba alone repertoire from circa 1960 to 2006. Each piece was reviewed for its use and notation of extended techniques. The database is arranged by composers last name, and lists the title of the work, the publisher, the language, and what extended techniques occur within the piece. More information can be obtained about each piece from the Morris/Perantoni.

Alder, Samuel

Canto VII

Boosey and Hawkes, English

Finger nail tap, key/valve clicking, foot stomps, consonant voiced air, flutter tongue, gliss,

Antoniou,Theodore

6 Likes for solo tuba

Barenreiter- Verlag, English/German

Multiphonics, Gliss, Flutter Tongue, Quarter tones, Quarter Tone fluxuation, Wind Pattern, Finger tapping, Valve Clicking, Fluxuating Intonation

Arakaki, Renee

Trinity

Media Press, English

Gliss, Flutter Tongue

Baadsvik, Øystein

Fnugg

Ovation, English

Multiphonics, Lip Beats (percussive lip sound)

Ballif, Claude

Solfeggietto #7

Durand, French

Multiphonics, Valved half-valve, quarter tones, Vowel Voicing, (Staging)

Bamert, Matthias

Incon- Sequenza

G. Schirmer, Inc., English

Multiphonics, gliss, finger nail tapping, mouthpiece hitting, singing into horn, speaking into mouthpiece, kissing sound, jew harp sound (timbre lip trill), percussion usage

Baxley, Wayne

Tuba McDifficult

Clark- Baxley, English

Multiphonics

Beatles/ Holmgaard, Lars

Blackbird

Handwritten (None), English

Multiphonics, Gliss

Beauregard, Cherry

Suite for Tuba

Held by Composer, English

Tremelo

Ben-Aaron, Charles

Always Move Towards the Hoop and Go Strong

Handwritten (None), English

Multiphonics, Gliss, Harmonics (air support fade)

Blank, Allen

Three for Barton

Associated Music Publishers, English

Multiphonics, Quarter tones, Gliss, Rhythmic air sounds, flutter air sound, flutter tongue, Tonged air

Blatter, Alfred

Cameos

Media Press, English

Multiphonics, fluter tongue, scream, gliss

Brooks, Mark

Concertpiece

Held by Composer, English

Pitch Bend

Cage, John

Solo for Tubas in F and Bb, Pages 109-120 from the score of the Concerto for Piano and Orchestra

Henmar Press Inc., English

Finger clicking, Flutter tongue, Dicated vibrato, Harmonic Gliss, Shouting into horn, Barking into horn, Mouthpiece Alone, Quarter tone bends, Split valve open, Graphic Notation, Valved Halfi-Valved, Scoops, Multipul tonguing

Cardoso, Lindenbergue

2 Miniaturas

Funarte, Spanish

Gliss

Chamberlin, Robert

Elegy

Held by Composer, English

Multiphonics, Gliss, Half-Valve, Quarter Tone, Pitch Bend, Sing into horn, Rip, Whisper into horn, Growl, Timbral Trill, Varied Vibrato, Sympatric Vibrations (piano)

Colding-Jorgensen, Henrik

Boast

Samfundet Til Udgivelse af Dansk Musik, English/Norwegian

Gliss

Creuze, Roland

Eria

Gerard Billaudot, French

Flutter Tongue, Varie Vibrato

Dalbavie, Marc- Andre

Petit Interlude

Gerard Billaudot, French

Ditated Trills

Dobrowolski, Andrzej

Musik für solo tuba

Edition Modern Munchen, German

Half-Valve, Multiphonics, Chirping Sound, Growl, Eletronic Sound, Toneless/Blast, Gliss, Improvasation, Mutes (Cone mute, Bowl mute), Open Close mute changes

Dutton, Brent

Theme Varie

Held by Composer, English

Multiphonics

Dutton, Brent

Polis

Held by Composer, English

Motorcycle sounds, Mute, Multiphonics, Gliss, Breath sounds, Orgasm breath

Emmerson, Simon

Variations for Solo tuba

Arts Lab Music Publisher, English

Multiphonics, Gliss, Quarter Tone Gliss, Tonged Air, Mouthpiece playing

Feiler, Christian

Fünf Schritte

Verlag Neue Musik, German

Gliss

Fennelly, Brian

Tesserae IV

Held by Composer, English

Gliss, Sung into horn, Tonged air, Staging, Multiphonics, Mouthpiece hitting

Frackenpohl, Arthur

Sonata for Solo Tuba

Tuba Press, English

Gliss

Frackenpohl, Arthur

Tuba Tunes

Kendor Music, English

Foot Stomp, Leg Slap, Key Clicking/Fingernail tapping, Timber Trill (Alt. Finger Trill), Gliss

