The Historical and Technical Development of Clarinet Transposition.

Gloria Mcilwain Giammanco
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THE HISTORICAL AND TECHNICAL DEVELOPMENT
OF CLARINET TRANSPOSITION

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in
The School of Music

by
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ABSTRACT

The development of the now traditional transposition procedure for the clarinet is examined from several viewpoints. Historically, the roots of the present-day clarinet are found in the chalumeau of the seventeenth century. The basic fingering system of the chalumeau can still be recognized in the far more complex modern clarinet.

As a reed instrument of cylindrical bore, there were from the beginning significant obstacles to producing an instrument capable of being played smoothly in various key signatures. This fact encouraged the development of different sized instruments with different "preferred" key signatures; but did nothing to alleviate the difficulties of the performer, who was expected to be master of such a variety of instruments.

A number of systems evolved to enable the musician to perform satisfactorily in the numerous keys in which clarinet music was written. Multiple instruments gave way to interchangeable joints, which evolved to a much more limited set of distinct instruments. The pressures which forced these changes originated with the composers of music for the clarinet, who constantly increased their demands on
the instrument and its instrumentalist. It was necessary to provide a means by which a common set of fingerings, could play adeptly on the several different clarinets which had become the favorite of composers.

The F chalumeau, ancestor of the clarinet, provided the base upon which such a system could be built. It fell to the composers to score for the clarinet in the "transposed" manner, so that the musician could play any instrument of the family without undue regard for its physical properties. Drastic improvements in the mechanical properties of the clarinet rendered the need for several different pitched instruments less and less acute. The B♭ clarinet emerged as a favorite as a result of its success in the military band, and its position as an excellent compromise instrument for a wide range of key signatures, given the modern key mechanisms.

An examination of the clarinet tutors from the early days of the instrument shows singular lack of appreciation of the significance of the transposition procedure. These tutors can shed little light on the background and development of the transposing tradition. The contemporary clarinet student, however, has the opportunity to be taught the special nature of the instrument and the rich musical tradition which underlies the seemingly mysterious ways of the clarinet.
CHAPTER I

Introduction

The use of transposing instruments or transposing notation dates from the time (18th century) when only natural tones were available on brass instruments. An explanation of the transposing system involves reasons as to why clarinets were built in different tonalities and why it was necessary for orchestral clarinet players to have instruments built in several keys. One explanation for the use of transposed clarinets is that it enables players to play all of the members of the family of clarinets by employing the same fingerings.

Purpose

The purpose of this research project was to present the history of clarinet transposition and to discuss other facets of the transposition topic from the viewpoint of clarinet makers, performers, and composers.

The tutors (instruction books) contained music which furnished a guide to the taste and style of the period, but contained little information on transposition. Therefore, information necessary to develop a defensible hypothesis
was sought within the historical development of the clarinet and by examining orchestral music composed for the instrument.

**Significance of Study**

The data derived from the study of instructional material for the clarinet and other sources helped to clarify certain aspects of the clarinet as a transposing instrument. As a result, the theories of clarinet transposition appear codified in this report.

**Delimitations**

Only soprano clarinets pitched in B, D, E, A, and C have been included in this study. The history of the clarinet from its birth to the present has been presented. Only orchestral music was analyzed while solo clarinet music was not presented.

**Definition of Terms**

Unfamiliar terms used in this study will be defined as they occur in the text.

**Development of Remainder of Report**

Chapter II presents the history of the clarinet from the simple tube with six or seven holes through its development into an efficient instrument. A description of the changes in music and the composers' usage of the
clarinet are presented in chapter III. In an effort to determine if the early instruction books (tutors) discussed the teaching of transposition, an analysis of clarinet tutors is presented in chapter IV. Chapter V deals with the theory of transposition and the necessity for transposition. Chapter VI contains the summary, conclusions, and recommendations.
CHAPTER II

HISTORY OF THE CLARINET

Introduction

The history of the clarinet is presented in chronological sequence in this chapter. The relationship between the historical development of the clarinet and the effects the development of the clarinet had upon transposition is also discussed.

For the first 100 years of the clarinet's existence (1700-1800), it was an instrument capable of performing only in the simpler keys (no more than $2^b$ or $2^#$). Beginning in the seventeenth and continuing through the twentieth century, many designs of key arrangements, bore sizes, and acoustical placement of holes were adapted to the instrument. In the 1900s, the Boehm system had generally replaced the other mechanisms.

Seventeenth Century

Forerunners of the Clarinet

The clarinet was developed from the simple, single-reed instrument called the chalumeau. The word chalumeau may have been derived from the Latin word *calamus* or
calamellus (small, reed-blown pipe). Other forms of the word chalumeau are ciaramellus (Italian), chalemie (French), Schalmei (German), and shawm (English).

The word chalumeau was used loosely to describe any small woodwind instrument. It applied to wooden pipes played with a double or single-reed and chanters of bagpipes and musettes. One historian of the instrument, Sybil Marcuse, said that "... the chalumeau (1730s) was a short cylindrical instrument with wide bore, seven finger-holes, having a compass of f' to f"' played with a single-reed."¹ The Musikalisches Lexicon, written by Johann Walther in 1732, described the chalumeau as "... a small wind instrument of boxwood with seven holes on top, one beneath, and two brass keys."² The chalumeau was further described in the Encyclopédie of Diderot and D'Alembert in 1767.

Primitive form used in Europe. Walnut stained brown cylindrical bore without bell, eight finger-holes in front, one of which is stopped with wax; a thumb-hole in the rear. Single-reed attached to the mouthpiece by a thread.³


In Reynvaan's *Muziikaal Konst-Woordenboek* of 1795, the chalumeau is described as "... a cylindrical pipe with six finger-holes on the upper side, thumb-hole with the upper end stopped with a cork and a flexible tongue split down the top of the pipe with the free end towards the player." Plate I is a reproduction of the early chalumeaux (sources of all plates in the appendix).

The chalumeau of the 1690s had a diatonic series of tones ranging from $f'$ to $f''$ (no keys for chromatics). It was a cylindrical instrument and was closed at one end by the reed. Its preferred mode of vibration was through the odd harmonics (e.g., 3rd, 5th), thus overblowing a twelfth instead of an octave. Instrument makers sought to overcome the problem of narrow range by providing the chalumeau as a family of instruments from treble to bass. The instruments were built in the keys of C and F. These chalumeaux produced the entire range from $f$ to $c''$. The chalumeau was similar to the recorder. Transposition was accomplished by a change in fingerings. As will be seen in chapter III, music was written at concert pitch.

---


PLATE I

A reproduction of the early chalumeaux
Early Name for the Clarinet

Before considering the origin of the clarinet, it is necessary to describe the term clarino which is sometimes used to describe the clarinet. "The clarino is an ancient synonym of the word trumpet and refers to the high trumpet of the seventeenth and eighteenth century in Italy. Clarino playing was a method of producing the highest partials and was rarely used to play below the ninth partial. The instrument demanded that a player have a good embouchure, flexible tongue, good breath control, and endurance. Since the disappearance of the Baroque clarino, the term has been identified with the clarinet. The name clarionet was given to the chalumeau when it began taking the place of the clarino. The tone of the new clarionet resembled the upper register tone of the clarino. Johann Walther stated in his Lexicon of 1732 "...that from a distance it sounds rather like a trumpet."  

The physical status of the chalumeau in the late 1600s was that of a family of wooden instruments built in C and F with seven finger-holes. The performer had to change fingerings from one instrument to the next and because the music was still written at concert pitch.

---

Eighteenth Century

The Denner Family, Instrument Makers

The Denner name is well known to most woodwind performers. Johann Christoph Denner, whose father was a horn tuner, was born in Leipzig in 1655. Johann was eight when the family moved to Nuremberg and he soon began an apprenticeship with his father. The Denners (Johann and sons, Jacob and David) gained fame as makers of a variety of woodwind instruments including bassoons, pommers, and especially recorders. The Denners used two distinctly different stamps on their instruments, I. C. Denner (Johann Christoph) and I. Denner (Jacob). It was a common practice for sons to carry on the mark of their father after his death (d. 1707). This practice has created problems in properly identifying the surviving instruments.

The earliest account of Denner's invention of the clarinet was published by J. G. Doppelmayr in 1730.

Finally his (Denner's) artistic passion compelled him to seek ways of improving his invention of the chalumeau. . . . At the beginning of the current century (18th), he invented a new kind of pipe-work the so-called clarinet, to the great delight of all music lovers. . . .

J. C. Denner began his improvements on the F chalumeau. Later he began to make changes on the other pitched

---

chalumeaux. Plate II is a reproduction of the treble chalumeaux and the two-keyed chalumeaux.

The earliest clarinet was 50 cm long, in three joints, cylindrical bore, and with a 15 mm width reed placed against the upper lip. The mouthpiece and barrel were of one piece, the body had six finger-holes, and the instrument was pitched in C. It is assumed that J. C. Denner made the following improvements. He bored a speaker hole near the mouthpiece which doubled the register of the clarinet, leaving a gap between the already existing scale and the new top notes. His improvements created a clarinet with a range of f to g' which could be produced by uncovering eight holes. He extended the range from g'' to f'' but left a gap between g' and c''. Above the g' he added two keys. By opening the one key, a' was produced and with both keys opened b' was sounded by stopping the tone holes of the upper joint and relaxing the embouchure. This gave the chalumeau a range of eleven notes. When the top key, b', was opened, all other keys being closed, a new scale on C could be played with many of the same fingerings. The b' key acted as a speaker key

---


PLATE II

A reproduction of the treble and the two-keyed chalumeaux
to bridge the gap between the upper and lower notes.

Figure 1 shows the scale from $f$ to $f''$ with the gap bridged by adding a' and b' keys.

![Scale of a chalumeau in F](image)

Fig. 1. Scale of a chalumeau in F

H. W. Schwartz said that "Denner merely improved the already existing chalumeau. He added two keys, a separate mouthpiece which was extremely large, and developed the bell."\(^{11}\)

The improvements to the chalumeau by Denner consisted of giving the mouthpiece the shape of a beak and attaching a separate reed, which was turned upwards and controlled by the upper lip, and by adding two more holes for the a' and b', which were placed near the mouthpiece and covered with two keys. A two-keyed clarinet is described by Bessaraboff as follows:

In C with two keys. The earliest form with a $b^\#$ key. Tube of maple, stained brown, cylindrical bore without bell, made in three parts: long mouthpiece, body, long joint. . . . The reed is tied by a piece of string. Length $13$ mm.$^{12}$

Figure 2 shows the scale that could be played on Denner's two-keyed clarinet.

![Scale Diagram](image)

**Fig. 2.** Scale of Denner's two-keyed clarinet$^{13}$

In 1720 Jacob Denner, son of Johann Christoph Denner, moved the speaker hole and key nearer the mouthpiece and reduced the size of the speaker hole. The movement of the speaker hole and key caused $b^\#$ to become $b^b$. He placed a small metal tube into the hole to remove moisture. Jacob also added the bell and lengthened the tube which improved the quality of the lower notes and made it possible to add another hole for low $e$. When low $e$ is overblown, it sounds $b^b'$. The addition of the $e-b^\#'$ key formed a connection between the chalumeau and clarion registers.


Denner soon discovered that the clarinet was different from other woodwind instruments. The clarinet overblows the twelfth instead of the octave, because of its acoustical properties. Being a cylindrical reed-pipe, the clarinet has the properties of a stopped-pipe. Consequently, its fundamental note is an octave lower than the corresponding note of either an open-pipe or conical reed-pipe of the same length. Without using any keys, the player can open seven tone-holes successively and produce the natural scale of G. The air column is progressively shortened as tone-holes are opened by raising a key or finger. When the limit of the fundamental scale is reached, harmonics are brought into play. Since the tube is closed at one end, it vibrates with modes that are odd multiples of the fundamental. The next mode has a frequency three times that of the fundamental or an interval of a twelfth.

