

# **The History and Development of the Tuba.**

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## **Introduction**

The 19<sup>th</sup> century was a period of innovation, invention, and creativity. Many composers were interested in experimenting with the treatment of melodic material, tonality, and form, but also demonstrated an interest into creating new sounds and expanding the symphonic orchestra. Among these interests was the desire to invent a durable and mechanically sound bass within the family of brass instruments. From these intentions, the tuba was born, along with its close relative, the euphonium. The tuba's growth into the modern day was truly an evolutionary process. However, there is a clear explanation as to why the tuba has survived and is currently thriving today while its predecessors are only seen in museums. By including it in their landmark compositions major composers paved the way for the future growth of the tuba and contributed greatly to its notoriety.

All wind instruments can be classified as aerophones; however, brass instruments are not classified together based upon the material out of which they are manufactured. Brass instruments are grouped together because their sound is produced by vibrating the lips within a mouthpiece (Phillips 1) and this vibration is caused by blowing air through the lips. From there, brass instruments can be classified in two ways. Cylindrical instruments maintain a constant bore through a majority of the body of the instrument with a slight flare to the mouthpiece and a large flare to the bell. Examples of cylindrical bore instruments are the trumpet and trombone, known for their bright and brilliant tone. Conical-bored instruments have a more gradual taper throughout the instrument, typically with a more cylindrical tubing in the valve section. Examples of this are the cornet, flugel horn, horn, euphonium, and tuba.

## **The Serpent**

The earliest predecessors of brass instruments were conch shells, ram's horns, and wood pipes and were used for distant communication, during battle, and during various ceremonies. However, the true ancestry of the tuba can be traced back to the end of the 16<sup>th</sup> century with the invention of the serpent. The serpent was invented around 1590 by Edme Guillaume of Auxerre, and an early notable player of the serpent was Michael Tornatoris around 1602 (Bate/Sadie 143). The serpent can be defined as “a lip energized wind instrument with side holes and a cup-shaped mouthpiece, sometimes called the bass of the cornet family” (Bate/Sadie 140). It is made of

conical tubes of wood, typically walnut, and is covered in leather. These wooden tubes were coiled in order to have the tone holes accessible to the fingers. Later, keys were added in order to facilitate technique. The mouthpiece was a shallow cup, and was typically made of ivory. The serpent began with six holes, and expanded to fourteen holes, later including the mechanism of keys.

During its lifetime, the serpent could be found in five forms and was referred to with a wide variety of other names the most notable of which is the bass horn. The “Russian Bassoon” is constructed with a wooden body and had a brass bell in the shape of a dragon’s head. While it is definitely not a double reed instrument like the bassoon, its name may have been derivative of its similar shape to the bassoon. The “military serpent” of French origin was made of wood and sometimes constructed in the shape of a saxophone or a tuba. A later model, the Italian “cimbasso” had a long crook with a wooden body and a metal bell. This instrument later developed into the valved bass trombone and contrabass trombone called upon in Verdi’s music, and will be discussed in greater length later in this paper. The French serpent makers Forveille and Frichot were known for experimenting with upright serpents by creating serpents made of part wood and metal. Around 1790-1820 they added a metal bell made of brass or copper. In fact, in 1793 a ‘bass horn’ was patented by Frichot. These instruments were in a “V” rather than a “U” shape, and marketed upon the widely used term “bass horn” (Baines 199). Lastly, the English “bass horn” was made largely of metal, and was in the shape of a “V” (Bevan 83).

The serpent was intended to reinforce the bass in plainchant and for this reason it quickly spread to church music. It originated in France, and was later brought to England. In 1771, Englishman C. Burney reported widespread use of the serpent in cathedral choirs in France. In 1795, the Paris Conservatory was chartered with the intention of having two full time serpent teachers on the faculty. In spite of this, the serpent was relatively unknown in Germany until the middle of the 18<sup>th</sup> century. It was around this time that the serpent also began to come into use in German and English military bands. It remained in use in these ensembles until it was later replaced by the valved brass instruments. It was often considered the bass of the cornet family and referred to as the ‘basse di cornett.’ It is worth noting that the serpent was called for in Wagner’s *Reinzi*, but was eventually replaced by the tuba. Harvey Phillips speculates that the reason the serpent did not become a full-fledged member of the symphony orchestra is because it

was fairly soft-spoken and lacked a wide range of dynamic capabilities (Phillips 2). Hector Berlioz was highly critical of the serpent for what he considered to be poor sound and mechanics. It is also speculated that upon the invention of keys for the serpent, players believed it to be a cure for intonation woes, while it was not. Hence, less sensitive musicians were playing the serpent and the instrument fell out of favor of the composers and critics of the time (Bate/Sadie 145).

### **The Ophicleide**

Perhaps the closest immediate predecessor of the tuba is the ophicleide. The name ophicleide is derivative of two Greek words, “ophis,” which means serpent, and “kleid,” which means that which serves for closing. It was invented in 1817 in Paris by Jean Hilaire Aste, commonly known as Halary. It is said that Halary was inspired to invent the ophicleide following a British military review in which he saw an example of John Distin’s keyed bugle (Bate/Sadie 499). Its invention was at a time when serpent manufacturers were experimenting with the integration of metal and wood. This instrument was the first instrument treated like the tuba, a bass to the trombone family as well as an independent instrument. Its first appearance was in 1819 in Paris, within the stage band for Spontini’s *Olimpie*. The ophicleide is made of brass, and resembles a large metal bassoon. It uses tone holes to manipulate the pitch with padded key mechanisms to close them. Its “U” shape was the result of the influence of the serpent, while its use of metal was influenced by the English bass horn. The mouthpiece was quite similar to the serpent, made of ivory, cup shaped, and similar in size to that of a modern euphonium. It was first made with seven keys and two were added by Halary in 1822. Later models were made with nine to twelve keys, eleven being the most common. By modern standards, the ophicleide sounds like a euphonium and bassoon hybrid and can be closely matched by lightly playing a small tuba pitched in F. It was designed to replace the serpent with a fuller sound and improved intonation, although it is no match for modern brass instruments.

At the top end of the family of ophicleide instruments was the seldom-used alto ophicleide. It was known for its piercing clarity much like the E flat clarinet, and was quite unpopular. Its attacks and releases as well as its intonation were suspect, and it was quickly replaced by the clavicor and alto horn (Bevan 140). The most common of its type, the bass

ophicleide, was pitched in C and in B flat with C being the most common. The crook added to lower the pitch to B flat often added intonation problems such that musicians would often play a C instrument and transpose when asked to play B flat parts (Baines 200). The contrabass ophicleide or “ophicleide monster” extended beyond the lower range of the bass ophicleide but was rarely used due to the large amount of wind demanded to play the instrument.

Soon after its conception, the ophicleide it came into wide use in France, England, Italy, Spain, and even the United States. Eventually, the ophicleide could be found in orchestras, opera orchestras, light orchestras, military wind bands, and even British brass bands. For example, in 1860 in Great Britain at the Crystal Palace Brass Band Contest, a total of 133 ophicleides were present, along with 155 tubas in E flat, and 2 tubas in BB flat (Bevan 157). Although the ophicleide was common to military bands, it was rarely found in civilian wind bands. It was at the Paris Opera that the ophicleide was first scored for in 1819. Spontini’s *Olimpie* calls for four horns, eight trumpets, three trombones, and one ophicleide. Meyerbeer’s *Robert le diable* (1831) includes the ophicleide and through a majority of the score it doubles the third trombone part. In the orchestra of the Paris Opera the ophicleide remained until 1874, and in other parts of France, the instrument was in use until 1885. Its prominence was not limited to the stage as it was given significant parts in n non-operatic works by major composers, including Mendelssohn’s Overture to a *Midsummer Night’s Dream* (1827), Berlioz’s *Symphony Fantastique* (1830) and early Wagner operas such as *Rienzi* (1840).

The ophicleide commonly replaced the serpent in 19<sup>th</sup> century churches and even appeared in some solo literature of the time. While the French and the Spanish shared similar conceptions about the ophicleide’s use in churches, England and the United States treated the instrument slightly differently in this context. Within England and the United States, it was not uncommon for the instrument to be seen side by side with serpents as well as tubas. This combination was not well received by all, as Fetis was quoted to say that serpents, ophicleides, and Russian Bassoons ought not be in the same section due to their divergent timbres (Bevan 162). Solo works were often published for bassoon or ophicleide, or euphonium and ophicleide. It is the opinion of Bevan that composers demonstrated very little knowledge of the instrument’s strengths and weaknesses in this medium (Bevan 163). The famous musician Joseph Caussin,

to whom Berlioz affectionately referred as the only man in Paris who could play the ophicleide, also wrote an instructional method for the instrument.

While the ophicleide was popular in France and England, this was not the case in Germany. According to Bevan, in 1827 the ophicleide was rarely used in Germany, and even in up to 1843 it was not seen in the major orchestral centers of the country (Bevan 153). However, its rarity in Germany was not because the instrument was unheard of. Bevan provides numerous citations of the ophicleide in the journal published by the well-known Schott Company, titled Caecilia. These appearances in 1827, 1828, and 1829, more than a decade after the instrument was first conceived in France. Even then, ophicleides found in Germany were more likely to be equipped with valves than keys despite the opinion amongst many scholars that instruments with the key mechanism had a better tone (Bevan 213). Although Wagner first called upon the ophicleide for his opera *Rienzi*, it should be stated that this opera was written with the intention to be performed at the Paris Opera (Bevan 303). It seems as if the serpent family remained as the bass wind voice in Germany until the tuba came into prominence. While the tuba came into use fairly quickly in regions under German, Austrian, and Russian influence, many parts of France, England, and Spain remained loyal to the ophicleide until later decades of the 19<sup>th</sup> century.