Fulkerson, James

Patterns III

Media Press, English

Doppler Effect (Staging), Hissing Wind Pattern, Whistle into mouthpiece, Tongue Click, Unvoiced Tonged Air, Mouthpiece hitting, Multiphonics, Timber Trill, Vowel Fluxuation, Flutter Tongue, Gliss

Geissler, Siegfried

Studie V für Tuba

Verlag Neue Musik, German

Flutter Tongue, Multiphonics

Globokar, Vinko

Echanges

Litolff/ Editions Peters, German

Gliss, Flutter tongue, Different mouthpiece (steel/sheet metal), Double Reed, Plastic Pipes/Different metal pipes (inserts), Single Rees mouthpiece, Plunger Mute (open/close), Second end, Different mute types

Grant, James

Three Furies

Grantwood Music Press, English

Half-Valve Flutter, Rip, Half-Valve Gliss, Half-Valve Scoop

Gregson, Edward

Alarum

Intrada Music Publishing, English

Gliss, Flutter Tongue

Gruner, Joachim

Solo für Tuba

Verlag Neue Musik, German

Multiphonics, Gliss (dictated shape)

Ha, Jea Eun

Three Abstracts for Tuba

Neil A. Kjos Music Co., English

Flutter Tongue, Pitch Bending, Violent Exhale into horn, Key Clicking, Gliss

Hanks, Paul

Solo No. 1 for Tuba; Three Short Pieces

Tomorrow Brass Series, English

Flutter Tongue, Half-Valve Gliss

Hartley, Walter

Music for Solo Tuba

MCMLXXIV, English

Lip Gliss, Valved Gliss, Flutter Tongue

Heider, Werner

September

Moeck Verlag, English/German

Gliss, Flutter Tongue, Multiphonics

Hilprecht, Uwe

Vier Haltungen zu einem alten Theme

Verlag Neue Musik, German

Gliss, Flutter Tongue, Quarter Tones

Hoag, Charles

Tuba Play

Held by Composer, English

Percussion while playing

Holden, Derek

Samsara, Alma Nox

Potenza Music, English

Flutter tounge, Rip

Kagel, Mauriaio

Mirum

Universal Edition, Englsih/ Latin

Articulated Air, Audible Intake, Staging, Spoke Text

Katzenbeier, Hubert

Drei Spielstücke für solo tuba

Verlag Neue Musik, German

Multiphonics

Kavanaugh, Patrick

Debussy Variations No. 14

Pembroke Music Co., English

Second End, Slide Popping, Breath Sounds, Mouthpiece pop, Flutter tongue, Half-Valved, Free Buzzing, Multiphonics, Stopped tubes, Out of horn singing

Kraft, William

Encounters II

Editions BIM, English

Multiphonics, Gliss, Half-Valve, Flutter Tongue

Krush, Jay

I will Speak Briefly on…

Held by Composer, English

Spoken Text, Staging, Spoke Word into tuba, Fingernail tapping on tuba, Consonance voiced air, Gliss

Lang, István

Aria di Coloratuba

Editio Musica, English/ Italian

Tongue Tremolo, Flutter Tongue, Varied Vibrati, Tongue Click, Multiphonics

Leitermeyer, Fritz

Tubissimo

Ludwig Doblinger, German

Gliss

Lipp, Charles

Three Magritte

Media Press, English

Multiphonics, Flutter Tongue

Manneke, Daniël

Gesti

Donemus, English

Gliss, Dictated Gliss, Varied Vibrati

Mannino, Franco

Tre Impressioni Seriali

Edizioni Curci, Italian

Multiphonics, Flutter Tongue, Gliss

Mitsuoka, I

Whales

Musical Evergreen MCLXXVI, English

Unnotated, multiple possibilities, Grapic Notation

Müller-Weinberg, Achim

Vier Kapitel für Tuba solo

Verlag Neue Musik, German

Wind patteren (inhale and exhale) into horn, Finger nail tapping on horn, Fultter tongue