The tones of the lower register retained the name chalumeau while the next register was called clarion, because of the resemblance to the high trumpet of the same name. In 1721 F. Bonanni described the clarinet in his Gabinetto Armonico.

An instrument similar to the oboe is the clarinet [sic]. It is two and a half palms long and terminates in a bell like a trumpet three inches in width. It is pierced with seven holes in front and one behind, and there are
two other holes opposite each other, but not diametrically, keys pressed with the fingers.¹⁴

Listed below are the developments of the clarinet up to 1725.

(1) The chalumeau was a primitive, folk instrument with a range from $f$ to $f''$. It overblew a twelfth and was built in the key of C and F as a family of instruments. (1690)

(2) J. C. Denner added two keys ($a^\sharp$, and $b^b$) opposite each other extending the range from $f$ to $c'''$. (1700)

(3) Jacob Denner moved the speaker-hole closer to the mouthpiece and reduced the size of the hole. ($b^q$ became $b^b$, 1720)

(4) Jacob Denner added the bell and lengthened the tube. He also added the $e$ key which overblew, giving a $b^\natural$.

The next keys to be added to the clarinet were for $f^\#$ and $g^\#$. The addition of these keys extended the chromatic possibilities of the clarinet and improved the tone quality and intonation. Barthold Fritz, an organ maker from Brunswick, was given credit for this addition in the 1750s. Joseph Beer (1744-1811), an instrument maker, added the $e^b$ and $c'$ keys in the 1760s, extending further chromatic possibilities.

By 1720, music written for the chalumeau had reached the limits of the instrument's capabilities. Until improvements to the clarinet were made, composers were limited in their writing for the instrument. Composers had to avoid certain chromatic notes, large leaps, and keys of more than three sharps and three flats. With improvements to the clarinet, there was an increase in the complexity of the music written for it. The chalumeau continued to be used into the eighteenth century and it was not until 1830s that the clarinet completely replaced it.

The *Concentus Musico-Instrumentalis* (1701) by Johann Josef Fux (1660-1741) calls for two clarinos, but the art of clarino playing was fading; thus, two clarinets in C could be used. In Example 1, there is a rhythmic complexity for a two-keyed clarinet which was often missing in Fux's earlier works. In Example 2, notice the use of $b^{\flat}$ in measure six. $b^{\flat}$ would have to be forked fingering, since there was no key for $b^{\flat}$ at this time.

---


Music for the three- and four-keyed clarinet was written to fit that particular instrument, and was made by Berthold Fritz. In Example 3, the **Mass** (1720) by J. A. J. Farber (?), only those notes available on the clarinet appear. Notice, in Example 3, the use of the low $e$. The low $e$ was added by Denner shortly before the **Mass** was written.


Antonio Vivaldi (1675-1741) used the clarinet in his **Concerto in DO Maggiore No. 1** (four-keyed clarinet would have been in use around 1730). In this piece, accidentals are rare with the range staying in the clarion register. The running passages are scale-wise, with fairly large leaps also appearing as shown in Example 4, measures 5-8 and measures 12-13.

The Standard Five-keyed Clarinet

To meet the growing demands of the music for a clarinet with greater range and facility, instrument manufacturers increased the number of keys from four to five by 1760. The range of the clarinet was increased from $e$ to $e^b$...
The inherent problem of playing one instrument in various keys made it necessary to use clarinets built in different pitches. The main reason for using a set of clarinets was that one instrument could not easily be played in every tonality. Playing the different pitched clarinets became very awkward since players were constantly changing from one instrument to another. Problems of intonation caused by mouthpieces of different sizes and reeds responding differently were obstacles to the players.

In order to gain more control over intonation problems, the clarinet was divided into a number of separate joints. These joints were the mouthpiece, barrel, left-hand joint, right-hand joint, lower-joint, and the bell. Some clarinets were made with a lower-joint between the right-hand joint and the bell. Before 1750 the players could not interchange joints to alter the pitch of the clarinet. The changing of joints on the clarinet to alter pitch was developed from the practice of changing of crooks used by the horns. The term used to denote this interchange was corps de rechange. Armand Vanderhage discussed this idea in his clarinet tutor of 1785.


In the 1780s, clarinets were pitched in C, B\textsubscript{b}, and A. The instruments were made of boxwood while ivory or bone ferrules were provided to strengthen the joints and protect the end of the bell. The instrument had a nearly cylindrical bore beginning at a diameter of 13 mm. near the mouthpiece and expanding to 18 mm. or more at the top of the bell joint. In the transition, the instrument now called the C clarinet retained the natural scale of F major from the F chalumeau. The pitch name of the instrument was taken from the concert pitch which sounds when c is read. The B\textsubscript{b} and A clarinets were developed from Denner's C chalumeau as a result of minor changes to solve intonation and fingering problems in the various keys.

Between 1730-1780, music for the clarinet was gradually being written in transposed form (see Examples 5, 6, and 7). This allowed the performer to use one set of fingerings for the instrument with interchangeable joints. Composers had to specify the instrument to be used in a particular work and make a choice as to which instrument sounded better.

Composers were interested in writing for the clarinet, but during the seventeenth century many technical difficulties had yet to be overcome. The standardization of the clarinet into the five-keyed instrument gave the eighteenth-century composer the inspiration to compose more interesting parts for the clarinet. Johann Stamitz (1717-1757), famous conductor and composer of the
Mannheim School, often stressed the importance of wind instrument parts in his orchestras. His standard scoring was for strings, 2 horns, 2 oboes, or 2 clarinets. In 1754, Stamiz conducted the Paris performance of his symphonies which established the use of clarinet in the Concert Spirituels. By 1758, the Mannheim Orchestra used two clarinets. After this date, the clarinet gradually appeared in various other German and Austrian orchestras. The young Mozart was impressed by the sound of the Mannheim orchestra and wrote to his father, "... you can't guess the lordly effect of a symphony with flutes, oboes, and clarinets." In specific works of J. C. Bach, J. Haydn, and W. Mozart, the music for the clarinet became an important aspect in developing texture and quantity of sound in orchestral music.

For example, in the J. C. Bach Symphony No. 1 for two clarinets, bassoon, and horn, the music never goes below $f'$ or above $d''$ for the clarinet. Accidentals are $f\#'$, $g\#'$, and $c\#'$, which were on the five-keyed clarinet, and the numerous sixteenth-note runs are usually scale-wise. In Example 5, the first clarinet part is the important voice, while the second clarinet, horn, and bassoon are strictly accompanimental figures. (Original form had transposed parts.)

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Example 5. J. C. Bach, Symphony No. 1 for two $B^b$ clarinets, horn, and bassoon, measures 30-33. (microfilm)
In the early eighteenth century, the clarinet was used primarily as a harmonic instrument. Haydn and Mozart realized that they had an instrument of great potential which could create different orchestral coloring.

Haydn did not use the clarinet until his later works of the 1790s and 1800s. In the Harmoniemesse (1802), the clarinet part remains within the capabilities of the five-keyed clarinet. The "Kyrie" of the Harmoniemesse has as an opening statement a combination of $B^b$ clarinet and strings. The movement is in the key of $B^b$ major and is an early example of the clarinet becoming a leading solo instrument as shown in Example 6. In Example 7 Haydn uses the clarinet to introduce the "Gratias" in the Harmoniemesse.


The clarinet doubles with the violin (orchestration practice of the 18th century). Clarinet parts were gradually becoming more technical with less of the accompanimental figures.
Example 7. J. Haydn, "Gratias," from Harmoniemesse, B♭ Clarinet part, measures 71-77.

After returning from one of his many travels, and hearing the clarinet for the first time, Mozart wrote to his father; "... if only we had clarinets." Mozart began to use the five-keyed clarinet around 1770, and was one of the first composers to explore the chalumeau register of the clarinet. Mozart's operas were an ideal place for him to write for the clarinet in creating music to depict characters on the stage. His use of the clarinets in the opera orchestra was made possible by the technical capabilities of the instrument and the performer. The parts for the five-keyed clarinet were difficult, but Mozart did not compose parts which could not be played.

In Example 8 from Cosi fan tutte, Mozart used the low notes of the chalumeau register in the second clarinet part, while the first clarinet plays the melody. Mozart was one of the earliest composers to expand the use of the lower clarinet register.


Another example (9) of his use of the chalumeau register is in the "Trio" of Symphony No. 39 (1788). Mozart explored various color combinations of the wind section as shown in Example 10. He also freed the clarinet from its previous responsibility of sustained harmony. Mozart wrote clarinet music which was more


melodic and with rapid rhythms as shown in Example 11 for a five-keyed clarinet. The winds were handled with the utmost freedom, both in thematic work and in accompanimental figures.


The tutors (instruction books) of Armand Vanderhagen (1780-1782), Jean Gehot (1784-1786), and Reynvaan (1795) were written for the five-keyed clarinet. For the next forty years, the clarinet manufacturers, tutor writers, and performers concerned themselves with the perfection of and performance on the five-keyed clarinet, called or referred to as "The Classical Clarinet." Plate III shows a reproduction of the classical clarinet and fingering chart. Plate IV shows a series of clarinets from the soprano chalumeau to the Müller clarinet.

In 1790 Jean Lefèvre (1763-1829), a teacher at the Paris Conservatory, added the sixth key for c♯ and g♯.

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PLATE III

A reproduction of the classical clarinet and fingering chart
A series from the soprano chalumeau to the five-keyed clarinet and the Müller clarinet
The seventh, eighth, ninth, and tenth keys were added to achieve an extended range, purity of tone, and to further correct faulty intonation. The keys which were added from 1690 to 1790 produced the notes which are shown in Figure 3.21

![Fig. 3. Dates of addition of keys to the clarinet](image)

Changes in the Mouthpiece and Reed

The mouthpiece of the classical clarinet retained the old principle of the single vibrating reed, but the reed was more tapered and had a reduced width. Some of the mouthpieces were whittled from a block of wood while others were made from two blocks of wood held together by two pieces of metal tacked along-side. These mouthpieces resembled the shape of the modern mouthpiece and used string or leather to secure the reed. One of the earliest descriptions of the reed is in a tutor by Johann Backofen (1803). He said that "... the reed was small, narrow, and hard, either thinned down towards the tip or with a blade of

equal thickness to the tip." In the early 1800s, the players began the practice of controlling the reed with the lower lip rather than the upper lip.

Nineteenth Century

Further Addition of Keys to the Clarinet

The increasing demands of virtuosi such as Iwan Müller (1786-1854), Johann Simon Hermstedt (1778-1846), and Heinrich Joseph Bärmann (1784-1847) fostered a need for mechanical improvements on the clarinet. They demanded better key position, evenness of tone, and an increase in the technical capabilities of the instrument.

Iwan Müller collaborated with Merklein, a Viennese instrument manufacturer, and Gentellet, a French instrument manufacturer, to effect further improvements on the clarinet in 1811. Müller selected the $B^b$ clarinet for his work because it was midway between the C and A. Müller insisted on the re-location of tone-holes in an attempt to improve intonation without respect for accommodating the fingers. He devised the mechanical system to adjust to the awkward new position of the tone-holes and was responsible

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\(^{22}\)Ibid., p. 302.

\(^{23}\)Iwan Müller, Méthode pour la nouvelle clarinette et clarinette-alto (Paris: Gambaro, ca. 1821), p. 25.
for the design of a new rounded key cup and the stuffed leather pad. Müller also created the first instance of alternate fingerings for the lower notes by soldering additional levers for the f#, c', a', and e'. The addition of these levers and keys increased the system to thirteen keys. When the thirteen-keyed clarinet was introduced in 1812, it became the custom to hold the reed on the mouthpiece with a metal band or ligature which could be clamped tightly to the mouthpiece with a screw. These developments improved the performer's control over intonation.