Although it may seem that the ophicleide was welcomed almost instantly with open arms, this was not always the case. It provided a more powerful voice for the bass of the brass instruments, but it generally not well received by music critics of the time. At the forefront of their criticism was a perceived inability for the instrument to play with great sound, intonation, technique, and dynamic sensitivity. In fact, composers rarely voice the ophicleide below the dynamic of forte (Bevan 158). One of the instrument's chief critics was of course Hector Berlioz. In his treatise on instrumentation Berlioz outlined many of his opinions on the ophicleide. Berlioz believed that the ophicleide did not blend well enough to be used regularly as the independent lowest part, but should regularly be doubled at the octave. He considered it to be excellent for sustaining the lowest part of massed harmonies with an agile upper register but problematic in the lower register. Furthermore, he did not care for the tone in the lower register. However, Berlioz said that, "in certain cases, under a mass of brass instruments, it works miracles." Staccato articulations were considered impractical in the more brisk tempos. Some of his thoughts on its treatment in rapid phrases are as follows,

“Nothing is more clumsy-I could almost say, more monstrous-nothing less appropriate in combination with the rest of the orchestra than those more or less rapid passages played as solos in the medium range of the ophicleide in certain modern operas. They are like an escaped bull jumping around in a drawing-room” (Berlioz/Strauss 337).

Berlioz also believed that “the highest notes are of a ferocious character which has not yet been utilized appropriately.” He goes on to say that he does not believe the instrument should be used without the cover of other instruments (Berlioz/Strauss 337). In perhaps the biggest blow to the very reasons the ophicleide was introduced, Berlioz states his opinion that in the middle register the tone of the ophicleide is of little difference to the serpent (Bevan 157). One underlying fact in all of this is that the ophicleide’s widely conical bore created no wind resistance. Therefore, the ophicleide required a large amount of air to sustain a tone. Berlioz concluded that the instrument’s lack of use resulted from the huge amount of breath required to play it (Bevan 142).

One may conclude for various reasons that the ophicleide was not necessarily given a fair chance by its critics. They were highly critical of the ophicleide’s tone, technical capabilities, and poor workmanship that went into building them. However, it was an instrument thrust into the public arena very quickly after its invention. The instrument originally was produced with seven keys in 1817. In 1819 it was first introduced publicly at the Paris Opera. However, it was not until 1822 that its inventor Halary added two more keys. Even with nine keys at that point, its innovation was not complete, as the instrument later was most commonly produced with eleven keys. In 1843, the famous ophicleide player Joseph Caussin added a key himself in order to produce the low F sharp with clarity. On this addition Berlioz states that,

“formerly it (low F sharp) could only be produced only very imperfectly with the lips and left much to be desired in regards to intonation and steadiness...It now sounds like all the other notes” (Berlioz/Strauss 337).

This shows that even after the invention of the instrument that would eventually replace it, the bass tuba, improvements were being made to the ophicleide. Another factor which may have turned public opinion against the ophicleide was the lack of musicians who could play it properly. According to Bevan,

“There is no doubt that some adverse comments resulted from those who heard ophicleides being overblown, resulting in a particularly unpleasant, hard, bloated sound” (Bevan 158).

Fair or not, when the tuba gained the grace of the influential composers of the day, it slowly replaced the ophicleide, and the critics had their way.

## **The Valve**

The old cliché “necessity is the mother of invention” certainly holds true with brass instruments at the beginning of the 19<sup>th</sup> century. What was needed was a reliable way to achieve the chromatic pitches between the partials within the overtone series with pleasant tone and consistent intonation. Until the 19<sup>th</sup> century, brass instruments such as the horn and trumpet had a limited means to change pitch. This included the addition of crooks to place the instrument into different overtone series as well as vent holes, keys, and hand stopping to alter chromatic pitches. All of these methods were problematic in terms of tone and intonation and cumbersome in terms of technique. The solution was first invented by Heinrich Stozel in 1815: the valve. Stozel, who was thirty-eight at the time was a horn player in the orchestra of Prince von Pless of Prussia. This invention was advertised in 1815 in the Allgemeine musikalische Zeitung, which said, “He has laid this invention before the King of Prussia and now awaits a favorable outcome” (Baines 207). Stozel placed two valves on his horn, one to lower the pitch a whole step, and one to lower the pitch a half step, and first performed on it in concert in 1817. In 1818 he took out patent in Berlin along with Fredrich Bluhmel for a square spring operated piston valve. In the early years there seemed to be a dispute as to who the true inventor of the valve was although scholars seem to give Stozel more credit for this invention.

Shortly after the invention of the valve, other instrument makers, including Stozel, quickly began to experiment and improve upon its design. Thus, the square Stozel valve was soon modified into a round valve by two Parisian companies, Halary and Labbay (Philips 3). In 1827, Stozel devised a way to create a shorter valve with a wider diameter. This new type of piston valve was called the “Berlin-Pumpen Valve.” This new mechanism was very influential on future instrument makers, including Leopold Uhlmann of Vienna, who used this to create the Vienna Valve mechanism on double horns. This mechanism came into use on horns up until about World War II. The other main 19<sup>th</sup> century innovation to the valve was the invention of the rotary valve. The invention of the rotary valve is generally credited to Joseph Riedl of Vienna in 1832. This valve came with adjustable crooks, much like modern rotary valves

(Phillips 3). However, there is some question as to if the rotary valve is in fact a European invention. Nathan Adams (1783-1864) of Milford, New Hampshire is said to have applied the rotary valve to a horn in the Massachusetts Navy Yard as early as 1824. This instrument contains an inscription with the name of the inventor, and the date. Regardless of their inventor, the major brass instrument makers of the major centers of innovation, including Berlin, Potsdam, Paris, Prague, and Vienna, created instruments with valves influenced by one of these two major types.

### **William Weiprecht**

During the 1820's, many instrument makers worked to apply these new valves on low brass instruments, but even with the introduction of the Berlin-Pumpen valve, success was not instant. The problem lay in the difficulty of applying small bored valves into large bored instruments. Many were interested into taking on this challenge, perhaps none as influential as William Weiprecht. Weiprecht was a key figure in the evolution of brass instruments of the time and was a leader of Prussian military bands. At the age of twenty-two he moved to Berlin where he convinced military authorities to allow him to completely reorganize all of their military bands (Bevan 206). However, he still remained a civilian which was quite unusual for the time. Never the less, his success must have relied on him having a military like personality. Berlioz recalls in the memoirs,

“The worthy man positively cracked my ribs, interspersing his interpolations with Teutonic oaths besides which Guhr's (what Bevan refers to as the likelihood to curse for Prussia at any international competition) were Ave Marias” (Berlioz/Cairns 340).

A major way in which Weiprecht influenced the instrument makers of the time is through including parts for their instruments in his compositions. In 1828, Stozel created several bass chromatic brass instruments for which Weiprecht wrote parts in his marches. Phillips refers to these instruments as being prototypes for the bass tuba (Phillips 4). Although certainly a monumental step, the flurry of innovation that seemed to surround Weiprecht would not end here.

### **The Invention of the Tuba (Weiprecht and Moritz)**

This whirlpool of activity led to the invention of the one musical instrument for which we know a specific birth date, the bass tuba. On September 12, 1835, William Weiprecht and Berlin instrument maker Johann Moritz took out a Prussian patent for the first valved brass instrument called the tuba. The instrument was pitched in F and was twelve feet long, much like the F tubas used today. It contained five Berlin-Pumpen valves, two controlled with the left hand and three with the right hand. Four days later on September 16, 1835 this invention was mentioned in the Allgemeine Preussische Staats-Zeitung. Shortly following these events, Weiprecht successfully advocated the inclusion of two bass tubas into each of the Prussia military bands, and the newly invented instrument quickly spread all over regions under the German and Austrian influence (Bevan 207).

### **Adolphe Sax**

While 1835 was certainly a key moment in the development of the tuba, the innovation did not slow down at that point. A key factor in understanding its development is to realize that it was an evolutionary process that did not necessarily unfold in a linear fashion. Exhibitions, fairs, and contests for military contracts were taking place annually, if not more often. Therefore manufacturers were frequently witnessing the developments of their counterparts, and in many cases copying their competitor's inventions and claiming them as their own. Along these lines we introduce the legendary instrument maker, Adolphe Sax (1814-1894). Sax moved from Brussels to Paris in 1842 in order to escape his debts. It was his intention to set up shop in Paris and invent an integrated family of brass instruments generically dubbed "Saxhorns." In 1845 he patented these instruments as his own invention, an act that led to much controversy. Shortly thereafter, he won French military contracts which angered his competitors. These instruments were clearly influenced by German valved bugles, and yet Sax erroneously claimed the invention to be his own. In fact, his competitors complained that his "inventions" could be seen hanging up in any German maker's front shop (Baines 255). Through litigation these manufactures were able to put Sax in financial ruin, but they did not destroy his name.

While Adolphe Sax was considered outlandish to claim to be the inventor of these valved brass instruments, his influence on their development is undeniable. His creations were imitated

immediately, even by his competitors (Baines 255). A major contribution of Sax was his ability to codify his inventions into a true family of valved brass instruments. Of particular interest to tubas and euphoniums are five instruments at the lower end of this family. First was his E flat alto horn, which was referred to as the althorn in the east. Today this instrument is commonly called the English tenor horn, used primarily in brass bands. Next was his B flat baryton, which was called the tenorhorn in the east. This mirrors Carl Moritz's 1838 invention of the tenor tuba, which will be discussed later. This instrument is close to what we refer to today as the baritone. Next is the baryton's close cousin the B flat basse, which is called the baritone in the east. This instrument bears similarity to Herr Sommer's 1843 invention, the euphonium which will be discussed later. After the B flat Basse was the E flat contrebasse, Sax's version of the bass tuba. This instrument was simply called the bass in the east. Last is Sax's version of the contrabass tuba, the B flat contrabasse. In the east, this instrument was referred to as the contrabass. These instruments were equipped with an upright bell, and upright piston valves. The valves had a lug and groove system for alignment, an improvement over the fixed pin system previously in use. Sax arranged the valves and tubing much more neatly, and most importantly the overall workmanship on the instruments was a large step above anything that had yet to be created.