Nelson, Gary

Verdigris

Held by Composer, English

Spoken Text, Singing, Tapping on mute

Osmon, Leroy

Concert Etudes

Southern Music Company, English

Rip, Valved Gliss

Penderecki, Krzysztof

Capriccio

B. Schott's Sohne, German

Gliss

Penn, William

Three Essays for Solo tuba

Seesaw Music Corporation, English

Gliss, Trill, Vocal Sounds, Second End, Singing into horn, Multiphonics

Persichetti, Vincent

Parable XXII

Elkan- Vogel, Inc., English/ Italian

Lip Gliss, Valved Gliss

Poore, Melvyn

Vox Superius

Arts Lab Music Publisher, English

Multiphonics, Singing to horn, Timbral Trill, Vowel Manipulation, Spoken Word into horn, Flutter tongue

Poore, Melvyn

Variations

Edition HH Ltd, English/German

Dynamic Choices, Tempo Modulations, Sung pitches throught horn, Articulation choices

Potter, C. E.

Tuba Sonata

Held by Composer, English

Mute Technique (Open and close)

Powell, Morgan

Midnight Realities

Brass Music Ltd, English

Air through horn, Valve Clicking, Singing into horn, Multiphonics, Gliss

Ptaszyńska, Marta

Two Poems

Polskie Wydawnictwo Muzyczne, Polish/English/German

Flutter Tongue, Multiphonics, Gliss, Vowel Manipulation, Voiced Constance Articulations, Gliss, Quarter tone gliss, Speaking into Instrument, Whistle out of horn

Reck, David

Five Studies for Tuba Alone

Editions Peters, English

Gliss, Multiphonics, Flutter tongue

Rozen, Jay

In the 90%

Held by Composer, English

Multiphonics, Quartertones

Schlünz, Annette

Ach, Es…

Bote and Bock, German

Flutter Tongue, Wind Pattern, Air Gliss, Gliss, Key Clicking, Key Clicking with Air sounds

Silverman, Faye-Ellen

Zigzags

Seesaw Music Corporation, English

Gliss, Flutter tongue, Multiphonics

Slavicky, Milan

Echos

Editions BIM, English/Italian/French

Futter tongue, Trilled Gliss line

Stevens, John

Remembrance

Editions BIM, English

Flutter Tongue, Multiphonics, Gliss

Stevens, John

Salve Venere, Salve Marte

Editions BIM, English

Gliss

Stevens, John

Suite No. 1

Manduca Music Pub., English

Rip, Fall

Stevens, Thomas

Encore: Boz

Wimbledon Music Inc., English

Gliss, Fall, Foot stomp, Both Feet stomp, Flutter tongue, Quarter Tones, Improvisation

Stockhausen, Karl

In Freundschaft

Held by Composer, English/German

Gliss, Flutter Tongue, Valved Half-Valve, Half-Valve, Staging

Szalonek, Witold

Piernikiana

PWM Edition, Polish/German

Consonance sounds, Trills, Finger Clicking, Trupmet Slides, Trupmet Bells, Flugel horn bell, Trombone Bell, Second End, Pressure Roll on horn with body, Color Trill, Sax mouthpiece, Sympathetic Vibration, Acting

Szentpali, Roland

Caprice No. 1

Editions BIM, English

Gliss

Szentpali, Roland

Caprice No. 3

Editions BIM, English

Gliss

Terzakis, Dimitri

Stixis III

Musikverlag Hans Gerig, English/German

Gliss, Quarter Tones

Tisne, Antoine

Monodie III

Gerard Billaudot, French

Flutter tongue, Wispering sounds, Multiphonics, Quarter tone vibrato (above and below)

Vazzana, Anthony

Self Portraits

Tuba Press, English

Gliss

Warren, Frank

Tuba Music Op. 13

Held by Composer, English

Gliss

Warren, Frank

Leeann

Seesaw Music Corporation, English

Multiphonics, Valved half-valve, Trill, Wind Sound

Wefelmeyer, Bernd

Sieben durch Acht

Verlag Neue Musik, English/German

Gliss, Shake

Wilder, Alec

Convalescence Suite

Margun Music Inc., English

Growl, Flare (Valved Gliss)