Müller's intention was to make a clarinet with a uniform quality of tone and improved intonation. He also wanted to increase the clarinet's technical capabilities so that a player would need only one instrument to play a composition in any key signature.24

An official French Commission composed of five composers and two clarinetists was appointed in 1812 to evaluate Müller's clarinet. The composers were Luigi Cherubini (1760-1842), a conservative by nature and well known for his operas; Francois Joseph Gossec (1734-1829), active as a conductor, concert manager, and known for his symphonies and string quartets; and Etienne Méhul (1763-1817), whose operas were remarkable for their dramatic

power and for the novelty and effectiveness of his orchestration. Other members of the commission were Charles-Simon Catel (1773-1830), Professor of Harmony at the Paris Conservatoire, who wrote mainly operas for the French stage and Bernard Sarrette (1765-1858), director of the Parisian band of the National Guard and founder of the Paris Conservatoire. The two clarinetists Jean Lefèvre and Frédéric Duvenoy were non-voting members of the Commission.

Müller wrote to the Commission several times, pleading with them to make an announcement concerning their evaluation of his new instrument. In Figure 4, is a copy of one of Müller's letters to the Commission. Below is a translated summary of that letter.

Your excellency is the protector of the arts and a supporter to the artist.
I have pleaded in vain in the interest of workmanship for you to come to some conclusion about this instrument.

The Commission rejected the Müller clarinet. Their reasoning was "... that the tonalities achieved by the interchangeable pieces were in fact of great necessity to the subtlety of the art. The myths of music were operating strongly in this adherence to tradition, and the members of the Commission were not of a mind to accept the idea that there was a possibility of alleviating a physical inconvenience due to the accommodation of the hand
À Son Excellence le Ministre de l'Intérieur,

Montagnac.

[Signature]

Le 17 Octobre 1812.

Le Ministre de l'Intérieur.

[Signature]

J'ai le honneur de vous présenter mes respects et mes sentiments les plus sincères.

Fig. 4. Müller's letter to the Commission
Müller's reforms began to solve the clarinet's acoustical problems, such as the function and correct position of the register key-opening, the most accurate distribution possible of the finger and key location, and their influence on the purity and fullness of tone. Plate V is a reproduction of Müller's clarinet and mouthpiece.

The Boehm System Clarinet

In 1843-1844 Hyacinthe Klosé and Auguste Buffet devised a new clarinet based on Müller's design, which made it possible to play all the music in any key on one instrument. They applied the principles of ring keys devised by Theobald Boehm (1794-1881) in 1832 for the flute. Boehm himself had nothing to do with the Boehm clarinet except for his ring key design which became an integral part of the clarinet mechanism. Two basic principles were followed in constructing the Boehm clarinet: (1) "to place the tone-holes of the instrument where the laws of acoustics demand that they should be and (2) to continue a mechanical key system which would serve the purpose of covering the necessary holes, and actually improve the facility of the fingering system." 26 The primary components of this

26 Ibid., p. 161.
PLATE V

A reproduction of Müller's clarinet and mouthpiece
mechanism were rings, keys, rods, and clutches which connected the key mechanism together. The Boehm clarinet had twenty-four tone-holes governed by seventeen keys and seven rings. The system freed the little fingers from the task of sliding or gliding from key to key. Plate VI is a reproduction of the full Boehm clarinet. The exterior was improved in appearance, as greater care was given to the fashioning of the keys.

The Boehm clarinet achieved an economy of fingerwork. The fingers are more comfortably placed and the mechanism is quicker and more responsive than that of previous clarinets. Duplicate fingerings are provided for e-b', f-c', f-c#', and there are fewer forked fingerings (an odd fingering combinations). In addition, trills and sequences are facilitated.

By the time of Beethoven's Ninth Symphony (1826), the clarinet had seven more keys than the clarinet of Mozart's time. The addition of these keys enhanced the technical possibilities of the clarinet. Müller's B♭ clarinet was in use at this time. Beethoven often used the B♭ clarinet but also used the A and C clarinets in his works. In Example 12, from the first movement of the Ninth Symphony, the B♭ clarinet would have to be the Müller instrument since alternate fingerings were required between d'' and e'''. The passage could be played by sliding the fingers but the Müller instrument simplified the matter and made the passage smoother. With the
PLATE VI

A reproduction of the Boehm clarinet
growing independence of the woodwind parts, Beethoven became more interested in each instrument's representative tone-quality. The clarinet tended to become one of a pair of soloists rather than just one voice in a choir of instruments.

Example 12. L. Beethoven, "First Movement," from Symphony No. 9, B♭ Clarinet part, measures 338 and 543.

In Example 13, the improved control the performer now had over the instrument is shown in the clarinet part of Der Freischuetz Overture by Weber. It also illustrates the clarinet's and the player's ability to crescendo, decrescendo, and morendo with a beautiful tone.

With the many improvements made during the nineteenth century, the clarinet became a much more flexible and versatile instrument. The tone-holes of the elaborate key-system of the Boehm clarinet were more evenly spaced and acoustically better situated than those on the preceding systems of the clarinet. These changes produced a more even quality of tone and an improvement in intonation. For an analysis of the clarinet tone, see the appendix. No longer did the music for the clarinet remain in the middle range. With Müller and Klose's new improvements, the performer could easily move over the entire range with ease and agility. Figure 5 shows the middle range of the clarinet and its entire range.

![Fig. 5. Range of the Clarinet](image)

The agility needed by the performer and the instrument are shown in Berlioz's Fantastique Symphony. Example 14 shows a rapid note passage in which the performer needs control over the two-note phrases to make it sound dolce. In Wagner's Götterdämmerung, Act I, the music becomes difficult and requires the performer to improve his skills. Example 15 shows the rhythmic changes, control of dynamics, and the overall musicianship which the improved
clarinet gave to the performers.

The Albert System Clarinet

E. J. Albert (Instrument maker) of Brussels based his clarinet of 1846 on Müller's design with refinement of the ring-key mechanism, rollers for the little-finger keys, the register key on top, and a separate key for both a and e# at the top of the upper joint. Intonation and tone were very good on this instrument. The Albert system mouthpiece had a long lay with a hard, narrow reed.

The Oehler System Clarinet

Oskar Oehler (d. 1940), a Berlin instrument manufacturer, had a clarinet with twenty-two keys, five brille rings (piece of metal around the hole), and one finger-plate (solid metal plate over a hole with a small hole bored in it). This clarinet is still being used in some European countries.

Other Systems of Clarinets

Antonio Romero introduced the Boehm system clarinet to Spain in the 1850s and immediately began to devise an improved system for crossing the break. His design was the one-piece body with twenty-eight holes which transferred many of the left-hand duties to the right-hand. This mechanism was constantly in need of adjustment.27

The Barret action (named for A. M. Barret, oboist) is said to be Frédéric Triëbert's invention for the oboe (1850) which takes two keys and replaces them with one. This was tried on the clarinet. It facilitated difficult trills and combinations in keys of more than two flats and three sharps.

The Schaffner system clarinet was developed by H. L. Schaffner of Florence, Italy, in the 1850s. The instrument was in one piece and made of ebonite (synthetic). It was squared for the bottom part of its length while the upper part had a circular neck and socket to receive the mouthpiece, and had twenty oblong and rectangular toneholes. The system necessitated frequent and skilled adjustments. Plate VII is a reproduction of other systems of clarinets.

There were many different systems placed on the clarinet during the nineteenth century, but none with the lasting effect of the Boehm system.

Twentieth Century

Clarinets today are made of grenadilla wood or vulcanized rubber. Grenadilla wood is close-grained and has a dark brown color until aged and soaked in oil which turns it black. When subjected to extreme temperature changes, the wood may split. This splitting has led to the use of synthetics such as ebonite or hard rubber in making clarinets, but most professional performers prefer
PLATE VII

Romero, Oehler, Schmidt Reform, Quarter-tone clarinets
Mouthpieces can be made of ebonite, glass, plastic, or crocus-wood. The reed is fitted to the mouthpiece with a metal ligature. The mouthpiece tip is broader and the aperture wider than the nineteenth-century mouthpiece. Also, the reed is longer than those used in the previous centuries. Figure 6 is a diagram of the mouthpiece and reed.

Fig. 6. Diagram of mouthpiece and reed
The Boehm system clarinet is standard in France, Latin America, North America, and England. In Germany and countries influenced by Germany, the clarinet is based on Müller's design. The only change of recent importance occurred in the 1950s. Manufacturers made an acoustical correction for a more precise production of the third and fifth partials by a corrective design for the speaker key. This correction allowed for the "separation of function of the speaker aperture required to allow the proper use of it as a tone-hole by the supplementary action of a resonance aperture, and at the same time to improve its use as a speaker key." 28

Several well-known manufacturers of today's clarinets are Selmer, Buffet, Leblanc, and Boosey and Hawkes. The B♭ clarinet is 66 cm long and the bore in the mouthpiece is 14.5 mm and expands to 21.8 mm at the bell. 29

The important schools of clarinet playing include the French, which uses the Boehm system with a narrow bore of 14.9 mm and a mouthpiece with a short lay with a soft reed. In England, players use the Boehm system with the


bore exceeding 15 mm and a mouthpiece with a medium length lay with a medium hard reed. The German School uses an Albert system clarinet with a longer length, cylindrical bore, and a mouthpiece with a narrow and pointed beak with a small hard reed. In America, players use the Boehm system with a 14.5 mm inverse conically shaped bore and medium length lay mouthpiece with a medium hard reed. Figure 7 shows a table of various materials used in construction of the clarinet. Plate VIII is a reproduction of today's clarinet and mouthpiece.

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<tr>
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</table>

Fig. 7. A table of various materials used in the construction of the clarinet
PLATE VIII

A reproduction of today's clarinet and mouthpiece
Conclusion

The chalumeau, pitched in C and F, was a primitive folk instrument with a range from f to f'. With Denner's improvements, the instrument known as the chalumeau became the clarinet. By the 1720s, the music written for the chalumeau had reached the limits of the instrument's capabilities. The improvements on the clarinet by Denner enabled composers to expand their usage of the instrument within a composition. The inherent problem of playing one instrument in various keys made it necessary to use clarinets built in different pitches. The main reason for using a set of clarinets was that one instrument could not easily be played in every tonality. In order to gain more control over intonation problems, the clarinet became an instrument with interchangeable joints pitched in C, B♭, and A.

Denner's F chalumeau evolved into the C clarinet. The B♭ and A clarinets developed from Denner's C clarinet as a result of minor changes made to solve intonation and fingering problems in the various keys. The music for the clarinet was written in transposed form during Mozart and Haydn's time and composers specified the pitch of the instrument to be used.

The clarinet of Müller improved intonation and tone quality and the player needed only one instrument to play in any key. Müller made his improvements upon the B♭
clarinet which has become the standard instrument of composers of the late nineteenth and twentieth centuries. The growth and development of music also coincided with the improvements on the clarinet. An important part of this musical growth created a change from the non-transposing C clarinet to the transposing $B^b$ and A clarinets.
CHAPTER III

CHANGES IN THE MUSIC AS DIFFERENT PITCHED CLARINETS DEVELOPED

The Composer's Choice of Clarinets

Introduction

The evolution of the clarinet with its method of producing a tone and the mechanical design are contributive factors to the development of performance styles. The development of styles also contributed to the change to a transposing instrument.

Development of Music for the Clarinet: The Chalumeau

The first parts in music for the chalumeau occurred in M. A. Ziani's Caio Pompilio (1704), A. Bononcini's Conquista delle Spagne (1707) and Turno Aricino (?), and A. Ariosti's Marte placato (1707). In the catalogue of Etienne Roger, published in Amsterdam in 1704, were found the following listings:

Livres de pièces pour les Flutes, les Hautbois, le Chalumeau et pour les Violons à la Francaise à 2, 3, ete parties

Fanfares pour les Chalumeaux et les trompettes, propres aussi à jouer sur flutes, violons et hautbois, à 2 et 3 parties composées par Jacques Philippe Dreux.²

The pieces in the latter work were not all fanfares, but bear such titles as Air, Marche, Rondeau, Minuet, Gigue, La Chasse, Canon, etc. "They are scored for two instruments. The range is from $g'$ to $g''$ and the key is C major. The rhythm is the same in both parts which move in parallel thirds, fourths, and fifths. The overall primitive character of the music points to the use of instruments of limited possibilities."³ Example 16 shows "Air" from the Fanfares of J. P. Dreux, which illustrates this usage and simplicity of writing.