To what degree history credits Adolphe Sax towards the development of brass instruments is unclear. Harvey Phillips refers to Sax as "perhaps the most important individual in correlating developments of various European instruments" (Phillips 7). Through yearly international exhibitions, ideas were passed around, leaving the lineage of these developments in question. Never the less, Baines believes Sax's influence was the heaviest in England, France, and the United States (Baines 260). His popularity in Great Britain can be traced to the Distin family of brass virtuosos. Distin's use of Sax's family of instruments is credited for sparking the amateur brass band movement in this Great Britain. In fact, until about 1857 Distin franchised and marketed these instruments under the name "Saxhorns." Upon their contract ending in 1857, Distin referred to the horns in their catalogue under different names, greatly affecting the terminology under which these instruments were known as in England. Bell-front horns were called flugel or chromatic horns, while bell-up horns were called the tuba or euphonium (Bate/Sadie 348). Lastly, Bates is able to offer perhaps the most concise summary of Sax's influence in the following quote,

“The evidence suggests that Sax’s claims were extravagant, even arrogant, but against this must be set his achievement in bringing order to a class of instruments which was developing elsewhere in a hopelessly irregular manner. The standards of workmanship he introduced were beyond reproach and, throughout his life, he seems to have been genuinely obsessed with the concept of consistency of tone quality” (Bates/Sadie 351).

## **Vaclav Cervený**

In 1842, at about the same time that Sax was setting up shop in Paris, another key figure in the evolution of brass instruments came onto the scene, Vaclav Cervený. The Bohemian Cervený worked in a location that was a center of brass innovation, which is now about sixty miles east of Prague in The Czech Republic. While he may not have been surrounded by as much controversy as his French counterpart, it is clear that Cervený had as much influence on the manufacturing and design of low brass instruments in Eastern Europe as Sax had in Western Europe. The Cervený firm became one of the most influential forces in instrument design not only in the 19<sup>th</sup> century, but well into the 20<sup>th</sup> century. Interestingly enough, Phillips states that Moritz’s tuba patented in 1835 may not have been the first.

“In 1834 Cervený invented a contrabass tuba in BB flat and CC. The shape of the instrument was in upright form (to rest on the lap of the player) or in circular form (to be held on the shoulder and referred to as a helicon)” (Phillips 7).

One area in which many instrument makers were challenged and Cervený excelled was with the use of a wide conical bore on a valved low brass instrument. His innovative bore was such that less tubing was necessary to achieve a lower fundamental with a full and mellow sound. He was also known for innovative rotary valve design. His contrabass tuba in BB flat and CC was invented in 1845, an instrument which he claimed was a prototype to all others (Baines 261). These horns typically were equipped with rotor valves that were on the front of the horn. In that same year he built a helicon which was adapted by Russian bands. In fact, Cervený was the sole supplier of these instruments to Russia up until some time in the 1880’s (Bevan/Sadie 880). Three years later in 1848 Cervený built a large bore helicon in BB flat, an instrument very influential to bands especially in the United States and Germany. The Cervený firm expanded into Kiev in 1867, later into New York City, and it is still around today. In the 1880’s Cervený further codified his design of large-bore low brass instruments with his “Kaiser” line of tubas and euphoniums. Like much of Europe, the Russian Revolution brought about many changes to

the Cervený Company, however they continue to be a link to the golden age of instrument design.

Before and after the tuba, many valved bass brass instruments were being created of many shapes and sizes. Harvey Phillips states that,

“by the mid 19<sup>th</sup> century the proliferation of bass wind instruments was of such great variety that some confusion of terms and nomenclature has existed to this present time” (Phillips 5).

In fact, Bevan finds mention of no less than seven of these instruments in Berlioz’s memoirs: the ophicleide, the bass in B, the contrabass in F or E flat, the bombardon in F, the German bass tuba, the old wooden serpent, and the Russian Bassoon (Bevan (1<sup>st</sup> ed.) 90). This matter so clouded that scholars like Bevan have spent a significant percentage of their writings attempting to bring light onto this confusing identification of instruments. Perhaps the most common confusion in terminology in effect today is between the euphonium and the baritone. One of the largest misunderstandings surrounding the euphonium is that the euphonium and the baritone are in fact two separate yet closely related instruments. The baritone is a brass instrument with three valves which is smaller in size and has a narrower cylindrical bore. Subsequently, it has a brighter sound than the euphonium. The euphonium is typically larger than the baritone, conical, equipped with four valves, and has a more mellow and dark sound. This misconception is mostly found in the United States. Part of the reason is that instrument manufactures have marketed similar horns while using the names baritone and euphonium interchangeably. Clifford Bevan cites that this use of the terminology may have taken root in the language of 19<sup>th</sup> century German immigrants, who translated the term euphonium to “baryton” (Bevan/Sadie 417). Even today, there is no international standard for the labeling of the instruments.

## **The Euphonium**

The birth of the modern euphonium can be traced to 1838 in Berlin where Carl Moritz built the first tenor tuba. This instrument was pitched in B Flat with four valves, two in each hand. However, the tenor tuba was replaced in 1843 with the invention of the euphonium. The word “euphonium” is from the Greek language and is translated to meaning “sweet-voiced.” This instrument was invented by Herr Sommer from Weimar, Germany for whom no records indicate his first name. Sommer’s invention was said to have had a wider bore than its

predecessor, and to resemble the size of a modern baritone. The euphonium had first appeared in programs in 1849, where Sommer was listed as a euphonium and “sommerphone” soloist. Clifford Bevan believes the instrument performed by Sommer was a euphonium, and that this may have been an unsuccessful attempt to preserve his name. However, no information has been found about Sommer following 1851 (Bevan 226). The modern euphonium is pitched in B Flat, and on rare occasion is pitched on C or A. It is written in concert pitch in the bass clef and frequently is transposed up a major 9<sup>th</sup> and written in the treble clef. The euphonium comes in three to five valves, and most commonly is produced with four.

### **The Compensating System**

Following Sommer’s invention, many manufacturers began to create their own line of euphoniums, including Adolphe Sax, Vaclav Cerveny, and Gustav Besson. As mentioned earlier, Sax had developed his B flat Baryton and B flat Basse, which mirrors the modern baritone and euphonium, respectively. In 1848, Cerveny had produced his “Baroxyton” which had become the first bass in all of the Russian infantry bands (Bevan/Sadie 417). His 1853 model of this instrument was the first to have the bell front design, which was very influential in Eastern Europe. His later “Kaiser” models appeared in the 1880’s with the more widely conical bore that Cerveny was known for. A major issue that was to be dealt with was the intonation problems of the euphonium. When all four valves are depressed, the result is the pitch being rather sharp. In addition to that, the musician cannot play the entire octave between the fundamental and second partial with four standard valves. The solution of adding extra tubing to “compensate” for the more noticeable errors was first introduced by Gustav Besson in 1853. This was first accomplished through use of an invention by Besson called a “barillet.” The barillet was a trigger which when activated would open up the necessary tubing to play in tune. In 1856-57 Besson first introduced a compensation system through the fourth valve. Perhaps the most common compensating system in euphoniums today was introduced in 1874 by David Blaikley (Bevan 198). At this time Blaikley introduced a compensating system through the valves that uses conventional fingerings. This system can be employed for horns with both three and four valves. The extra tubing is activated when the last valve is depressed. This enables the musician not only to play much more in tune, but when played on an instrument with four

valves, the musician can play the entire octave between the fundamental and second partial. These improvements are still seen on most professional euphoniums today.

### **The Wagner Tuba**

Many composers were interested in the innovation that dominated the brass world in the 19<sup>th</sup> century, especially Richard Wagner. His imagination brought about the “Wagner Tuben” commonly referred to today as Wagner tubas. These instruments were created because of Wagner’s intention to bridge the gap between the horns and the trombones. Since it was frequent practice for Wagner to score for quartets of wind instruments in his compositions, he employed two tenor Wagner Tubas in B flat which were nine feet long, and two bass Wagner Tubas in F which were twelve feet long. These horns were oval in shape and were equipped with four valves controlled by the left hand. These instruments are typically played by horn players, as the fifth and seventh part will play the tenor Wagner tuba, and the sixth and eighth part will play the bass Wagner tuba. They are known for having a wider conical bore and a darker sound than the horn, as well as somewhat incisive of an attack and difficult intonation.

The idea of adding this extra section of Wagner Tubas first came to Richard Wagner in 1853. At the time he was working on sketches of *Das Rheingold*, which was finished in 1854. In October of 1853 Wagner visited Paris, where he met the legendary instrument maker Adolphe Sax. Following that visit, it is likely that the Wagner Tubas in use by Wagner were saxhorns with an adapted horn mouthpiece. In a September 1865 letter to King Ludwig, Wagner describes these new instruments which he desired to use in *The Ring*. He goes on to talk about these instruments that he says were invented and introduced to him by Adolphe Sax. The problem Wagner was having is that he was unable to find them or reasonable substitutes in any Vienna or Munich military band. Also in 1865, Wagner had yet to conceive the idea of having these instruments played with an actual horn mouthpiece. Baines suggests that this idea first came from Richter, a horn player on Wagner’s staff. The first time the Wagner tuba had been used in that capacity was an 1869 performance of *The Ring*. The origin of the instruments used at this performance is unknown. Although Wagner may have contacted the instrument maker Alexander about this new tone color as early as 1862, he ordered a set of these instruments from Carl Mortiz of Berlin in 1867. These instruments were not delivered until 1877, and they were

considered to be more like tubas than horns by Wagner (Bevan 461). To the contrary, Baines believes that the Wagner Tubas used at an 1875-76 Bayreuth premiere of *The Ring* were instruments made by Moritz. Although those origins may be unknown, today's symphony orchestras are more likely to own a Wagner Tuba than an individual musician. The instrument did not end up as popular as Wagner may have wished, as the notable composers besides Wagner to score for it on occasion were Bruckner, Stravinsky, and Strauss.