Wiley, Frank

Caverns

Ludwig Music, English

Flutter Tongue, Vowel Manipulation, Fall, Multiphonics, Gliss, Flutter Pedal notes (Fingered bugle/use of tongue to create "note")

Wilhelm, Rolf

5 Etüden

Trio Musik Edition, English/German

Gliss

Wilson, Richard

Civilization and its Discontents

Southern Music Company, English

Flutter tongue, Trill, Mute

Zerbe, Hannes

Gamma

Verlag Neue Musik, German

Gliss

Ziffrin, Marilyn

4 Pieces for Tuba

Held by Composer, English

Flutter, Gliss, Alt. Fingers for sequential notes

APPENDIX B

DATABASE OF TUBA AND ELECTRONICS

This appendix contains works from the tuba and electronics repertoire from circa 1960 to 2006. Each piece was reviewed for its use and notation of extended techniques. The database is arranged by composers last name, and lists the title of the work, electronic medium, the publisher, the language, and what extended techniques occur within the piece. More information can be obtained about each piece from the Morris/Perantoni.

Alexander, Joe

Infamy…

Tuba, Electroacoustic tape

Held by Composer, English

Flutter Tongue, Mouthpiece Pops

Ayers, Jesse

Dancing King

Tuba, CD

Tuba-Euphonium Press, English

Rips

Bales, W. Kenton

Collage 3

Tuba, Live Process (Mic, Phase Shifter, "Fuzz Box," or solo

Held by Composer, English

Trill

Biggs, John

Invention for tuba and Tape

Tuba, Tape

Consort Press, English

Trill

Bottje, Will Gay

Triangles for Brass and Tape

Trump/ Cornet, Tuba, Tape

Held by Composer, English

Mute

Brown, Anthony

Interim for Tuba and Slides

Tuba, Slides, not included

Seesaw Music Corp., English

Percussive sounds, Valved flutter, Pressure roll on instrument, Air Sounds, Growl, Key Clicking, Vocal Sounds, Finger nails on horn, Singing, Blowing air into mouthpiece but not into horn

Cope, David

Spirals

Tuba/ tuba consort, CD/ made by performer

Seesaw Music Corp., English

Pitch Bend, Drape Mute, Growling, Cuivre (Pushed brass sound), Mouthpiece alone, Flutter tongue, Mouthpiece pop, Fingernail clicks, valve flutter gliss, Spraking out of the horn, Air sounds

Corwell, Neal

Simyeh

Euph, CD

Held by Composer, English

Gliss, lip gliss

Corwell, Neal

2 a.m.

Brass, CD

Held by Composer, English

Muted

Corwell, Neal

Quiet Mountain

Trombone, Tuba, CD

Held by Composer, English

Gliss, Muted, Pitch Bend

Corwell, Neal

New England Reveries

Tuba, CD

Held by Composer, English

Corwell, Neal

Ritual

Euph/Tuba, CD

Held by Composer, English

Trill, Gliss, Flutter tongue

Corwell, Neal

Night Song

Euph, CD

Held by Composer, English

Trill

Corwell, Neal

Distant Images

Trombone, euph, CD

Held by Composer, English

Gliss, Mute, Pludger mute

Corwell, Neal

Aboriginal Voices

Tuba, CD

Held by Composer, English

Muiltiphonics, Windsounds, Clicks, Fall, Flutter Tongue, Valved Gliss

Cresswell, Lyell

Drones IV

Tuba, High Pitched Drone

Arts Lab Music Publishing, English

Notated vibrato, Singing into horn, Shouting, Mute, Quarter tones, Moving pitch, Gliss, Whistling, Immitation of sound, Trill, Flutter tongue, Growl

DeMars, James

Tapestry III

Tuba, Tape

Tos Music Productions, English

Fall, Gliss

Dutton, Brent

Sub-Terrestrial Sounds

Tuba, CD/ made by performer

Seesaw Music Corp., English

Rip, Singing into horn, Multiphonics

Ernst, David

Coludes

Tuba, Tape

Manuscript Publications, English

Vowle shape change, Notated Vibrato, Gliss, Flutter tongue, Trill, Multiphonics

Fulkerson, James

For Morty Feldman, II

Tuba, CD/ made by performer

Donemus, English

Flutter Tongue, Multiphonics, Vocal sounds, Glissandi, Whitle Tone, Wind sounds, Percusive sounds, Graphic Notation