The 1716 Catalogue of Roger listed the following:

Airs à 2 Clarinettes ou deux Chalumeau and Airs for 2 Chalumeaux, 2 trumpets, 2 clarinets, with Huntinghorn or oboes.⁴ Both pieces were by M. Dreux. These advertisements suggest that the chalumeau and clarinet existed side by side for the first two decades of the eighteenth century.


⁴Ibid., p. 7.
One of the earliest compositions written in France which used the chalumeau was *Concerto de Chalumeau avec Accompagnemens de la Simphonie* (1728) whose composer was unknown. In Germany, Reinhard Keiser used the chalumeau in his opera *Croesus* of 1710. The opening measures of *Croesus*, Act I, Scene 10, demand a fair amount of ability from the chalumeau player. The aria is in F major with the ranges of the three chalumeaux from $b'$ to $a''$, $g'$ to $d''$, and $d'$ to $c''$. Example 17 shows the opening bars of the 1710 version. The parts are evidently scored for the improved chalumeaux with added $b_b'$ key and $a_4'$ key. These keys extended the limited range of the old chalumeau which did not have $b_b'$ and $a_4'$ keys. In the 1730 version of *Croesus*, the opening measures show a change in key to A major with changes in the chalumeaux lines as shown in Example 18. This revision, though indicated for chalumeaux, requires the addition of several keys to the instrument ($e^#'$, $f^#'$, $g^#'$, and $a^#'$) which would probably have been the true clarinet. These key additions were made to the clarinet and not to the chalumeau.

Example 17. Reinhard Keiser, Croesus (1710), Chalumeaux parts, measures 1-20.
George Frederick Handel was one of the earliest composers to use the chalumeau as an accompanying instrument. In the opera, *Riccardo Primo* (1727), Handel wrote a chalumeau part which was elaborate and quite independent from the chalumeau doubling of the oboe. Handel's original score called for two chalumeaux, two violins, viola, and continuo as accompaniment for the F major aria "Quando ne vedo la cara madre." The chalumeaux were used either in unison or in thirds for the obbligato passages, with a range from $f'$ to $g'''$ as shown in Example 19. An earlier work, *Tamerlano* (1724) employed the clarinet in the air "Par che mi nasa." It was possible that some German musicians may have brought to England specimens of the new instrument (Denner Clarinet) in this part of the eighteenth century and Handel, ready to try new

experiments in orchestration would have used the clarinet. At a later time (1740s), Handel composed the *Overture in D* for two C clarinets and horn indicating continued interest in the possibilities of the clarinet. This work, one of the earliest of this partnership, illustrates the combination of the clarinet and horn in the clarinet's struggle to gain a foothold in the concert hall as an orchestral and chamber instrument.

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The notes of the break were omitted since there was not a $b^\flat$ key and the instrument for which the Overture was written may not have been as advanced as that used by R. Keiser (See p. 55).\(^7\)

The Cantata bey der Zurückkunft Ihre Hochfüstl (1728), by Johann Ludwig Bach, used a solo chalumeau. The range of the chalumeau was from $f'$ to $b^\flat$ (an upward extended range) and the key was $B^\flat$ major as shown in Example 20. This work also demanded more facility of the instrument and player in the execution of the sixteenth notes.

C. W. Gluck wrote for the chalumeau in *Orfeo* (1762), using the chalumeau offstage (creating an echo effect with the violins) with the orchestra to accompany the aria "Chiamo il meo ben cosi" in Act I for dramatic purposes. The music was written in the key of F major with a range from $f'\text{ to } e^\flat''$ (a smaller range than the more developed clarinet - possibly because the tone quality was not desirable) as shown in Example 21. In the opera *Alceste* (1767), Gluck used the chalumeau but at a later scoring changed to the clarinet. The later change in specification of clarinet for *Orfeo* and *Alceste* was done after Gluck went to Paris (1778), where the clarinet was in more common use than in Italy. After changing to the clarinet, Gluck continued to use the instrument in its middle register. In *Alceste*, he wanted to create a theme of desolation in the aria "Ah, malgré moi" and the middle range of the instrument would reinforce that effect with the rather sombre quality of that range.

Other composers to score for the chalumeau, in the early part of the eighteenth century, were Telemann, *Sieg der Schönheit* (1722); Hasse, *La virtù appie' della Crocer* (1737) and *Alfonso* (1738); J. J. Fux, *Guinone placata* (1725); and Christoph Graupner, *Overture à 3 Chalumeau* (?)\(^8\).

Forward looking composers of the first half of the eighteenth century were beginning to choose wind instruments for individual timbres. The choice and use of tone-color became a feature of their orchestration. The quality of sounds and the effect of various combinations were beginning to be very important. With the use of the chalumeau, composers were able to distribute tone-color between flutes, chalumeaux, and oboes. The changes in instrumentation allowed the composers to vary the color within the movement itself, instead of changing color with each movement.

As shown in the orchestration of Keiser in his Croesus, flashes of independence bring about a more varied orchestral effect. The chalumeau for which he wrote was merely a two-keyed instrument with seven finger-holes and
a narrow range. The parts required the performer to be sufficiently expert on his instrument and to execute these parts. The chalumeau parts of J. C. Bach required considerable technique for the performer on the chalumeau but today's clarinet player would find the passages easy to master.

The Clarinet parts began to appear sporadically in orchestral scores and parts soon after the middle of the eighteenth century, and for about twenty or thirty years they were often used in place of oboes. One of the earliest clarinet parts was written by J. A. J. Faber for a Mass dating around 1720 for the Cathedral in Antwerp.\(^9\) The Mass used the C clarinet and was specifically for that particular instrument, not a chalumeau. In the "Qui Tollis" of Faber's Mass, the clarinet was treated as an integrated orchestral instrument. In Example 22, measures nine to eleven show the use of arpeggios in the chalumeau register descending to \textit{f} (lowest note at this time on the clarinet), which was unexpected because of the clarinet's then limited capabilities. Notice should be taken of the judicious absence of tones between the break (\textit{b}_b^\flat and \textit{c}'').\(^{10}\)

\(^9\)Ibid., p. 178.

The clarinet was used by Vivaldi. He first used the term salmo (chalumeau) in the *Concerto funebre con Hautbois, sordini e violi all'Inglese (?)*. The range was $f$ to $b^b$, written in the $F$ clef. "By transposing the part an octave higher, it corresponds to the clarinet of J. C. Denner."\textsuperscript{11} (See p. 10) Vivaldi also used the soprano salmo in the oratorio *Juditha*. The range was from $b^b'$ to $b^b''$, using the higher register of the instrument. He also called for two claren with the same range as the soprano salmo (chalumeau) which could have meant either the high trumpets or chalumeaux (since the term still applied to both instruments at this time). The writings for the chalumeaux, salmo, and high trumpets do not differ. According to Pincherele, Vivaldi was one of the first to treat the chalumeau (clarinet) as a true orchestral instrument.\textsuperscript{12} As exemplified in *Concerto con 2 Haut bois, 2 clarinets, 3 Istromti and a e istromti* in 1730. The *Concerto* was intended for the two-keyed instrument with a range from $g$ to $g''''$.\textsuperscript{13} The writing was mainly diatonic with short scale passages, rapid triplets, and easy trills,


\textsuperscript{12}Ibid., p. 127.

which shows the improvements made on the instrument by this time. The accidentals used are $b^b$, $e^b$, $f^#$.

J. J. Fux (1660-1741) used the combination of two C clarinets and two oboes in his *Concentus Musico-Instrumentalis* of 1701. The clarinets open the *Concentus* with sixteenth-note runs with the parts being diatonic in the key of C major. The adagio of the "Intrada" in Example 23 shows the clarinet playing the melodic line without being doubled by other instruments recognizing its soloistic character. Fux's method of scoring preceded other composers in using the clarinet as a solo instrument. In his opera, *Constanze e Fortezza* (1723), Fux used two clarinets in C to play trumpet calls, replacing the older clarion trumpet playing.


J. P. Rameau (1683-1764) was a pioneer in using instruments to improve tone-color in the orchestra and was among the earliest composers to write for the clarinet. He added clarinet parts to the pre-existing score of Castor et Pollux (1737) and to Temple de la gloire (1745). Two clarinet parts were also added to the score when he revised Zorastre (1756). In Acante et cephise (1751), two D clarinets and two horns in four-part harmony were used in the entr'acte "Pastorale-Heroique" between acts two and three. The use of clarinets and horns show a skillful use of tone-color as used by Handel in England. The pairing of these different instruments becomes very important in the development of orchestral writing from the 1750s onward to present day writing. The "Overture" was divided into three sections with the clarinets being used in "Feu d'artifice" as shown in Example 24 and in the "Fanfare" in Example 25. Acante et cephise was one of the earliest instances of the clarinet's use in French orchestras and quite exceptional in Rameau's work. Rameau wrote some sections of Acante et cephise in the key of A major which was awkward on the clarinet because of the $\flat$ which had to be played by changing the embouchure.

Alexander de la Pouplinière (1692-1762) included clarinets in his Paris orchestra in 1750. He preferred the horns to play in octaves and the clarinets in thirds, for a "calm and restful sound." The Paris performances of symphonies by Johann Stamitz, sponsored by Pouplinière, influenced the *Concert Spirituels* to establish the use of clarinets (1754).

François Joseph Gossec (1734-1839) used the clarinet in his orchestral writings for his *Te Deum* and *Messe des Mortes* (1760). He used clarinets in C, B♭, and A in *Le Triomphe de la République* (17??). In his *Symphonie A Dix*, Gossec used a pair of flutes and a pair of clarinets. The music calls for a B♭ clarinet rather than the more piercing and obtrusive quality of the C clarinet. Gossec apparently felt that the B♭ instrument was able to blend better with the other instruments than the C clarinet. Gossec served as conductor of the *Concert Spirituels*, the opera, and Pouplinière's orchestra, which used two clarinets. The clarinet players in La Pouplinière's

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15 Alexander de la Pouplinière was a businessman and secretary to the Court. He was an amateur musician and sponsored many musical groups including an orchestra. Pouplinière was involved in musical performances and took an interest in improving orchestral techniques of the time.


orchestra were one Flieger and Gaspard Procksch who also composed symphonies and chamber works for the clarinet.\textsuperscript{18}

C. W. Gluck (1714-1787), as shown in earlier examples, used the chalumeau in \textit{Orfeo} and \textit{Alceste} but rewrote the part for the clarinet in C for the Paris performances. Gluck used the clarinet with oboes, violins, flutes, or horns, but rarely as a solo instrument.

The Use of the Clarinet in England

Although Handel had used the chalumeau, the first reference to the use of the \textit{clarinet} in England was in an "Air" from \textit{Dr. Faustus} (1723) performed by Mr. Charles.\textsuperscript{19} Mr. Charles also performed solos in 1737 at Stationer's Hall. At first, English composers treated the clarinet like a horn. One newspaper advertisement in 1762 announced a concert at Ranelagh Gardens in which the French horns and clarinets would play their favorite pieces.\textsuperscript{20} (Another example of the pairing of the clarinets and horns.) The clarinet's tone was penetrating and most suitable to be played out-of-doors.