### **The Bombardon**

A lesser-known predecessor of the tuba is the bombardon. There seems to be no consistent understanding about this instrument as it is known under several different names and its title was frequently used on several different instruments. That being said, the term bombardon comes from Italy, and is best labeled as a generic title to describe a small predecessor of the tuba (Philips 5). Bevan states that the name may have survived beyond the life of the instrument in order to be used as a point of reference when describing the tuba, and that the term bombardon typically brings about connotations of band instruments. (Bevan 207) A frequent explanation describes the bombardon as a valved bass brass instrument between the sizes of the ophicleide and bass tuba. Berlioz described it in his orchestration treatise as, "a kind of bombardon whose mechanism has been improved by Herr Weiprecht" (Berlioz/Strauss 339). In other words, he is saying that the bombardon came first. The tuba was first equipped with Berlin-Pumpen valves, which was regarded as an improvement over the bombardon's valves. Also, the tuba usually came with four to five valves, while the bombardon usually had three. Johann Riedl of Vienna contributed to the confusion over the nomenclature when he created a bass valved ophicleide under the name bombardon in the 1820's. In 1833, he took out a patent for this instrument (Bevan 207). Weiprecht and Cerveny also marketed instruments under the name bombardon, although it is believed that they were known to have made their tubas first. Despite this, the bombardon was regarded as being an inferior instrument to the tuba, and thus was quickly made obsolete.

## **The Helicon**

The helicon is a tuba designed to rest on the shoulder, much like the modern sousaphone. However, rather than the bell being placed straight forward it is at an angle close to 45 degrees. Its origins are likely with the Cerveny firm in the middle to late 19<sup>th</sup> century, and the instrument has enjoyed great tradition and popularity in Eastern Europe. It was designed to be played by mounted cavalry so one hand was free to control the reins. The helicon also enjoyed popularity in the origins of the band tradition in the United States. John Phillips Sousa wanted to avoid the directional quality of the helicon, and requested that an instrument be designed with the bell pointed completely upward. These instruments were first made by the J.W. Pepper Company in 1893 and manufactured by the Conn Company in 1898. They were dubbed “Rain Catchers” and diminished the overall popularity of the helicon in the United States. In 1908, Conn began to make helicons with the bell completely forward, and named them after the great Sousa. There is of course some irony that Sousaphones bear his name since they provide the directional sound that he was attempting to avoid. Never the less, by World War I helicon manufacturing in the United States had disappeared, and remained only in areas where it was most popular in Eastern Europe.

## **The Cimbasso**

A few of the tuba’s close relatives were able to come to fruition in their country of origin, but their use did not spread vastly beyond their home country. First, the cimbasso was first known in Italy around 1815. It first appeared in Paganini’s First Violin Concerto in (1815-16). It evolved from an instrument that resembled a serpent, in a time when any low brass instrument could be known under that name in Italy. With the 1815 invention of the valve, the Italians and Spaniards took an interest into applying it to the trombone. Thus the cimbasso became known as a valved bass or contrabass trombone. It was prominent in the scores of Verdi, who desired to have a fourth voice to complete the sound of the trombone section, but not disrupt its sound.

## **The French C Tuba**

The French C Tuba is another close cousin of the tuba which has had more longevity than many other instruments of its kind. It is pitched in C, one step above the modern euphonium.

While it may seem a bit of an oxymoron that it is named a tuba and pitched higher than a euphonium, some of its repertoire is still performed by tuba players today. One notable example is the Bydlo solo from Maurice Ravel's orchestration of Modest Mussorgsky's *Pictures at an Exhibition*. The pitch of the French C Tuba is a reason why many French composers of its time had chosen to score it in what would be considered the tuba's upper register. It has six valves, the first four follow that of conventional valves today, the fifth lowers the pitch by a semitone, and the sixth lowers the pitch by a perfect fifth. Its weight, size, and amount of tubing made the horn somewhat cumbersome to hold. By modern standards the horn also was known for being stuffy to blow through. While its bright and lightweight tone did not blend very well with the rest of the brass section, this was not necessarily a deterrent for French composers of the time. Since many impressionist composers of the time generally desired to have numerous colors in their arsenal, the French C Tuba had a place in French music. This could be a reason why it was commonly used in French orchestras through 1960.

### **The Vienna F Tuba**

The Vienna Philharmonic is regarded to have a unique sound, possibly due to the instruments being used by its musicians, most notable the Vienna horn. The instrument known as the Viennese Concert Tuba was created by Leopold Uhlmann in 1836, a tuba in F with five rotary valves. Daniel Fuchs later added a sixth valve in the 1870's. This instrument had three valves played on each hand, and was known for having some challenging fingerings. Bevan speculates, "Just how distinctive the timbre of this instrument actually is may be arguable: the player could contribute a major role" (Bevan 324). A case in point may be told through the well-known conductor Fritz Reiner. Reiner had completed a conducting tour in Vienna in 1956, and upon arriving back to conduct the Chicago Symphony, had requested that some of its musicians perform on those instruments. Thus, Reiner requested that the legendary tubist and pedagogue Arnold Jacobs perform on a Viennese Concert Tuba. Jacobs had trouble with the instrument's fingerings and believed it to be poorly made. In fact, a bass player in the orchestra Jim Palacek had dubbed the instrument the "bass accordion" (Bevan 324). Never the less Jacobs used the instrument to record Tchaikovsky's Sixth Symphony. Then, when Jacobs realized that Reiner's eyesight was failing Jacobs then switched back to his famous Yorkbrunner tuba.

## The Influence of Hector Berlioz

With all of this activity, one may wonder how the tuba came to be the most prominent instrument of its kind today. Bevan states that during this period of transition, there was not much of a homogeneous sound in the low wind section, which could consist of serpents, bombardons, bass horns, Russian Bassoons, ophicleides, and tubas. A simple answer can be seen through the major composers advocating the tuba by placing it in their compositions. Despite the German origin of the tuba, one of its biggest and perhaps earliest advocates was a Frenchman, Hector Berlioz. Berlioz went to Germany on an extended conducting tour at about the same time that the bass tuba was being discovered, in 1843. During this tour he was disappointed that the bands did not have an ophicleide, but was quite pleased with the discovery of this new instrument.

“I was offered as a substitute a bass tuba a magnificent instrument of which I shall be speaking in connection with the military bands of Berlin” (Bevan 208).

“The bass tuba, which I have mentioned several times in previous letters, has completely dislodged the ophicleide in Prussia, if indeed the latter was ever prevalent there, which I doubt” (Berlioz/Cairnes 335).

These encounters influenced Berlioz to write for the tuba instead of the ophicleide, and in 1846 he first called for the bass tuba in *The Damnation of Faust*. This excerpt is frequently studied by tuba players today as it is almost surely to be called upon in orchestral auditions.

Typically, a modern tuba player will play Berlioz excerpts on a bass tuba pitched in F as it is regarded to best match the timbre desired by Berlioz and creates the most ease in performing. Berlioz explains his thoughts on employing the tuba in the following quote,

“The lowest notes of all are a little blurred, it is true, but when doubled an octave higher by another bass tuba, they take on a richness and resonance, and in the middle and upper registers the tone is impressively noble, not at all flat like the ophicleide’s but full and vibrant and well matched with the timbre of trombones and trumpets, to which it serves as a true bass, blending perfectly with them. Weiprecht is the man who popularized the instrument in Prussia. Adolphe Sax now makes admirable tubas in Paris” (Berlioz/Cairnes 335).

Berlioz was so impressed with the tuba, that he desired a tuba to be played instead of the ophicleide in every instance in which he had requested an ophicleide. Bevan explains,

“The collection of Berlioz autograph scores at the Bibliotheque Nationale shows Berlioz’s replacement of ophicleides by tubas in almost every case. Where Berlioz did not make the alteration, his publishers did” (Bevan 210).

One of Berlioz' most famous compositions is *Symphony Fantastique*, composed in 1830. Berlioz' mark on the tuba is unquestionable through the pivotal role given to the tuba within the composition. He called upon it without hesitation not only to support the orchestra harmonically, but also melodically. But perhaps most importantly he wrote parts that still provide a challenge to tuba players today, ranging from the intense melodic sections in "March to the Scaffold" as the main character is about to be beheaded to the demonic Dies Ire solo in the concluding movement.

### **The Influence of Richard Wagner**

Even while the tuba was still in its infancy, Richard Wagner was not hesitant to include it into his orchestrations. In the early 19<sup>th</sup> century, the serpent was more popular than the ophicleide in Germany: however, Wagner included the ophicleide in his early opera *Rienzi* (1840), with the intention of having it performed at the Paris Opera. In this score he included one ophicleide in the orchestra and four in the stage band. Wagner often treated the serpent like the bass to the woodwind family, and the ophicleide as the bass to the brass family (Bevan 303). The first time Wagner called specifically for the newly invented bass tuba was in *Eine Faust Overture* (1840/1855). About that Baines said the following,

"Moritz's tuba won much admiration and must surely have been envisaged by Wagner in the opening of *Eine Faust Overture*, which no contemporary bombardon could manage" (Baines 250).