Harvey, Jonathan

Still

Tuba, Live processed, reverb,

Faber Music Ltd, English

None

Hiller, Lejaaren

Malta

Tuba, Tape

Theodore Presser Co., English

Quarter Tones, Trill, Quarter tone trills, Gliss, Mute

Jacobs, Kenneth

The Children of the Hermit and Their Mountain Handiwork

Tuba, Tape

Seesaw Music Corp., English

Trill

Lazarof, Henri

Cadence VI

Tuba, Tape

Bote and Bock, English

Muiltiphonics, Mute

McLean, Priscilla

Beneath the Horizon III

Tuba, Tape

Held by Composer, English

Gliss, Quarter tones, Non played flutter tongue, Fingernail tapping, Mouthpiece whistle, Multiphonics, Mute, Flutter tongue, Howl, Vocal sounds in horn, Play to sing, Trill, Valved Gliss

Melby, John

Passages

Tuba, Tape

Held by Composer, English

Dictated Trill, Mute

Nono, Luigi

Post-prae-ludium per Donau

Tuba, Live Processed, Delay, Independanly Panned sounds, Low Pass Filter

Casa Ricordi, English, Italian, German

Singing into the horn, Mulitphonics, Tremelo, Circular Breathing

Ott, Joseph

Timbres for Brass Quintet

Brass Quintet, Tape

Claude Benny Press, English

Mute, Improv, Registal notated improv

Ott, Joseph

7 22 73

Tuba Quartet, Tape

Claude Benny Press, English

Trill, Air Sounds,Half-Vlaved, Gliss

Ott, Joseph

Bart's Piece

Tuba, Tape

Claude Benny Press, English

Indeterminent Pitches, Flutter Tongue, Valved Half-Valve, Gliss

Ott, Joseph

Concerto for Tuba and Eletronics

Tuba, Tape

Claude Benny Press, English

Flutter Tongue, Fall, Indeterminent Pitches, Half-Valve, Gliss, Slap tongue

Ott, Joseph

Music for Tuba

Tuba/ tuba consort, Tape/made by performer

Claude Benny Press, English

Gliss, Alternative fingerings (color trill), Lip trill, Trill, Tremelo, Pitch Bend, Falls, Key Clicking, Ineterminent Pitches

Raum, Elizabeth

Nation

Tuba, CD

Held by Composer, English

Falls, Multiphonics, Vibrato

Raum, Elizabeth

Secret

Tuba, CD

Held by Composer, English

Fall, Gliss

Rodgers, Lloyd

New Ground in D

Tuba and Ele or Tuba and Mixed Brass, Pianos, and Harps, Mixed Tape Delay

Tomorrow Brass Series, English

Multiphoncs

Rollin, Robert

The Raven and the First Men

Tuba, Horn, and Piano, Tape

Seesaw Music Corp., English

Trill

Ross, Walter

Midnight Variations

Tuba, Tape

Tomorrow Brass Series, English

Syllabic sounds, Valved Half-Valved, Speech/Vocal sounds in tuba, Multiphonics, Bugle Gliss, Trill

Ross, Walter

Piltdown Fragments

Tuba, Tape

Held by Composer, English

Dictated Trill, Half-Valve, Singing into the horn, Consonace into the horn, Flutter tongue, Gliss, Notated Gliss

Scott, Andy

Going Down

Tuba, CD

Astute Music, English

Singing into the horn, Gliss

Souster, Tim

Heavy Reductions

Tuba, Tape

Arts Lab Music Publishing, English

Acting, Trill

Winsor, Phil

Asleep in the Deep

Tuba/ tuba consort, Tape/made by performer

Pembroke Music Co., English

Gliss, Trill, Valved Half-valved, All half-valved, Vocal sounds, Talking, Key Clicks, Blats, "Random Noise," Improv, Notated Vibrato, Falls, Multiphonics, Unsable sound- upper partials

Witkin, Beatrice

Breath and Sounds for tuba and tape

Tuba, Tape

Belwin-Mills Publishing Comp., English

Wind sounds, Articulated air (unpitched), Consonance sounds, Pitched air

Wyatt, Scott

Lifepoints for tuba and Percussion and tape

Tuba and Percussion, CD

Media Press, English

Dictated Trill

Wyatt, Scott

Three for One

Tuba, Tape

Held by Composer, English

Trill, Flutter tongue

APENDIX C

IPA TRANSCRIPTIONS

These transcriptions and examples are taken from the *Linguistics: An Introduction to Language and Communication,* 6th edition by Adrian Akmajin, Richard A. Demers, Ann K. Farmer, and Robert M. Harhish. Some of the transcriptions are created by the author. The IPA symbols are listed by the order the symbol first appears in the document. Page numbers will be listed for each usage of the IPA symbol.