\textsuperscript{18}Georges Cucuel, \textit{La Pouplinière Et La Musique De Chamber au XVIII Siecle} (New York: Da Capo Press, 1971), p. 338. (Cucuel does not give a listing of work


\textsuperscript{20}Ibid., p. 282.
Thomas Arne (1710-1778), in his opera *Artaxerxes* (1762), used the clarinet in C to accompany the aria "Water Parted." This opera is one of the earliest which calls for the clarinet in an opera score. In *Thomas and Sally* (1769), Arne combined C clarinets with horns. In the opening measures of the "Overture" (Example 26), the sound of the clarinets and horns begin playing from the wings of the stage, then the clarinets and horns appear on the stage playing the introduction to the "Overture." The parts were played by Karl Barbandt and Karl Weichel, both oboists. They were paid 10 shillings and 6 pence for doubling on the clarinet - a sizable sum indicating the necessary additional musical expertise. In the *Fairy Prince* (1771) by Arne, "The Fairy Duet" and "Seek You Majesty to Strike" were accompanied by clarinets and bassoons. Arne moved with the times by using frequent woodwind solos.

J. C. Bach (1735-1782) wrote for the $B^b$ and $D$ clarinets in his opera *Orione* (1763). This was his first opera written in London and, according to Charles Burney, the first occasion in which clarinets were used in an English opera. (Burney does not mention the Arne work, p. 71.) Bach's scoring for the clarinets in *Orione* was neither adventurous, remarkable, nor lengthy. They were prominent only in the "Overture" and in repeated passages of four bars in the first act, which are shown in Example 27. Elsewhere the clarinets are grouped with the horns and the third oboe. In the middle movement, "Andante," the clarinets are silent and in the finale, "Allegro," they are conspicuous only in a short passage which is shown in Example 28. Bach was one of the first composers to indicate in the music a change of instruments. When the music modulated to a flat key, the $B^b$ clarinet was used instead of the $D$ clarinet. Bach's use of the clarinets in the arias was equally sparse. They were employed only in "Enopiones Ferma crudello sdegno" and "Di quest alma desolata." Charles Burney wrote of *Orione*:

Every judge of music perceived the emanation of genius throughout the whole performance but were chiefly struck with the richness of harmony, the ingenious texture of the parts, and above all, with the new and happy use he made of the wind-instruments.


(These examples are less sophisticated in use of the clarinet than previous and contemporary examples.)
this being the first time that clarinets had admission in our opera orchestra.\textsuperscript{21}

J. C. Bach's *Amadis des Gaules* was produced in 1779 on a scale which dwarfs his earlier operas. The orchestra was very large, with strings, two flutes, two B\textsubscript{b} clarinets, two bassoons, two trumpets, two horns, three trombones, and timpani. (Presumably the B\textsubscript{b} clarinets were used because of their mellow, blendable qualities.)

Bach was less disposed to use the clarinet in his symphonies. The clarinets were used in *Op. 18*, in a Wolfenbüttel MS., *Op. 21*, No. 2 and in a *C Major Symphony*. Bach also wrote military marches: 2 *Marsche, Nr. 1 vom ersten, Nr. 2 vom Zweiten Bataillon Garderegiment in Hannover, Due Marce di Cavalleria e d'Infanteria le Prince Wallis de la Gran Bretagna d'un Regiment di Dragoni*. They were all written for two clarinets. (Probably B\textsubscript{b} instruments because most military bands at this time used B\textsubscript{b} clarinets.) Bach also wrote several *Odes* using B\textsubscript{b} clarinets together with horns, using the now popular combination of instruments.

William Jackson (1730-1803) was also one of the first to write for the B\textsubscript{b} clarinet. The *Lord of the Manor* (1780) used two players who played the flute, oboe, and clarinet. Jackson's treatment of the clarinet was as though he was unsure of their availability for the

\textsuperscript{21}Ibid., p. 322.
clarinet part was dispensable. He would have had clarinets as a part of the Drury Lane Theater orchestra; however, few clarinets were used in the provincial orchestras, and if the work were performed elsewhere, some other instrument had to play the part.

In Telemachus (1777), an opera by Philip Hayes (1738-1797), the "Galante Overture" used clarionets as a solo instrument. The instrument indicated as "clarionet" appears in a number of arias by Hayes.22

The instrument for which Gluck, Rameau, Arne, and Bach wrote was the three-keyed or possibly the four-keyed clarinet. The instrument at this time had some chromatic possibilities which improved the tone quality and intonation, thus making it more acceptable to the composers. The addition of clarinets was a distinct gain to the substance of the woodwind harmony. The clarinet was able to blend with other instruments which was ideal for its use in the orchestra. At first the parts for the clarinet were rapidly becoming more important as solo instruments.

The Use of Clarinets in Germany

The Mannheimers were not solely responsible for the introduction of the clarinet into the orchestra but their orchestra played a decisive part in the general adoption of the instrument. From 1758 onwards, there were two

clarinetists in the orchestra. Karl Stamitz used the
clarinet as a melodic instrument and made few technical
demands on the players in his orchestral music. Stamitz
used the low register of the clarinet, as Faber did in his
Mass. (See p. 64.) Stamitz used the low notes for
chordal figures.

Joseph Haydn (1732-1809) developed his interest in
the clarinet from hearing Mozart's use of the instrument
in his operas. He employed the clarinet in his symphonies
No. 99, 100, 101, and 103. In the $E_b$ Major Symphony
No. 99, he used the sonorous chalumeau register of the
clarinet as an effective bass for the strings. In the
"Military," Symphony No. 100, he used the penetrating C
clarinet in the "Allegretto." The piece increases his
ordinary symphonic orchestra by military instruments:
triangle, cymbals, bass drum, and the clarinet. In
Symphony No. 103, "Drum Roll," Haydn used the $B^b$ clarinet
which was one of the first performances with doubled wood-
winds in his orchestra. In the "Allegro," Haydn used the
clarinet in the quiet passages to create a darker sound
to contrast the previous trumpet fanfares. He used the
A clarinet in Symphony No. 104. The Divertimentos in C
Major used two C clarinets. Other works by Haydn and
scored for the clarinet were the Mass of Incarnatus, The
Creation, The Seasons, Theresien Messe, and Harmonie Messe
(Wind-band Mass). Example 29 shows a clarinet part from
the Harmonie Messe exemplifying Haydn's clarinet writing
which shows little experimentation for the instrument. He wrote in a very precise and straightforward manner for the clarinet, as in Examples 6 and 7 in chapter II. (See pp. 24-25) This example is relatively simple writing for the more sophisticated instrument of this time. The thirty-second notes would present no problem at this tempo.


In Missa in tempore belli, Haydn doubled clarinets with oboes but later separated the clarinets for a brief section and then returned to the original doubling. Haydn wrote seven marches, mostly in the key of $B^b$ major, scored for three clarinets, two bassoons, and two horns. Another use of clarinet doubling by Haydn is shown in Example 30, the Notturni for two lire organizzate, two clarinets, two horns, two violins, and bass. The two clarinets play in thirds (in the manner of Handel's writing for the chalumeau in Example 19) and often double the lira part in octaves in measures 4-7. This is a graceful piece, soft-toned, with technical limitations because of the two
principle lira instruments. The work is in three movements.

Wolfgang A. Mozart (1756-1791) first became acquainted with the clarinet in 1764 in London. He transcribed a symphony of C. F. Abel which was scored for two clarinets. In Mannheim and Paris, Mozart had a chance to study the clarinet in more detail. Beginning with Idomeneo (1780), he included the clarinet. This work showed greater independence for the woodwinds and their frequent employment for the most subtle touches of color and expression. Mozart brought out the most brilliant possibilities of the clarinet, and by using clarinets in the keys of A, E, E\textsubscript{b}, and B\textsubscript{b} he revealed the clarinet as richer and more resourceful than any other wind instrument. "The chalumeau octave is deliciously nutty in arpeggios, and dramatically hollow in sustained notes."\textsuperscript{23} Mozart did not find the high notes appealing. He used the clarinet's sound for particularly moving and soulful parts as in The Abduction from the Seraglio (1782). The C clarinet is used in Belmonte's first aria, "Hier soll ich dich denn sehen," and then not again until Constanze's aria, "Ach, ich liebt" where it emphasizes the pathos of the aria. Mozart also used the instrument to accompany

\textsuperscript{23}Donald Francis Tovey, "Instrumentation," Encyclopaedia Britannica (London: MacMillian and Co., 1944), p. 79.
Belmonte's and Constanze's duets. In *The Marriage of Figaro* (1786), there was a similar trend as in *The Abduction* where the clarinet does not appear for the first five numbers. When the clarinet does play, the part is intimate and sensuous as in accompanying the lovers Belmonte and Constanze. In Mozart's *Don Giovanni* (1787), the clarinet in B♭ was not transposed on the score. Mozart supplied an orchestral accompaniment with great variety of texture and tone-color. It reveals the same consummate craftsmanship and imagination of his other works. Mozart used the clarinets in lyrical and sentimental moments, often playing in parallel thirds. In *Cosi fan tutti* (1790), Mozart's B♭ clarinet part was for the first time transposed on the score as shown in Example 31. The clarinet can execute accompaniment figurations of a serious or humorous character sometimes better than other wind instruments. Mozart put this ability of the clarinets to good use in all of his operas. Mozart rarely employed the clarinet in his symphonies. He used it sparingly in the *Paris Symphony No. 31* (1778) and as a leading instrument in the *E♭ Major Symphony No. 39* (1788). In the "Trio" of the "Minuet" of the *E♭ Major Symphony*, he contrasted echoes on the flute with low arpeggios on the second clarinet as shown in Example 32. Mozart's use of the low register of the clarinet was not new. Faber (p. 64) used this technique in his *Mass*; Vivaldi in his *Concertos* (p. 65),

and also Karl Stamitz. Mozart, seeming to dislike the high register, seldom used the notes above g'''. Mozart does show a varying partnership in his wind combinations, more than previous composers. He would use clarinets and bassoons, flutes and clarinets and other combinations heard melodically and harmonically at various times. The D Major Symphony (1772) was one of the first times Mozart scored a symphony for full orchestra including clarinets. In the slow $A^b$ major movement of the Prague Symphony (1786), he uses a gurgling accompaniment in the second clarinet to possibly represent a naïve peoples' music. Mozart later (1789) added the clarinet to the G Minor Symphony No. 40 which had been written in 1788.

The clarinet of Haydn and Mozart was the five-keyed instrument made with interchangeable joints to alter the clarinet in pitch with a commonly used range of e to $e^b$. . . .
Mozart used clarinets in opera to characterize people on the stage, thus utilizing the peculiar qualities of the clarinet. Whereas, many composers wrote interchangeable parts for oboe or clarinet or used both. In early use of the clarinet, the oboe received the more active parts, but as was shown in the musical examples, the clarinet began to have more important parts requiring comparable facility.

In the area of mechanical development, it was discovered that the range of the music for the clarinet in the orchestra had grown from an octave and a half (1700s) to more than three octaves (1800s). The early clarinet parts were found to move diatonically, avoid large interval skips, and only touch the lower register of the clarinet. During the eighteenth century, composers wrote parts for two clarinets which were interchanged with two oboes. Beyond the composers considered in this chapter, clarinet parts were not really considered vital to the orchestra until Beethoven. The clarinet attained a comparable degree of rhythmic complexity in the late 1780s. When the clarinet did become playable in all keys in 1843, new heights of technical proficiency became obtainable.

The Use of the Clarinet in America

"In the autobiography of Benjamin Franklin, he states that he heard clarinets being played in Bethlehem,
Pennsylvania, in 1756." Early writing for the clarinet in America was by Moravian composers. David Moritz Michael (1751-1825), a Moravian, was especially interested in music for wind instruments. He wrote *Thirteen Partien* for two B♭ clarinets, two bassoons, two horns, and occasional flute or trumpet. Michael also wrote *Die Wasserfahrt* for two clarinets, two bassoons, and two horns. Samuel Holyoke (1762-1820) included the clarinet in his tutor, *The Instrumental Assistant*, which will be discussed in a later chapter. Peter Wolle (1792-1871) was one of the earliest composers to introduce the clarinet to American concert life.²⁵ Hans Gram (?) was the first to have an orchestral score published in America, *The Death Song of an Indian Chief* (1791).²⁶ It was scored for strings, two C clarinets, and two E♭ horns. The clarinet parts are shown in Example 33. The use of clarinets with horns was popular in European writings of an earlier time.