Although Bevan states that the tuba part was likely added in the 1855 revision of *Eine Faust*, we do know that Wagner originally calls for bass tuba in *The Flying Dutchman* (1843). Another ground-breaking work is *Das Rheingold* (1853-54), in which Wagner calls for a contrabass tuba. Typically parts calling for a bass tuba refer to tubas in E flat and F, while contrabass tubas are pitched in BB flat and CC. Perhaps the most played tuba excerpt in existence is in his opera *Die Meistersinger* (1867). The tuba part is perhaps most widely known for its trill, which is known as "the trill" by many tuba players. Even with its notoriety, Bevan states that its intention was to support the tuba's melodic partner in this excerpt, the string bass (Bevan 306). The trill was the only of its kind until Mahler called for one in his Fifth Symphony (1902). In summarizing Wagner's orchestration, the following quote provides insight into Wagner's intent:

“Expanding the tonal resources of the orchestra involved both the redeployment of existing instruments and the creation of new ones” (Bailey/Sadie 952).

In his expansion, Wagner was bold. “The Giants” motive, “Faffner” as the dragon in *Das Rheingold*, the sinister solos in *Siegfried*, and such music as “Siegfried’s Funeral March” were built around the sound of the tuba. Wagner stimulated the growth of the tuba by including it in his compositions, but also spread its reputation through his influence on future generations of composers.

### **Other Germans: Brahms, Schubert, Mahler, and Strauss**

Following Wagner’s ground-breaking introduction of the tuba into his scores, many other German composers began to include the tuba as well. Perhaps the most notable of these composers include Brahms, Schumann, Strauss, and Mahler. Brahms is not known for writing large amounts of significant tuba parts: for example, the only of his four symphonies to call upon a tuba is his Second Symphony (1877). What Brahms is known for in his tuba parts is their effectiveness towards his desired effect. About this Bevan states,

“The tuba is used only in a few works one of the symphonies, two of the overtures, a work for choir and orchestra-and therein lies the secret: it is withheld (like the trombones) until the moment when it is essential for the desired effect” (Bevan 310).

However, Bevan is much less complimentary of Schumann for his use of the ophicleide and tuba. In Schumann’s composition *Das Paradies und die Peri*, a part originally scored for a valved ophicleide, Bevan feels that the instrument is scored in unusual doublings, in an awkward range, and does so at great length.

In his time, few composers wrote tuba parts that were as significant as those by Gustav Mahler. Mahler’s use of the tuba was prolific, he scored the tuba not only to accompany the melody and provide a harmonic bass but to also deliver the melody. Bevan best summarizes Mahler’s versatile use of the tuba in the following quote,

“With his awareness of the potential of individual voices Mahler probably allotted more soloistic parts to the tuba than any of his contemporaries. Sometimes they are low, quiet solos, audible because of their distance from the other instruments (Symphony No. 2); sometimes they take place as a significant contribution to the working of melodic material (Symphony No. 1); sometimes they are tiny solos, the quick flash of some grotesque goblin (Symphony No. 5). It is impossible to deny Mahler’s influence on twentieth-century writing for tuba” (Bevan 318).

Even a century after his death, the tuba parts of Gustav Mahler are regarded as being some of the most significant parts in the tuba repertoire.

Richard Strauss called upon the contrabass tuba in many of his works, including *Ein Heldenleben* (1898), and, on occasion, scored for two contrabass tubas, as in *Also Sprach Zarathustra* (1897). *Don Quixote* (1899) is a significant work in that it is the first piece to require the tubist to use a mute. What is perhaps even more significant about this work was actually brought about through an accident, Strauss's inclusion of the euphonium in the orchestra. Today tenor tuba parts are typically played by euphonium players, but the tenor tuba called upon in *Don Quixote* was not Moritz's tenor tuba, but a tenor Wagner Tuba. In December of 1899 Ernst von Schuch was conducting a performance of *Don Quixote* and wrote Strauss to say,

“My tenor tuba player can not play the part and I have arranged for a euphonium player instead.”

Naturally, Strauss took the credit for this decision by saying,

“I myself have frequently written a single tenor-tuba in B Flat as the higher octave of the bass tuba, but performances have shown that, as a melodic instrument, the euphonium is much better suited for this than the rough and clumsy Wagner Tubas with their demonic tone” (Bevan 234).

While Clifford Bevan speculates that this may have been fueled by the Strauss-Wagner rivalry, Strauss's decision has been followed by orchestras today. It should come as no surprise that Mahler also scored for the tenor tuba in one of his symphonies. In a discussion about this piece, Professor of Euphonium at the University of North Texas Dr. Brian Bowman best explains a means to determine the composer's intent in regards to scoring for a tenor tuba versus a euphonium in the following quote,

“Mahler calls for a B-flat tenor horn, possibly having in mind the smaller bore German tenor horn rather than the euphonium. The part is written in B-flat treble clef which is the usual transposition for the smaller horn.” (Bowman 11)

Some other composers who have written for the euphonium in orchestra include Bartok, Janacek, Grainger, Stockhausen, Verdi, and Respighi. Lastly, Gustav Holst also calls specifically for the euphonium in the well-known solo in “Mars the Bringer of War” from his composition *The Planets*.

## **The Russian Influence: Rimsky-Korsakov and Tchaikovsky**

Almost immediately, the tuba was embraced in Eastern Europe, and especially in Russia. As was mentioned earlier, the Cervený firm was founded in 1842 and soon after had a large impact on the Russian market as it was the country's sole supplier of these instruments through the 1880's. Royalty favored the tuba, as even Tsar Alexander III (1845-1894) played the tuba in amateur ensembles. Perhaps the first major Russian composer to take a liking to the tuba was Rimsky-Korsakov, who was first introduced to the instrument during his work as inspector of the naval bands. It was at this time that he was impressed with not only its ability to provide a solid tone and foundation to the brass family, but also in its ability to be technically agile. His influence over the current and future generation of Russian composers was no doubt through his position as a composition and instrumentation professor at the St. Petersburg Conservatory. In fact, Bevan states that "Glazunov and Stravinsky were amongst his pupils, and Bordin and Tchaikovsky were amongst his friends" (Bevan 327). While Rimsky-Korsakov himself included significant tuba parts in his compositions *Scheherazade* (1888) and *Russian Easter Festival Overture* (1888), perhaps some of the most notable tuba parts from this generation of Russian composers came from Tchaikovsky. In his Fourth Symphony (1877) the tuba often doubles the string basses or is an octave below the bass trombone. In his Sixth Symphony (1893) Tchaikovsky treats the brass family much like one voice as they are usually orchestrated together in blocks, and often seamlessly exchange melodic material. Although some evidence states that Tchaikovsky may have intended these works to be performed on a small three valved tuba in E flat, they are most commonly played on BB flat or CC contrabass tubas today (Bevan 330). Even into the 20<sup>th</sup> century, the influence of this style of orchestration can be seen in the works of Prokofiev, Stravinsky, and Shostakovich.

## **The Golden and Modern Age of Tuba Manufacturing**

The Golden Age of tuba manufacturing coincided with a period of industrial revolution in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries. Quality metals were more available and techniques to work on these metals were improved which led small shop owners having the means to begin their own business. Around the mid 19<sup>th</sup> century the industry was booming in Europe, culminating with Cervený's "Kaiser" line of tubas in the 1880's and Gustav Besson's success in the later

years of the century. Manufactures like Conn soon followed in the United States, and this Golden Age lasted until about the 1920's or 1930's. During the 1920's and 1930's Europe was between the two World Wars and deeply entrenched in social and political upheaval and the United States was in an economic depression. With the invention of the motion picture, theatre musicians were made obsolete which eliminated another significant market for manufactures and ended this Golden Age. It is likely that in order to stay in business manufactures like Conn had to turn their research, marketing, and development efforts from professionals to school music programs. For example, an early 20<sup>th</sup> century Conn catalog advertises far more tubas in BB flat than in other keys. Furthermore, they were available in many varieties: upright with 3 front-action valves, helicons with 3 or 4 valves, and sousaphones with 3 valves in both the bell front and bell up variety. A few E flats were available, and only one "Grand Orchestral Model" was available in BB flat and CC.

Over time, a clear distinction has been made between tubas that fall into more of a Germanic school of tuba design and tubas that fall into a tradition seen in the United States. The Germanic school is born of influence from Cervený and these instruments are equipped with rotary valves, have a long lead pipe, and have a long and more narrow bell much like Miraphone and Meinl Weston tubas. They are more symmetrical in shape and are known for their more colorful and bright sound. The American school of design has its roots in Adolphe Sax and most tubas made in the United States are equipped with piston valves. The bore size tends to have slightly more girth with a wider bell and shorter lead pipe. They are known for a more dense, broad, and organ-like sound.

The story of the famous York tuba owned by Arnold Jacobs helps to demonstrate the preferences of many American tubists in the 20<sup>th</sup> century. Leopold Stokowski, legendary conductor of the Philadelphia Orchestra in the 1930's had requested that the tubist at that time, Philip Donatelli, acquire an instrument with true organ like quality to the bass register. At that time Donatelli consulted the York Company of Grand Rapids, Michigan to fulfill this request. The reason he may have selected this company is that in the 1920's and 1930's manufactures like Conn and York set a standard for tone, intonation, response, as well as with the layout of the tubing and quality control of the mechanical aspects of the instruments. York created two tubas for him with a medium large valve section, large bore, and a 5<sup>th</sup> rotary valve. One of the

instruments was so large that Donatelli, who was a rather large man, could not hold the instrument. Donatelli elected to sell the instrument to his student Arnold Jacobs for \$175. At his retirement, Jacobs sold this horn to the Chicago Symphony Orchestra for \$20,000. As it turns out, Stokowski may have been ahead of his time, as the Chicago Symphony Orchestra later perfected this concept of sound in the 1940's and 1950's.