IPA Symbol	Sound production location	English word usage	Page Number(s)
[a]	Tense low vowel	New England pronunciation of *Car* /k**a**ɹ/	12, 17, 20
[oʊ]	Tense mid back vowel	*Solo* /s**oʊ**l**oʊ**/	12, 17, 20, 30
[b]	Bilabial plosive consonant	*Blouse* /**b**laʊs/	13
[f]	Labiodental fricative consonant	*Fox* /**f**aks/	13, 18
[m]	Bilabial nasal consonant	*My* /**m**aɪ/	13
[p]	Bilabial plosive consonant	*Put* /**p**ʊt/	13
[v]	Labiodental fricative consonant	*Vein* /**v**en/	13, 18
[w]	Voiced labial-velar approximant	*Wish* /**w**ɪʃ/	13
[ʍ]	Voiceless labial-velar fricative	*Witch* /**ʍ**ɪtʃ/	13
[aʊ]	Tense low back vowel	*Blouse* /bl**aʊ**s/	17
[ɔ]	Lax low back vowel	*Caught* /k**ɔ**t/	17, 20
[ɑ]	Lax low back vowel	*Hot* /h**ɑ**t/	17, 20
[ə]	Reduced mid back vowel	*Sofa* /sof**ə**/	17, 20
[ɪ]	Lax high front vowel	*Wish* /w**ɪ**ʃ/	17, 21

[ɛ]	Lax mid front vowel	*Get* /g**ɛ**t/	17, 21
[ɨ]	Reduced high back vowel	*Ken* /k**ɨ**n/	17, 21
[ʊ]	Lax high back vowel	*Put* /p**ʊ**t/	17, 21, 42
[ʌ]	Lax mid back vowel	*Putt* /p**ʌ**t/	17, 21
[d]	Alveolar/post alveolar plosive consonant	*Dog* /d**ɑ**g/	18
[l]	Alveolar/post alveolar lateral approximant consonant	*Luck* /l**ʌ**k/	18
[t]	Dental/alveolar plosive consonant	*Toe* /**t**oʊ/	18, 24
[ð]	Dental fricative consonant	*This* /**ð**ɪs/	18
[ɵ]	Dental fricative consonant	*Three* /**ɵ**ɹi/	18
[g]	Velar plosive consonant	*Get* /**g**ɛt/	18
[k]	Velar plosive consonant	*Caught* /**k**ɔt/	18
[ɹ]	Alveolar/post alveolar approximant consonant	*Three* /ɵ**ɹ**i/	18
[h]	Glottal fricative consonant	*Hot* /**h**ɑt/	18
[s]	Alveolar fricative consonant	*Solo* /**s**oʊloʊ/	18, 21
[z]	Alveolar fricative consonant	*Zoo* /**z**u/	18
[ʒ]	Post alveolar consonant	*Measure* /mɛ**ʒ**ər/	18
[r]	Alveolar/post alveolar trill consonant	*Measure* /mɛʒə**r**/	18, 23
[ʀ]	Uvular trill consonant	No English equitant	18, 27
[o]	Tense mid back vowel	*Sofa* /s**o**fə/	20, 42
[ɒ]	Lax low back vowel	*Not* /n**ɒ**t/	20
[æ]	Lax mid front vowel	*Ash* /**æ**ʃ/	20
[aɪ]	Tense low back vowel	*My* /m**aɪ**/	20, 21
[i]	Tense high front vowel	*Three* /ɵɹ**i**/	21

[ɢ]	Uvular plosive consonant	No English equitant	27
[χ]	Uvular fricative consonant	*Loch* /la**χ**/	27
[!]	(Post)alveolar click	No English equitant	30
[Θ]	Bilabial click	No English equitant	31
[q]	Uvular plosive consonant	*Cut* /**q**ʌt/	31