Peter Albrecht van Hagen (1750-1803) came from Holland (1774) to America, where he sold instruments and taught the clarinet for six dollars a month. He wrote orchestral pieces to fit the instrumentation of Boston Theatre orchestras which included the clarinet. Christopher Moller (?-1803), composer, organist, pianist, and editor, wrote *Duetti for Piano and Clarinet* (1790). The *Duetti* was advertised for performance at one of the 1792 City Concerts in Philadelphia.

The Philharmonic Society of Boston (1800s), under Johann Christian Graupner, included two clarinetists, Thomas Granger and Louis Schaffer.

The Concerts of this Society are chiefly instrumental; the music is always heard with attention and oft times delight. The orchestra consists of nearly all the gentlemen of the profession in town and its members are principally amateurs.
with vocal and instrumental ability.  

In 1807 Oliver Shaw (1779-1848) wrote *For the Gentlemen: A Favorite Selection of Instrumental Music*. It consisted principally of marches, airs, minuets, etc., and was written chiefly in four parts for two clarinets, flute, and bassoon or two violins, flute and cello.  

John Frederick Peter (1746-1813) used the B♭ clarinet as part of an accompanying instrumental group for choral works such as *Singet Ihr Himmel, Frohlocket auf Erden*, and *Das Heiligthum ist Aufgethan* in which the clarinet was given a solo. John Herbst (1735-1812) wrote *Hallelujah Lasst uns Singen (?)* in which he used a solo trio of two B♭ clarinets and a bassoon. John Christian Bechler (1784-1857) used the C clarinet in his compositions. Benjamin Carr (1768-1831) wrote *Dead March and Monody* (1799) for the funeral honors for George Washington. He later (1802) adapted it for two flutes, violin, and clarinet.  

According to Oscar Sonneck in his book *Early Concert-Life in America* (1731-1800), the clarinet was a part of concerts given during this period. In the programs cited, the pitch of the clarinet was not given and only the  

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28 Ibid., p. 136.
performers' names appeared.\textsuperscript{29} Names of the composers did not appear on the programs. Plate IX is a reproduction of a program which presented the clarinet as a solo instrument.

In the late 1700s, J. A. Hiller wrote:

Any sensible composer knows how to go with the times and there can be no doubt that this penetrating and powerful instrument (clarinet) could well hold its place among wind instruments if it were played by skillful people and with some zeal; but so far it has served only to render the sound of the fife more warlike and the sound of the drum more bearable.\textsuperscript{30}


FIRST CONCERT, APRIL 8th, 1794.

ACT THE FIRST.

Overture ...........................................Haydn
Glee — 'Adieu to the village delights' ......Baldon
Quartetto .....................................Calcott
Song — Carr — 'Sembianze amabil!' ........Bianchi
Concerto Violino ..............................Mr. Shaw

ACT THE SECOND.

Song, Mr. Carr 'Primrose deck' ..............Linley
Concerto Violoncello .........................Mr. Menel
Glee 'Come live with me' ....................Webbe
Concerto Clarinet .............................Mr. Henry
Full piece ......................................Haydn

SECOND CONCERT, APRIL 15th.

ACT THE FIRST.

Overture .........................................Haydn
Glee 'Awake Eolian lyre' .....................Dandby
Quartetto ........................................Pleyel
Song — Mr. Carr — 'The ling'reng pangs' ..Horace [Storace]
Concerto Oboe ..................................Mr. Shaw

ACT THE SECOND.

Overture to Otho ...............................Handel
Glee 'When Arthur first' .....................Carr
Concerto Violoncello .........................Mr. De Marque
Song, Mr. Carr, 'Dear gentle Kate' .........Hook
Overture for wind instruments ..........Haydn
Full piece ......................................Haydn

THIRD CONCERT, APRIL 22d.

ACT THE FIRST.

New Overture ....................................Pleyel
Glee 'Here in cool grove' .....................Webb
Quartetto, by Messrs. Gillingham, Stuart, Shaw and Menel ..Pleyel
Song — Mr. Carr — 'Mansion of peace' ....Webb
Concerto Violoncello ..........................Mr. Gillingham

ACT THE SECOND.

Concerto flute .................................Mr. Henry
Song — Mr. Carr — 'Come, come thou Goddess' .Handel
Concerto Clarinet .............................Mr. Henry
Glee 'Sigh no more, ladies' .................Stevens
Full piece ......................................Haydn

Act 2d.

Overture ..........................................Vanhal
Quartetto, by Mr. Duguay, &c. ...............Pleyel
French song, accompanied on the harp by Mrs. Grattan ...Milieu
Violoncello concerto, by Mr. Dumarcoe, lately arrived from Philadelph ...Dumarcoe
Hail Columbia .................................Taylor

On March 5th 1799 the violoncellist Demarque, alias Dumarcoe gave a concert "composed of some of the first musicians of this city"... "at Williams's Coffee House, in the room occupied generally by the St. Cecilia Society" with a program on which the "local" composers seem to have figured prominently:

Act I.

Sinfonia ............................................Gerwits
Le Bataille de Trenton ...M. De Villiers
Song (the Soldier tir'd etc.), Mrs. Grattan.
Concerto Clarinet Mr. Foucard
Rondo ...............................................Pleyel

Act II.

Sinfonia ............................................Haydn
Concerto Violin, Mr. Petit
Concerto Pianoforte, Mr. De Villiers
Concerto Violoncello, Mr. Demarque
To conclude with the celebrated song of Hail Columbia, by Mrs. Grattan.

After which the ball will commence. The concert to begin precisely at 7 o'clock ...

"Weather permitting" Mr. Labatut, a clarinetist, announced for his benefit on Dec. 14, 1799 the following program:

PART I.

Grand symphony ...............................Haydn
Quartetto, Flute .................................Pleyel
Song, by Mrs. Placide
Duetto, Pianoforte by Mr. Eckhard & Son Pleyel
Concerto de clarinet ..Haydn
Finale .............................................Haydn

PART II.

Grand overture ................................Gyrowetz
Sonata, Pianoforte by Mr. Eckhard ..Gyrowetz
Song, by Mrs. Placide
Simphonie concertante ......................Daveau
Quartetto, Clarinet, by Mr. Labatut.
Grand Simphonie .............................Cimarosa
The Clarinet in the Nineteenth-Century Orchestra

Gradually, court and private orchestras began to employ the clarinet and in the 1780s and 1790s they were found in most orchestras. At the beginning of the nineteenth century, the woodwind group was stabilized with two flutes, two clarinets, two oboes, and two bassoons. (See Fig. 8)

It was not until the end of the first quarter of the nineteenth century that the clarinet stood on an equal level with other woodwinds. The ability of the clarinet tone to blend with other instruments had far reaching influence on composers in writing different tone-colors for the orchestra. A preference for the warmer and round toned blends, in which the clarinet tone replaced the more penetrating oboe tone, was a feature of orchestration of the later works of Beethoven, Weber, and Schubert.\(^{31}\) The clarinet gave expression to the era of romanticism and sentiment. D. Schubart described it:

Its character symbolizes the meeting sentiments of love--it is the tone of the passionate heart. . . . The tone is so mellifluous, so languishing; and he who knows how to bring out the medium timbre is sure to conquer every heart.\(^{32}\)


\(^{32}\) Ibid., p. 54.
<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Composer</th>
<th>Work</th>
<th>Inst.</th>
<th>No. Keys</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1701</td>
<td>J. J. Fux</td>
<td>Concentus-Musico</td>
<td>C Clarinet</td>
<td>2</td>
<td>c' - c''</td>
</tr>
<tr>
<td>Holland</td>
<td>1704</td>
<td>J. P. Dreaux</td>
<td>Fanfares</td>
<td>C Chalumeau</td>
<td>2</td>
<td>g' - g''</td>
</tr>
<tr>
<td>Germany</td>
<td>1710</td>
<td>R. Keiser</td>
<td>Croesus</td>
<td>C Chalumeau</td>
<td>2</td>
<td>g' - a''</td>
</tr>
<tr>
<td>Belgium</td>
<td>1720</td>
<td>J.A.J. Faber</td>
<td>Mass</td>
<td>C Clarinet</td>
<td>3</td>
<td>e - a''</td>
</tr>
<tr>
<td>England</td>
<td>1727</td>
<td>G. F. Handel</td>
<td>Riccardo Primo</td>
<td>Chalumeau</td>
<td>3</td>
<td>f' - c''</td>
</tr>
<tr>
<td>England</td>
<td>1728</td>
<td>J. L. Bach</td>
<td>Cantata</td>
<td>F Chalumeau</td>
<td>3</td>
<td>f' - b\textsuperscript{b}</td>
</tr>
<tr>
<td>Italy</td>
<td>1730</td>
<td>A. Vivaldi</td>
<td>Concerto</td>
<td>C Clarinet</td>
<td>4</td>
<td>c' - c''</td>
</tr>
<tr>
<td>France</td>
<td>1751</td>
<td>J.P. Rameau</td>
<td>Acante et Cephise</td>
<td>D Clarinet</td>
<td>5</td>
<td>a - d''</td>
</tr>
<tr>
<td>England</td>
<td>1763</td>
<td>J. C. Bach</td>
<td>Orione</td>
<td>D &amp; B\textsuperscript{b} Clarinets</td>
<td>5</td>
<td>g' - g''</td>
</tr>
<tr>
<td>England</td>
<td>1769</td>
<td>Thomas Arne</td>
<td>Thomas &amp; Sally</td>
<td>C Clarinet</td>
<td>5</td>
<td>c - c''</td>
</tr>
</tbody>
</table>

Fig. 8. Use of the Clarinet from 1700s to 1800s
<table>
<thead>
<tr>
<th>Country</th>
<th>Date</th>
<th>Composer</th>
<th>Work</th>
<th>Inst.</th>
<th>No. Keys</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>?</td>
<td>J. Haydn</td>
<td>Notturno</td>
<td>C Clarinet</td>
<td>5</td>
<td>c - c''</td>
</tr>
<tr>
<td>Austria</td>
<td>1790</td>
<td>W. A. Mozart</td>
<td>Cosi fan tutti</td>
<td>B♭ Clarinet Transposed</td>
<td>5</td>
<td>e - c''</td>
</tr>
<tr>
<td>Austria</td>
<td>1802</td>
<td>J. Haydn</td>
<td>Harmonienesse</td>
<td>B♭ Clarinet</td>
<td>5</td>
<td>?</td>
</tr>
<tr>
<td>Germany</td>
<td>1826</td>
<td>L. Beethoven</td>
<td>9th Sym.</td>
<td>B♭ Clarinet</td>
<td>13</td>
<td>e - e♭</td>
</tr>
</tbody>
</table>

Fig. 8 (Continued)
In the nineteenth century, the clarinet experienced its greatest improvements. First Iwan Müller's thirteen-keyed, acoustically correct clarinet was introduced. The performer could now play one instrument in all the keys without changing joints. Then Klosé and Buffet introduced the Boehm system clarinet with mechanical improvements, fuller tone, truer intonation, and greater facility in all keys. Increased agility of the performers and a much wider key range were among the greater technical demands made by composers on the capabilities of the clarinets. Three sizes of clarinets, C, $B^\flat$, and A, remained standard during the greater part of the nineteenth century. The once favored instrument in C was slowly becoming obsolete.