Arnold Jacobs went on to become the father of modern orchestral tuba playing, which was symbolized by his large York tuba. Many students sought such a horn and were willing to go as far as to modify older existing BB flat tubas into CC tubas rather than purchase a new one. Former tubist of the Milwaukee Symphony Bob Rusk grew up near Elkhart, Indiana, a region close to companies like Conn and DEG. He liked the large bore and sound of the older American BB flat tubas made by companies like Conn, York, and Marzan, which was personified through Arnold Jacob's York. Rusk made a name for himself by cutting down BB flat tubas to CC tubas to achieve the response and clarity of a CC as well as the ease in sharp keys. But thanks to innovative instrument manufactures like Peter Hirsbrunner, this was not the only option. Jacobs selected the Hirsbrunner Company to design a copy of his York, which was no small task. At the time Jacobs made one of his instruments at Hirsbrunner's disposal, a complete reconstruction was necessary, especially in the valve section. Jacobs felt as if only Hirsbrunner could fulfill this monumental task, not only was the original instrument in poor condition but the copy had to match Jacobs' iconic status as a tubist. In addition, most of the work had to be done by hand since most of the tooling was unavailable for this unique copy. It was a very laborious and tiresome project, which required a skilled craftsman. Never the less, in 1979 a prototype was created using the original lead pipe, valve section, and bell. In 1981, the first four Yorkbrunner tubas were created, and have achieved a high level of acclaim since.

### **Mouthpieces**

One key piece of equipment that should not be lost in a discussion on tuba equipment is the part that actually comes in contact with the embouchure, the mouthpiece. Today, there are numerous options for the individual to choose from, which is quite good since a one millimeter difference can affect the comfort level, response, and overall effectiveness of a mouthpiece. Overall, there are two prominent designs in tuba mouthpieces, bowl-shaped and funnel-shaped

cups. Generally, bowl-shaped mouthpieces will provide a brighter more refined sound while funnel-shaped mouthpieces will produce a larger more dark sound. The size of the cup also bears significance as deeper cups will facilitate greater ease in the middle and lower registers and more shallow cups will facilitate more ease and focus in the upper register. In addition to the cup, rim design is a key component of a mouthpiece. Rims that are wider will generally increase endurance, but decrease flexibility. Rims that are very thin generally will provide flexibility but an “edgy” sound. The cut of the rim is also a significant factor. Rims that are sharp will generally provide a more centered crisp attack, while rounded rims aid in flexibility. Rim diameter is also important, as larger rims provide a larger sound, but less ease in the upper register. Lastly, the length of shank and back bore should be proportional to the instrument, and the shank should snugly fit into the lead pipe. With every change in a mouthpiece’s characteristic, there is give and take. Thus, there is no “right or wrong” answer for everyone, it is an individual decision based on the musician, the instrument, and the repertoire being performed.

### **The Helleberg Mouthpiece**

August Helleberg (1861-1936) was the first tubist of the Chicago Symphony Orchestra, where he played from 1891-95. More prominently, he is generally credited with developing the funnel-shaped style of mouthpieces that bear his name. Whenever Helleberg purchased a tuba, he would custom design a mouthpiece for it, and when he sold the horn, the mouthpiece went with it (Frederickson 29). Many manufactures have since replicated and modified the design, and in doing so, just about every tuba player has performed on a similar mouthpiece at some point. One well-known advocate was Arnold Jacobs. During the 1930’s he purchased a Conn Helleberg mouthpiece for \$2.50, and it became one of the primary mouthpieces used in his career. Later, Renold Schilke modified one of his Hellebergs, and in 1993 the Canadian Brass Musical Instrument Company created the Arnold Jacobs model of the Helleberg mouthpiece (Frederickson 189).

## **The History of the Solo Tuba: Introduction**

The growth of solo tuba literature is quantified in three important catalogs of the instrument's repertoire: the Encyclopedia of Literature for the Tuba by William Bell and R. Winston Morris (1967), the Tuba Music Guide by R. Winston Morris (1973), and the Tuba Source Book edited by R. Winston Morris and Edward R. Goldstein (1996). This growth of the original solo tuba repertoire is evident by the significantly expanding number of compositions cited in these references. The 1967 edition lists approximately 170 works for tuba and keyboard, the 1973 edition lists 225 pieces, and the 1996 edition lists 800 compositions (Morris/Goldstein 10). This growth is further evident in the second edition of the Tuba Source Book, that was published in 2006 and edited by Morris and Daniel Perantoni.

The middle of the 1950's brought about one of the most significant events in the history of the solo tuba, the premiere of Ralph Vaughan Williams' *Concerto for Bass Tuba* on June 13, 1954. Shortly after Paul Hindemith composed his *Sonata for Tuba and Piano* in 1955, another revolutionary composition for the solo tuba. In his book The Art of the Tuba and Euphonium, Harvey Phillips emphasizes that both of these works were milestones in the tuba repertoire. He notes that both inspired the composition of other works for tuba, including those "that demonstrate the chamber music and solo/recital potential of the tuba" (Phillips 11). Before the middle of the 20<sup>th</sup> century, the tuba had been assigned an increasingly significant role within the symphony orchestra, through the innovative use of different forms of the instrument in orchestral compositions by Hector Berlioz, Richard Wagner, and Anton Bruckner. At the turn of the 20<sup>th</sup> century, solo tuba works were found in a handful of compositions by American composers such as *The Thunderer* (1891) by J.S. Cox, *Tuba Polka* (1886) by J.J. Davis, and numerous pieces by George Southwell. But it was not until Vaughan Williams' and Hindemith's ground-breaking solo compositions that the full range of the tuba's potential began to be realized.

Ralph Vaughan Williams' and Paul Hindemith's solo tuba works are truly revolutionary and served as a catalyst for solo tuba composition in the second half of the 20<sup>th</sup> century. The prestige of prominent European composers such as Vaughan Williams likely encouraged orchestral and wind band conductors in Europe and the United States to program works that featured solo tuba passages. This increased attention on solo tuba repertoire and the featured use of the tuba within orchestral and band compositions also affected the repertoire choices within

university and public school ensembles. Thus public school teachers began to seek a greater number of works to feature their tubists. Not only was a greater quantity of compositions needed, but a greater variety was also necessary because of the differing skill level of students. Composers such as H.A. Vandercook, Forrest Buchtel, and Fred Weber answered the call.

In many spheres of composition and performance, including pieces oriented towards professional orchestras and those towards amateur, student, and professional wind bands, a remarkable growth in the body of literature for the solo tuba can be traced in the decades following Vaughan Williams and Hindemith. In this development, individual performers and teachers played a large role in the commissioning and promoting of solo tuba compositions. Although works such as the Vaughan Williams and Hindemith were not written for specific individuals, others were. Certain compositions were inspired by performer-advocates such as Harvey Phillips and Roger Bobo; other works were stimulated by the growth of the university tuba and euphonium studios and professors within those studios. The links between composition and performance in these varied arenas can be represented as a Venn diagram of three interlocking but not necessarily subsequent classifications.

### **Vaughan Williams' *Tuba Concerto* and Hindemith's *Tuba Sonata***

One of the most significant benchmarks in solo tuba literature, Ralph Vaughan Williams' *Concerto for Bass Tuba and Orchestra* (1954), was not composed with the intent to be premiered by a specific individual. In fact its first performer, Phillip Catlinet (1910-1995), did not intend to have a career as a professional tubist. Prior to World War II he was employed by the BBC Military Band but his primary instrument was the piano. When he returned from military service his employment was guaranteed by British law; however, the BBC Military Band had been eliminated during the war. His experience on brass instruments led to his appointment as the tubist for the BBC Opera Orchestra in London and when that ensemble was dissolved he was offered employment with the London Symphony Orchestra. One could only imagine the surprise felt by Catlinet when he received a phone call from the secretary of the London Symphony Orchestra stating "Ralph Vaughan Williams has written a tuba concerto and wants you to play it at our Jubilee Concert" (Catlinet 54). The secretary also went on to explain, "Vaughan Williams wants you to call on him with your tuba this afternoon at 3 o'clock and our resident pianist will

arrive at the same time to play through the number with you!” (Catlinet 54). The piece made its debut on June 13, 1954 and Catlinet’s accounts of this event reflect positively about the performance and demonstrate his awareness of its profundities. More than fifty years later the Vaughan Williams *Concerto for Bass Tuba and Orchestra* continues to be a staple of solo tuba literature and a frequent requirement at orchestral auditions.

The *Sonate for Basstuba and Piano* by Paul Hindemith was composed in 1955. The work brought completion to a body of solo compositions for instruments that were composed for less frequently at the time and included works for double bass, bassoon, trumpet, horn, trombone, and harp. The *Sonate for Basstuba and Piano* truly fits Hindemith’s philosophy of “Music for Use,” as it remains one of the most significant pieces in the tubists’ repertoire today. In relation to the historical importance of the work Roger Bobo offers the following,

“Perhaps one of Hindemith’s most important contributions was his collection of sonatas written for instruments which were not regarded in a solo light at the time. He thus exploited the musical and technical resources available and left an invaluable heritage of music for performers as well as listeners” (Bobo, CD Notes from Bobissimo!).

The historical significance of the composition to tubists world-wide is profound, a phenomenon that is quite impressive since information on the premiere of the work is unknown. One way to quantify the impact of the composition is to cite a list of some of the significant tuba players who have recorded the sonata including tuba soloist and principal of the Los Angeles Philharmonic Orchestra, Roger Bobo, former tubist with the Philadelphia Symphony Orchestra and former Professor of Tuba and Euphonium at the University of Michigan, Abe Torchinsky, current Professor of Tuba and Euphonium at the University of Michigan, Fritz Kaenzig, and current tubist with the Chicago Symphony Orchestra, Gene Porkorny. In fact, Norwegian tuba virtuoso Oystein Baadsvik has recorded the composition twice, in 1993 and 2006. In the notes to his second recording of the composition, Baadsvik comments on the sonata’s style,

“Although the other nine sonatas were written between 1936 and 1943, there is no significant difference in musical style between the *Sonate for Basstuba and Piano* and its older siblings. The sonatas for woodwind instruments are lighter and more easy-going in style, whilst those for brass seem more substantial” (Baadsvik, CD Notes from Danzas).

In conclusion, *Sonate for Basstuba and Piano* by Paul Hindemith was pivotal in the development of solo tuba literature and continues to be a cornerstone of the tubists’ repertoire.

### **Significant Performer-Advocates: Harvey Phillips and Roger Bobo**

While the Vaughan Williams *Tuba Concerto* and the Hindemith *Sonata for Bass Tuba and Piano* was not composed with a specific individuals in mind, there is a significant body of works composed for the tuba that was inspired by its virtuoso performers. Harvey Phillips (b. 1929) is perhaps the greatest advocate for the tuba of all time and is chiefly responsible for the commission of over 100 solo compositions. In addition to his solo tours throughout the world, he had a prominent career as a freelance tubist in New York City, was a founding member of the New York Brass Quintet, and was a tubist with the United States Army Field Band. Phillips, a student of William Bell, was selected to take over Bell's esteemed position at Indiana University upon his retirement in 1971. Prominent works composed for Phillips include *Serenade No. 12 for Solo Tuba* (1961) by Vincent Persichetti (1915-1987), *Concertino for Tuba and Piano* (1959) by Eugene Bozza (1905-1991), and numerous solo and chamber compositions dedicated to him by his friend Alec Wilder (1907-1980), including the *Sonata for Tuba and Piano* (1964) and *Suite No. 1 "Effie"* (1968). Phillips' many honors include in 2007 being the first brass player chosen for induction into the American Classical Music Hall of Fame. Other inductees from that year include Yo-Yo Ma, Donald Martino, and the Cleveland Orchestra. In summary, through his highly dignified conduct and outstanding musicianship, Phillips was truly a revolutionary figure in bringing high respect to the tuba from the music community.

Tuba legend Roger Bobo stands out as an important figure in the expansion of solo tuba literature. Roger Bobo (b. 1938) has enjoyed a diverse career as a tuba player, teacher, clinician, and conductor. Bobo performed for the Los Angeles Philharmonic for 25 years and was a prominent Hollywood studio musician for an even greater amount of time. He has also had a prolific solo career including being the first tubist to perform a solo recital in Carnegie Hall in 1961 and has recorded eight solo albums. For a generation he was one of the most prominent tuba soloists and appeared with a plethora of orchestras as a soloist world-wide. Perhaps one of the most notable works composed for him is *Encounters II for Unaccompanied Tuba* (1966) by William Kraft (b. 1923). The non-traditional performing techniques such as multiphonics and the difficult expansive range inspired tubists of that generation to a higher level of virtuosity. In addition to his numerous commissions, Bobo's playing has inspired many composers including Trygve Madsen, John Stevens, Roland Szentpali, and Roger Kellaway to write non-

commissioned works for him. His numerous achievements were recognized in 2002 when he was awarded the Lifetime Achievement Award by the International Tuba Euphonium Association. Today he resides in Japan and is sought after internationally as a conductor, teacher, adjudicator, and clinician.

### **The Growth of the University Tuba and Euphonium Studio**

Since the 1960's there has been an unprecedented growth of college tuba and euphonium studios. It was at this time that universities began to bring tuba players onto the full-time faculty beginning with the appointment of Rex Conner at the University of Kentucky in 1960. Other prominent appointments soon followed including William Bell at Indiana University in 1961 and Abe Torchinsky at the University of Michigan in 1967. Many of these new college faculty members forged relationships with composers in order to broaden the literature available for their own use as well as with their increasing number of students. These connections were mutually beneficial since college professors needed to perform as a part of the tenure and promotion process and composers desired a venue to have their works played. One of the most prominent figures in college tuba and euphonium teaching is Daniel Perantoni (b. 1941) who has served on the faculty at the University of Illinois, Arizona State University, and Indiana University. He was a leading individual in the foundation of the International Tuba Euphonium Association in 1973. Perantoni has commissioned and premiered many ground-breaking works by notable composers, including Robert Jager, Scott Wyatt, Thom Ritter George, and Anthony Plog. Perantoni is considered highly innovative in many genres of music.

### **Prominent Individuals: William Bell and Arnold Jacobs**

During the 20<sup>th</sup> century there was a multitude of individuals who contributed to the growth of the tuba as a performer-advocate, teacher, composer, research, and manufacturer. In addition to those previously discussed this essay will introduce a few more key figures with no intended disrespect to the others worthy of mention.

William Bell (1902-1971) was a prominent tubist and teacher in the 20<sup>th</sup> century and is viewed as many as the grandfather of the modern tuba movement in the United States. He held many key playing positions including the Cincinnati Symphony, the NBC Symphony, the Sousa

Band, and the New York Philharmonic. In 1937, General Electric's David Sarnoff invited esteemed conductor Arturo Toscanini to select personnel for a new orchestra to be known as The NBC Symphony Orchestra. This orchestra was to be comprised of the world's greatest musicians. William Bell was the third musician selected by Toscanini, after his concertmaster Mischa Mischakoft, and principal oboist Philip Ghignatti (Phillips). During his long tenure with the New York Philharmonic, Bell performed the American premiere of Ralph Vaughan Williams' *Concerto for Bass Tuba and Orchestra* (1954) with The Little Orchestra Society in 1955. He also held several key teaching posts including Julliard, the Manhattan School of Music, the Cincinnati Conservatory of Music, and most notably Indiana University from 1961-1971. Most of all, his teachings were a benefit to many tubists of his generation as well as future generations, including perhaps his most prominent student, Harvey Phillips.

Arnold Jacobs (1915-1998) was tubist for the Chicago Symphony from 1944-1988 and perhaps the most significant contributor to the study of the physiology and psychology of the respiratory system. His pedagogy was so renowned that not only tuba players but musicians of all backgrounds sought his teachings. He also had a prolific performing career, in June 1962, he had the honor of being the first tuba player invited to play at the Casals Festival in Puerto Rico. Jacobs, along with colleagues from the CSO were part of the famous 1968 recording of Gabrieli's music with members of the Philadelphia and Cleveland Orchestras. He was also a founding member of the Chicago Symphony Brass Quintet, appeared as a soloist with the CSO on several occasions, and recorded Ralph Vaughan Williams' *Concerto for Bass Tuba and Orchestra* (1954) with Daniel Barenboim conducting the Chicago Symphony (Frederickson). Jacobs gave clinics and prominent masterclasses worldwide, has been the recipient of two honorary doctorates, and in addition, Mayor Richard M. Daley proclaimed June 25, 1995 as Arnold Jacobs Day in the City of Chicago.

### **Prominent Manufactures: Willson, Hirsbrunner, Meinel and Tucci**

The quantum leap in musicianship and technical abilities that tuba and euphonium players have had in the 20<sup>th</sup> century certainly would have not been possible without innovative designers, manufactures, and distributors. In bestowing the Lifetime Achievement Award on William Kurath, ITEA President Skip Gray said, "It is the work of craftsmen that make it

possible for the technical dreams of musical artists to become a reality” (Gray 7). Kurath founded the Willson Company in the 1950 first as a repair shop. Then, in 1955 he devoted all his efforts to the development of low brass instruments. In 1974 the company began his relationship with euphonium virtuoso Brian Bowman, of which the famed Willson 2900 series euphonium was the result. This horn continues to be the standard by which all other euphoniums are judged today. In the 1990’s Willson began to collaborate with tubist Marty Erickson. As a result, improvements have been made in their CC, E Flat, and F tubas, as well as mouthpieces. Through it all, Kurath was known as a true “artist craftsman.”

For several instrument manufactures in Europe, the craft is a family business. The first Hirsbrunner to enter in the instrument design business did so in the mid 18<sup>th</sup> century. In the 20<sup>th</sup> century, Fritz Hirsbrunner (1894-1983) began experimentation with tubas. His son, Peter Arnold Hirsbrunner (b. 1925) worked to develop the first automatic compensation system for cylinder valves. He also was responsible for the first 4/4 CC Hirsbrunner CC tuba. Their line of instruments is viewed by many as some of the finest of the world, and is often sought after by professional tubists. In 2000, he was a recipient of a Lifetime Achievement Award from the International Tuba Euphonium Association. Today, his son Peter Christian Hirsbrunner runs the company into a new century with great promise.

Another family company associated with great tuba development is Meinl. Between the two World Wars, Wenzel Meinl, father of Anton Meinl started a wholesale music firm. Anton Meinl (b. 1922) attended school from 1928 to 1936, following which he took a two year course at the Technical State School for Musical Instrument Making. After a three year apprenticeship, his studies were interrupted by induction to the military service in 1941. He was separated from his father until 1947, when he joined his father’s enterprise and continued his studies at night courses and passed the examination for his master's degree in 1952. A highly skilled craftsman and excellent teacher, Anton Meinl has contributed greatly to the development and improvement of tubas. He has made significant contributions to the rotary valve linkage, placement of slide tubes, and cutting patterns on brass instruments. One of the many professional relationships he forged was the great William Bell. The Meinl's son Gerhard passed the bar exam in Munich in 1983, and then joined the firm in 1984 after an apprenticeship as a craftsman making musical instruments. Gerhard, who is an educated trumpet player, became famous for establishing new

artist relationships. He also represents the seventh generation of his family to work in the music industry. Today the company is known for their quality line of tubas which are built strongly and the choice of many professionals.

A former student of Arnold Jacobs, Robert Tucci has had a prolific career as a tubist with the Louisville Philharmonic, the Buffalo Philharmonic, and the Army Field Band. In 1970 Mr. Tucci moved to Europe and accepted a position with the orchestra of the State Theatre in Kassel. Later he became a member of the orchestra of the Bavarian State Opera in 1972. Mr. Tucci has performed with most major orchestras in the German speaking countries, and has toured the world as a clinician and soloist. Aside from his performing activities, his greatest contribution to the tuba and euphonium has been through his groundbreaking development, manufacturing and distribution of tubas and euphoniums. Through his partnership with co-designer Daniel Perantoni and the B&S Company, he has left an undeniable mark on the quality of tubas, euphoniums, mouthpieces, and accessories. He has also worked to distribute these instruments through his partnership with the Custom Music Company in Ferndale, Michigan and as owner and proprietor of the Horn and Tuba Center. This equipment has become the choice of many top professionals, who in some part owe their recent growths to the manufacturing accomplishments of Mr. Tucci.