With Ludwig van Beethoven (1770-1827), the clarinet began to have a greater share of solo parts. His scoring for the clarinet in the symphonies shows several traces of the style of Mozart. A favorite device in his compositions was to give the first clarinet the melody, accompanied by the second clarinet with arpeggios in the chalumeau register.\(^33\) In the \textit{First Symphony} (1801), he used the clarinet only as a harmony or tutti instrument, but with each new symphony the clarinet was given greater independence. Beethoven often asked for information about

the mechanism of the clarinet and its tonal and technical characteristics. Beethoven gave the A major melody in the "Andante" of his Seventh Symphony (1812) to the medium range of the clarinet because it created a melancholy character within that movement. In the Ninth Symphony (1826), the first movement uses B♭ clarinets throughout. In the second movement, Beethoven wrote for the C clarinets for reasons of tone-color and also not to frighten the B♭ clarinet player by the signature of concert A major in measure 276. The third movement changes from two sharps in measure 25 to one sharp in measure 64, but Beethoven left the signature of C major in the clarinet part. Later, the movement is in three flats (measure 166), which he wrote as the correct key signature of one flat for the B♭ clarinets. The fourth movement is in D minor with the B♭ clarinets written in E minor. When this movement changes to D major (measure 78), Beethoven changed the clarinet's signature to one sharp and used accidentals. He later changed to the A clarinet in measure 92 with one flat. The finale (Presto) has the A clarinet with the same key signature as that for the flutes, but Beethoven again uses accidentals. At the "Allegro Assai" the part changes back to the B♭ clarinet, but at the "Andante Maestoso" the A

clarinet is required. For this work many players today would transpose the A and C parts and not change back and forth. Beethoven was simply trying to make it easier on the clarinet players of the time by using the varied key signature for the clarinet. As a solo instrument, the clarinet began to assert itself gradually. With Beethoven, the combination of clarinets and bassoons, or clarinets, bassoon and horns began to replace the incisive-toned oboe. The composers who followed Beethoven used the capacity of the clarinet for playing arpeggio passages and the peculiar tone-color of clarinets to enlarge the orchestral tone-painting. (Used by Mozart in his operas.)

Carl Maria von Weber's (1786-1826) treatment of the woodwind instruments shows the clarinet to be more thoroughly appreciated and better understood. His clarinet solos, ranging over the entire compass of the instrument, exploit the individuality, the technical features, and tone-color of each register to its best advantage. A good example of his writing for the clarinet was Die Freischutz Overture (1820). (See Example 13).

Hector Berlioz writing about Der Freischutz said: "There is no other wind instrument which can produce a tone, let it swell, decrease and die away as beautifully as the clarinet. . . . No more admirable example of such shading
than this dreamy melody."

When Hector Berlioz (1803-1869) began composing, individual instruments were commanding attention by their improvements but their collective use was arbitrary. Tone-color was thought of as added to music which stood complete without it. Tone-color began to be used for expressive purposes. Berlioz wrote for the instrument with clear perception of the distinctive tone-color, tone-weight, and natural character of each instrument. Berlioz used the C clarinet even though it had been replaced by the B♭ clarinet. He felt that the C clarinet was indispensable for certain pieces of brilliant character and also preferable for passages demanding bright colors. He opened the "Allegro" section of the "Witches Sabbath" of Fantastique Symphony with the C clarinet. Berlioz was one of the first composers to use two different pitched clarinets simultaneously. In Example 34, the coloristic use is realized (unusual for the time) with the sharper more piercing quality of the E♭ clarinet contrasting with the sound of the C clarinet. The E♭ clarinet is used to parody and degrade a melody which can also be seen throughout the piece. Berlioz's music also shows an increase in the technical difficulty in the clarinet parts as shown in

36 Ibid., p. 212.

Examples 35 and 36. The tempo is fast with section A of Example 35 relatively easy but the section B requiring rapid tonguing. The clarinet with other reed instruments have difficulty in establishing rapid tonguing. Berlioz also used the A clarinet in the "Valse Allegro" or "A Ball" which also required good tonguing technique. Berlioz used the C clarinets in his Requiem (1837), and in the "Tuba Mirum" required the use of four C clarinets. He used the C clarinets possibly because the tone is harder than that of the B♭ clarinet or perhaps Berlioz preferred the C


clarinet. Berlioz wanted his performers to use the instrument indicated by the composer. He was possibly one of the few composers and conductors who could hear the difference between an A and B♭ clarinet and B♭ and C clarinet. Berlioz was very obstinate in insisting on the instrument he wanted used.
Clarinets provided with the reorganized key mechanism of the mid-nineteenth century came into general use in the more established orchestras, while older types of clarinets were used by smaller orchestras and military bands. The gains in key-facility, the ease in reaching the extremely high notes, and the rendering of shakes and tremolos were now easier than on previous clarinets. The C clarinet suffered neglect and finally was abandoned by orchestral players, even though C clarinet parts were found in operatic and symphonic music until late nineteenth century.

Richard Wagner (1813-1883) scored for the clarinet in his music-dramas with a marked advance in regard to the technical demands being made on the performer. Example 37 of Die Meistersinger, the "Overture," Wagner not only uses rapid tonguing but adds trills which leap across the break ($b\flat'$, $b'$, and $c''$). The Boehm clarinet which was in use made the trills easier than on previous clarinets. In Example 38, Die Walküre, the third act, is also shown some of the difficult writing for the clarinet. The D clarinet is used infrequently but Wagner chose the instrument for its power of penetration. The part is difficult because it is in the upper register, has numerous accidentals and a fast tempo creating the ride of the Walküres. In the Ring, Wagner wrote for a third clarinet in addition to the bass clarinet.
In the twentieth century, there is a return to the use of clarinets of various sizes that were popular in the eighteenth century. But the parts required to be performed today would never have been possible on those early instruments. Composers owe thanks to the instrument makers who were constantly seeking to improve the clarinet. Minor mechanical improvements in key-action and other facilities still appear from time to time and give added convenience to the performer.

With Richard Stauss (1864-1949), the need for more volume of sound became evident. He wrote for four of each of the woodwinds, often including high clarinets in D and E♭. He used the D clarinet in Till Eulenspiegel to create that roguish and droll humor of Till himself. The penetrating sound of the instrument could be heard throughout the piece even with the full orchestra playing. This type of characterization has been a part of the clarinet's history in the orchestra. Strauss's requirements

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regarding clarinet technique are more advanced than Wagner's, making severe demands on the clarinet players. Complicated passages were played at such speeds that the very mechanism of the clarinet was inadequate to articulate them. In Electra and Salome, Strauss uses a whole family of clarinets (E♭, 2 B♭, 2 A, bass clarinet, and 2 basset-horns). Example 39 shows in the third measure a sweeping effect on the clarinet which was almost like a glissando. Strauss seems to be inclined to seek novelty by over-loading his score with elaborate effects. He tries to astonish and startle as well as please. In


Example 40, he required prominence and intensity of tone by the close treatment of four clarinets in the upper range of the instrument.
Salome, E♭, A, and B♭ Clarinet parts, measures 718-721.

Early composers using the clarinet, e.g., Mozart, 
restrained their genius out of consideration for the 
capacities of the instrument, while in modern works no 
such consideration is found. The chief aim of present day 
composers seems to be to produce effect, without regard 
for the players. In Example 41, Stravinsky uses his unusual 
rhythmic patterns along with the clarinet's various ranges 
to create a sense of motion. Example 42 introduces the 
still difficult flutter-tongue technique for the 
clarinetist. This technique, not difficult for the flute
and trumpet, is for a reed instrument no easier than when first introduced by Berlioz.

Example 42. Igor Stravinsky, "Introduction," The Rite of Spring, D, A, and Bb Clarinet parts, measures 59-60.

Conclusion

The overall primitive character of the early music for the chalumeau points to its limited possibilities. The chalumeau family was pitched in C and F. The composers' choice of chalumeaux and the use of tone-color was a feature of their music. The quality of sounds and the effect of various wind combinations were beginning to be very important in the eighteenth century. The chalumeau parts began as very easy music and progressed to technically difficult music as the instrument developed into the clarinet. The earliest clarinet parts were
usually written for the C instrument, but as time passed, and improvements were made, clarinets in almost every key were used.

The early clarinet parts moved diatonically, avoiding large interval skips, chromatic tones, and hardly using the lower register. The eighteenth-century clarinet of Haydn and Mozart was five-keyed and had interchangeable joints to alter the clarinet in pitch. The A, B♭, and C clarinets became the popular instrument of that time. Mozart's early works, like those of earlier composers, did not transpose the clarinet part on the score until *Cosi fan tutti* of 1790. All were written in the tonic and the player had to transpose according to the instrument he was using (whatever key it was in). Clarinet parts did not attain a vital orchestral role until the early nineteenth century, as discussed in music of Beethoven and Weber.

It was not until the end of the first quarter of the nineteenth century, that the clarinet stood on an equal level with other woodwinds. Three sizes of clarinets, C, B♭, and A, remained standard with a gradual fading out of the C instrument. With the standardization of the B♭ clarinet, and no need to change instruments or joints, composers and the performers had only to read and play what was printed in the score.
CHAPTER IV

CLARINET TUTORS FROM 1732 TO 1840

Introduction

In this chapter are the descriptions of the construction of the clarinet, and the musical and pedagogical information found in early instructional materials for the clarinet. The main objective was to seek information on transposition and how it was taught.

Museum Musicum (1732) by Joseph Majer (Germany)

This tutor contains information on music theory and practice as well as descriptions of the major instruments. It is the first known publication that included material of an instructional nature for the clarinet. Majer wrote a brief paragraph about the clarinet and included a fingering chart. (This and all further translations were made by the writer.)

The clarinet is a wooden, wind instrument invented by a man from Nuremberg at the beginning of this century (18th), and is not unlike a long oboe, except that it has a broad mouthpiece. The sound of this instrument from afar is not unlike that of a trumpet and has a range from the
tenor f to the second a and sometimes to the third a.¹

The earliest means of gaining knowledge about the body of the clarinet was the illustration in Majer's tutor. His fingering chart, the earliest known, shows the instrument possessing ten tone-holes. Two of these are covered by keys, one by the left-hand thumb, three holes are covered by left-hand fingers and the remaining four fingers of the right-hand. This illustration shows the seven main finger holes evenly spaced.

Majer did not mention the key of the clarinet or anything about transposition in this early work.

*Méthode Nouvelle et raisonnée pour la clarinette* (1785) by Armand Vanderhagen (France)

This tutor was the first known substantial work for the clarinet. Announcement of the work appeared in the *Mercure de France*. The announcement was as follows:

(trans.)

New and rational method for the clarinet in which is given a clear and succinct explanation of the manner of holding this instrument, of its range, of its embouchure, of the quality of reeds that beginners ought to use, of true tone, of tonguing and in general everything which pertains to the clarinet. This method includes some lessons in which the different tonguings are put into practice, twelve

small airs and six duets very appropriate to train students.  

Vanderhagen's tutor is arranged in a series of twelve articles dealing with various aspects of clarinet playing. He stresses the importance of reading and following each lesson with care and patience. The best way to learn the clarinet is by long, slow practice.

Vanderhagen gave specific directions in each article. In holding the clarinet, he said that it is not held too high or too low, one should sit erect and keep arms from touching the body. In regard to breath control and phrasing, one must not raise or lower the head to an extreme because this impedes the breath. "It is therefore good to know in which circumstances one may breathe without altering the musical phrase. Breath should be taken after the tonic note, never before it, and after notes which are slurred together. . . ." 

Vanderhagen's method begins as an approach to learning to play the instrument by demonstrating the use of the speaker-key. He shows the natural scale of e to f' with the corresponding scale a twelfth higher, b' to c''', clearly indicating the function of the speaker-key.

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2 Eugene Rousseau, "Clarinet Instructional Materials From 1732 to ca. 1825" (Doctoral Dissertation, State University of Iowa, 1962), p. 28.

Concerning tone quality Vanderhagen says ". . . do not seek only to run the fingers over the instrument, but, on the contrary, play the scale very slowly, making a crescendo on each note. . . . I know from experience that it is a great abuse when students strive to run the fingers over the entire range of the instrument."

Vanderhagen discussed the need for having clarinets in C, A, B♭, E♭, and B⁴. These clarinets are necessary for those who wish to play the parts of the symphonies or the accompaniment parts in concertos. A new term appears in his discussion of transposition. Corps de rechange was used by the French to denote the various main joints of the clarinet which were used interchangeably to provide the instrument with different pitches. The division of the body into two main pieces was to allow these necessary changes. For example, "The clarinet in mi majeur (E major) has a corps in E which is put on the clarinet in C. . . ." Vanderhagen indicated the need for transposition and listed musical examples for the student to follow.