## **Conclusion**

The creativity of the instrument makers of the 19<sup>th</sup> century helped to spark an evolution in the tuba family, which has resulted in the tuba and euphonium having a permanent home in many mediums today. However, these masterpieces may have not made it out of their shop had it not been for the major composers of their time. Early on, composers such as Berlioz, Wagner, and Rimsky-Korsakov deemed the tuba a suitable bass voice to the brass family and fully capable both technically and melodically as early as the mid to late 19<sup>th</sup> century. Even with that as the case, the first concerto for tuba and orchestra was not written until 1954, Ralph Vaughan Williams' *Concerto for Bass Tuba and Orchestra*. Since then, many performer-advocates and manufactures have worked tirelessly to bring musicianship, technical prowess, and dignity to the tuba and euphonium. And although there is still work to be done, they have succeeded. In order

for the tuba to thrive tomorrow, performers, teachers, researchers, manufacturers, and composers must do as their predecessors have and view the tuba without a sense of limitations.

## Bibliography

- A. D., ed. "Brass bands ophicleide, trombacella, bass tuba and contra bass saxhorn." The Musical World Vol. 1, no. 22 (1850): p. 361.
- Anon. "Distin's Journal, for the cornet-à-pistons, sax-horn and sax-tuba, with pianoforte accompaniment." The Musical World Vol. 23, no. 21 (1848): p. 232.
- Baadsvik, Oystein. Danzas. Akersberga Sweden: BIS CD-1285, 2006.
- Baines, Anthony. Brass Instruments-Their History and Development. New York: Dover Publications, 1993.
- Bell, William J. and Morris, R. Winston. Encyclopedia of Literature for the Tuba. New York: Charles Colin, 1967.
- Berlioz, Hector. Berlioz's Orchestration Treatise: A Translation and Commentary (Translated by Hugh Macdonald). New York: Cambridge University Press, 2002.
- Berlioz, Hector. "New instruments [Reprinted from "Berlioz on Modern Instrumentation and Orchestration"]." The Musical Times Vol. 9, no. 212 (1860): pp. 345-348.
- Berlioz, Hector and Cairns, David, ed. The memoirs of Hector Berlioz. London: Victor Gollanez Ltd., 1969.
- Bevan, Clifford.  
The Tuba Family, 2<sup>nd</sup> ed. Winchester, England: Piccolo Press, 2000.  
The Tuba Family, 1<sup>st</sup> ed. London: Faber and Faber, 1978.
- Bird, Gary. A musical comparison of the serpent and ophicleide in selected compositions of the nineteenth century (Dissertation). University of Indiana, 1992.
- Bobo, Roger. Bobissimo! Camas, WA: Crystal Records CD125, 1991.
- Bowman, Brian. A History of the Use of the Tenor Tuba in Orchestral Literature (Dissertation). Ann Arbor: University Microfilms, 1976.
- Catlinet, Philip. "The Truth About the Vaughan Williams *Tuba Concerto*." TUBA Journal Vol. 19, no. 1 (Summer 1991): pp. 52-56.
- Cecil, Wilson B. Berlioz's Use of Brass Instruments (Dissertation). Case Western Reserve, 1971.
- Custom Music Corporation. Artist and Clinician Biographies.  
<http://www.custommusiccorp.com/bios/rt.html>. Accessed Online on 8/18/06.

Fasman, M.J. "Brass bibliography: sources on the history, literature, pedagogy and acoustics of brass instruments." TUBA Journal Vol. 18 (1991): pp. 21-22.

Fétis, François-Joseph. "New brass instruments [Sax tubas and saxophones]." The Musical World Vol. 3, no. 22 (1852): p. 380.

Frederickson, Brian. Biography of Arnold Jacobs.  
[www.windsongpress.com/jacobs/AJ\\_Biography.htm](http://www.windsongpress.com/jacobs/AJ_Biography.htm). Accessed Online on 8/1/06.

Gray, Skip. "Lifetime Achievement Awards." TUBA Journal Vol. 30 (2003): pp. 6-9.

Frederickson, Brian and Taylor, John ed. Arnold Jacobs: Song and Wind.  
United States: Wind Song Press, Ltd., 1996.

Gevaert, F.A. Traité général d'instrumentation : exposé méthodique des principes de cet art dans leur application à l'orchestre, à la musique d'harmonie et de fanfares, etc. Gand: Liege, 1863.

Griffiths, John R. The Low Brass Guide. Hackensack, N.J. Jerona Music Corp, 1980.

Hirshburner, Peter. Information on the Hirshburner Company.  
<http://www.hirshburner.com/>. Accessed Online on 8/18/06.

Keays, J.H. An investigation into the origins of the Wagner tuba (Dissertation).  
University of Illinois at Urbana, 1978

Korsakov, Nicolas, ed. Steinberg, Maximilian. Principles of Orchestration with musical examples drawn from his own works. Berlin: E.F. Kalmus Orchestra Scores Inc., 1912.

Kuehn, David Laurance. The use of the tuba in the operas and music dramas of Richard Wagner (Dissertation). University of Rochester, 1974.

Levachkine, A. "A short history of the tuba in Russia, Part 1." Brass Bulletin Vol. 107 (1999): pp. 18-25.

Machlin, Paul Stewart. "Wagner, Durand and 'The Flying Dutchman': The 1852 Revision of the overture." Music & Letters Vol. 4 (1974): pp. 410-428.

Meinl, G.A. "The tenor tuba: Richard Strauss' orchestration and the revival of an instrument." TUBA Journal Vol. 17 no. 4 (1990): pp. 9-10.

Meinl-Weston Corporation. Information on the Meinl-Weston Company.  
<http://www.meinl-weston.com/history.htm>. Accessed Online on 8/18/06.

Melton, William. "Greetings from Heaven, or demonic noise? A History of the Wagner Tuba Part 1." The Horn Call Vol. 31, no. 4 (2001): pp. 49-58.

- Meucci, R. "The cimballo and related instruments in 19th-century Italy." The Galpin Society Journal Vol. 49 (1996): pp. 143-179.
- Morris, R. Winston. Tuba Music Guide. Evanston, IL: Instrumentalist Company, 1973.
- Morris, R. Winston and Goldstein, Edward R., editors. The Tuba Source Book, 1<sup>st</sup> ed. Bloomington, IN: Indiana University Press, 1996.
- Morris, R. Winston and Perantoni, Daniel, editors. The Tuba Source Book, 2<sup>nd</sup> ed. Bloomington, IN: Indiana University Press, 2006.
- Myers, A. "The living role of historical instruments." TUBA Journal Vol. 27 (2000): pp 60-61.
- Phillips, Harvey and Winkle, William. The Art of Tuba and Euphonium. New Jersey: Warner Brothers, 1992.
- Phillips, Harvey. Biography of William Bell. [www.windsongpress.com/brass%20players/tuba/bell.htm](http://www.windsongpress.com/brass%20players/tuba/bell.htm). Accessed Online on 8/1/06.
- Sadie, Stanley, ed. The New Grove Dictionary of Music and Musicians, 2<sup>nd</sup> ed. 29 vol. New York: Macmillan, 2001.
- S.v. "Berlioz, Hector" by MacDonald, Hugh. Vol. 3, pp. 384-420.  
     "Orchestration" Section 17, pp. 406.
- "Euphonium" by Bevan, Clifford. Vol. 8, pp. 417-418.
- "Mahler, Gustav" by Franklin, Peter. Vol. 15, pp. 601-31.
- "Mussorgsky, Modest" by Oldani, Robert William. Vol. 17, pp. 541-555.
- "Ophicleide" by Bate, Phillip and Meyers, Arnold and Morley-Regge, Reginald and Weston, Stephen J. Vol. 18, pp. 498-500.
- "Ravel, Maurice" by Davis, Martha Ellen. Vol. 20, pp. 865-878.
- "Rimsky-Korsakov" by Frolova-Walker, Marina. Vol. 21, pp. 400-423.
- "Saxhorn" by Bate, Phillip and Herbert, Trevor and Meyers, Arnold. Vol. 22, pp. 348-52.
- "Serpent" by Bate, Phillip and Meyers, Arnold and Morley-Regge, Reginald and Weston, Stephen J. Vol. 23, pp. 140-46.
- "Strauss, Richard" by Gilliam, Bryan and Youmans, Charles. Vol. 26, pp. 497-526.
- "Tchaikovsky, P.I." by Wiley, Roland John. Vol. 25, pp. 144-83.
- "Tuba" by Bevan, Clifford. Vol. 25, pp. 857-861.
- "Wagner, Richard" by Bailey, Robert and Dahlhaus, Carl and Deathridge, John and Millington, Barry. Vol. 26, pp. 931-971.  
     "Orchestration" Section 13, pp. 951-52.
- "Wagner Tuba" by Baines, Anthony C. and Bryant, Raymond and Webb, John. Vol. 26, pp. 979-980.
- Solomonson, Glen Terrance. The history of the tuba to 1860 : a study of the development of the tuba through its ancestors (Dissertation). Ann Arbor: University Microfilms, 1984.

Tucci, Bob. "A closer look at the Hirsbrunner York Model CC Tuba."  
TUBA Journal Vol. 17, no. 1 (1989): pp. 34-37.

Turner, Charles R. A climate for invention: Wilhelm Wieprecht and an historical study of the invention of the Moritz chromatic F bass tuba (1835) (Dissertation).  
Morehead State University, 1978.

Yeo, Douglas. "A pictorial history of low brass players in the Boston Symphony Orchestra, 1887-1986." ITA Journal Vol. 14, no. 4 (1986): pp. 12-21.