Vanderhagen also explained the importance of the correct embouchure in all wind instrument playing. Each topic is fully discussed with great care and detail so as

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⁴Ibid., p. 6.

⁵Armand Vanderhagen, Méthode nouvelle et raisonnée pour la clarinette (Paris: M. Boyer, 1785), p. 70.
not to steer the beginner in the wrong direction.

"Descriptions of Musical Instruments (1797-1807)" from a projected *Dictionary of Music* (1766-1821) by Dr. J. Calcott (England)

In the unpublished manuscript of Dr. J. Calcott, the clarinet was briefly described.

The clarinet is a wind instrument played with a flat reed and is used as a treble instrument in military bands. The clarinet differs from the oboe not only in the manner of the forming but also in the compass of its scale, where its advantages are great; confined as to scale not having more than two or three in which it can be perfectly used. Hence arises the necessity of having several clarinets of different pitches as B♭, C, D, and A which B♭ and C are most common. The *Dictionary* stated that the clarinet was an important instrument. The complete excerpt appears in the appendix.

*Traité général de tous les instruments à vent à l'usage des compositeurs dédié à son ami Rodolphe* (1793) by Othon Vandenbroeck (France)

Vandenbroeck was a horn player in the Paris opera orchestra and a professor at the Conservatory. He was a composer of instrumental works as well as a writer of treatises. On the cover of his treatise is a statement of content: (trans.)

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It also indicates the manner of playing clarinet, trumpet, trombones, timpani, and other wind instruments in their natural keys.\(^7\)

The opening pages described the horn and gave numerous musical exercises. Vandenbroeck then introduced each instrument with a discussion on playing the instrument. Discussion of the clarinet does not appear until page forty-four of the treatise. He opened with an account of the scale of the clarinet. The \(B^b\), A, and C clarinets were the principal ones in use at this time. Vandenbroeck discussed specific notes which are difficult to produce (\(c^\#\), \(b^b\), \(e^b\), and \(a^b\)) and included a complete fingering chart.

Vandenbroeck felt that "the clarinet should accompany only the female voice, or a high tenor."\(^8\) For the sake of tone on the clarinet, transposition is taught by Vandenbroeck. According to his treatise, "To play the part as written the composer must announce at the beginning of the piece that it is written for the clarinet in C. If the piece is in F or G major, the clarinet in A is transposed a minor third higher. For the \(B^b\) clarinet, the player transposes one tone higher. The player transposes


\(^8\)Ibid., p. 63.
a minor third lower for the clarinet in E♭."

Vandenbroeck dealt with the problem of teaching transposition by giving musical examples. (trans.)

However, the majority of compositions allows flat and sharp tones in the clef. The musicians were obliged to know all the clefs and their transposition. Musicians found it embarrassing when they made a mistake in transposition and others learned transposition which became a habit. 10

Méthode de Clarinette (1802) by Xavier Jean Lefèvre (France)

Lefèvre was a member of the Conservatory of Music in Paris and first clarinetist at the opera. The method was arranged as a series of topics on the clarinet. Lefèvre was a prolific composer for the clarinet and a great contributor to its development. His own compositions make up sixty pages of the method.

The character of the clarinet was described by Lefèvre: (trans.)

The clarinet is not able to do everything. The artist sometimes refuses to play when the composer writes a difficult passage . . . lyrical and expressive music makes the composer and the performer shine. . . .11

9Othon Vandenbroeck, Traité général de tous les instruments à vent (Paris: Boyer, 1793), p. 46.

10Ibid., p. 47.

Concerning the approach to beginning study, Lefèvre said: (trans.)

Up to the present time, the performance of the scale has been the object of the first lesson... This method is difficult and tiring. ... As a student who does not know the clarinet, would he not be hindered when asked for four things at once—to hold the clarinet, to cover the holes, to form the embouchure, and to execute the scale? It is my desire to conceive a method more simple and less painful.12

As in several other methods, the indication of chalumeau written above the notes means that these notes were to be played an octave lower. One important aspect of Lefèvre's method was his detailed instructions on breath control and phrasing. "If one runs out of breath," Lefèvre said, "it is necessary to supply it with intelligence and to arrange almost imperceptible pauses."13

Lefèvre listed a few alternate fingerings. He indicated $b^1$ to be played with half of the thumb-hole fingering for the clarinet.14 Lefèvre also included separate trill fingerings for $e$ to $e''$.

In article VI, Lefèvre wrote of the character of the clarinet: (trans.)

12 Ibid., p. 17.
13 Ibid., p. 17.
The range, the variety and quality of tones of the clarinet distinguish it from other wind instruments. It can assume all the characters that the composer wishes to give to it . . . its has the advantage of encompassing the most opposite types.  

Lefèvre discussed the adjustments by the embouchure to correct faulty intonation. It was by the change in the lip pressure that certain notes were brought into tune and Lefèvre gave an illustration of the correct embouchure.

The instructional materials used by Lefèvre are exercises and short etudes in the keys of C, G, F, and B. The corps de rechange was in use at this time. The merit of Lefèvre's method can be seen in the numerous editions which have appeared. An important part of the treatise is his inclusion of twelve sonatas for the clarinet with a bass part. "These sonatas can be played on the B clarinet by transposing the bass part a tone lower." Lefèvre also stated: (trans.) "Seven different clarinets were used to play in orchestras. Today, two clarinets with the corps de rechange will suffice." Lefèvre's principle clarinet was in C. He stated, "The clarinet in C offered an easier corps de rechange with its corps of B which has only a half-tone difference and could be played

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\footnote{Xavier Jean Lefèvre, \textit{Méthode de clarinette} (Paris: l'Imprimerie du Conservatoire de Musique, 1802), pp. 17-18.}

\footnote{Ibid., p. 38.}

\footnote{Ibid., p. 38.}
in unison with the violins."18 Lefèvre's method is practical for clarinet teaching today.

The Instrumental Assistant (1800) by Samuel Holyoke (America)

Samuel Holyoke, a skilled clarinetist, was drawn into the field of instrumental music while in Salem, Massachusetts. He coached a "musical society" and an "Instrumental Club" made up of instrumentalists from various congregations. His Instrumental Assistant, one of the first instructional manuals published in America, contained a collection of traditional music for band instruments. The tutor was replete with fingering charts for flute, clarinet, violin, cello, and bassoon. It also contained brief musical exercises for this combination of instruments. Holyoke did not mention transposition. Most of the musical examples were in one key. In the music written by Holyoke, the melody was assigned to the first clarinet and the flute, the counter melody was assigned to the second clarinet, and the bass line was assigned to the bassoon and cello. The music was written for instruments pitched in C.

Nouvelle méthode de clarinette et raisonnement des instruments, principes et théorie de musique (1803) by Matthieu Blasius (France)

Blasius was conductor of the orchestra at the

18Ibid., p. 139.
Comédie Italienne and a member of the Conservatory of Music (Paris). He arranged his work into a series of articles, preceded by a five-page introduction on the principles of music. His was the only tutor which used the ancient Greek format of questions and answers in discussing the principles of music. He wrote twelve articles, of which forty pages were devoted to a discussion of staff, clef, notes, rests, and other essentials of theory.

Blasius used the term *chalumeau* to designate a return to the clarion register after having played in the chalumeau range. The use of this term was unusual. It was customary for the clarinet part to be written in the staff with the marking *Cal.* written above the notes in the clarion register which were to be played an octave lower. (trans.)

Regarding the clarinet, there is a word which is attached, which is chalumeau. This word means to transpose or to play the passage one octave lower. One plays the notes as they are written above them.¹⁹

In article VII there is an extensive paragraph in answer to the question, "Is one able to play in all keys on the clarinet?" stating, among other things, that the clarinet is the least perfect of all the wind instruments. (trans.)

Although, the clarinet is the king of wind instruments, one is able to play in only four keys on the same clarinet; . . . then you have a corps de rechange that is called the corps in A on which you play in A, D, G, and E major. By means of the two clarinets and the two corps de rechanges, you play in all the keys with much less trouble than on any other instrument, in that you never have more than one sharp or one flat in the key.20

Blasius also said that it would be advantageous for an artist to perfect his performance skills so one could play in all keys on the same clarinet.

La Retta maniera di scrivere per il clarinetto ed altri istromenti da fiato, con sei travoli contenenti (1813) by Francesco Antolini (Italy)

In this tutor, Antolini cautioned against writing passages for the clarinet that have difficult successions of notes. (trans.)

It is extremely important that the composer know in the first place what clarinet the professor must use for the key in which he is writing, and always keep in mind the awkward keyed notes, whenever what he is writing is in tempo allegro or vivace.21

The need for four clarinets $B^b$, $A$, $E$, and $B$ are cited by Antolini. (trans.)

20 Ibid., pp. 45-46.
21 Francesco Antolini, La Retta maniera di scrivere per il clarinetto ed altri istromenti da fiato, con sei travoli contenenti (Milan: Bucinelli, 1813), p. 25.
Note that manufacturers are accustomed to mark each section of the clarinet with the letter of the key in which it is constructed. That in C carries the letter C, because the C fingering actually produces C. That in B♭ carries the letter B, because the fingering for C produces B♭. The joint A carries the letter A. Only the piece in B is not named for the note produced by its C fingering, but for its fingering for F which produces the E; it is marked by all manufacturers in this manner: \[= E^\# =\]. I believe that this distinction cannot have any other purpose than to prevent the confusion that could arise, if this joint were marked with the letter B, between it and the clarinet in B♭ which is also marked with the letter B. ²²

To help composers from becoming confused with four different clarinets and their transpositions, he used the violin clef for the C clarinet, the tenor clef for the B♭ clarinet, and the soprano clef for the A clarinet. He further stated that the composer should be acquainted with the quality of tone of each clarinet, tone qualities of each register, and the range of each clarinet.

The Clarinet Instructor (1780) Published by Longman and Broderip (England)

Theoretical information was included in the opening pages and general playing instructions were given beneath the fingerings. This tutor served as a model for clarinet tutors of other English publishers. The Clarinet Instructor was one of the earliest works to give

²²Ibid., pp. 18-19.
a complete description of the clarinet.

As the clarinet is an instrument much esteemed in Regimental Bands as well as in concerts, a short description of it and its effects will be necessary before the method of playing on it is shown.

It is divided into four parts; the mouthpiece (on which a flat reed is tied), the upper joint the middle piece, and the bell or bottom piece.

It has thirteen holes, five of which are stopped by keys; it is to those keys that the instrument is indebted for its chief use, as before they were contrived, the clarinet could not be used in concert, as at present it is. When played by itself, the fullness and sweetness of tone is very pleasing, but when joined with French Horns only, or in concert with other instruments, its charming effect is too obvious to be particularly described. To make it familiar and render playing on it extremely easy, the following plain and concise instructions are intended; and, although at present most of those who study it are acquainted with some other instrument, consequently know the different marks and characters used in music, yet that anyone utterly unacquainted with music may attain to play with perfection upon it, the notes, marks, and characters shall be explained.

The tutor contains a brief paragraph concerning the various clarinets, pointing out the need for having two of them.

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As pieces of music are composed in different keys, in which clarinets can play in concert with other instruments, it is necessary to have two clarinets, one in B (B♭), the other in C. The B clarinet must be used if the piece is in the key of E (E♭) or B (B♭) and the C clarinet if it is in the key of F or C, in which four keys, B♭, C, E♭, and F, pieces of music most commonly are when clarinets join in concert.24

Transcriptions of music occurred in the earliest tutors which contain playing material for the clarinet. The Clarinet Instructor had more than fifteen such transcriptions.

Méthode pour la nouvelle clarinette et clarinette-alto (1821) by Iwan Müller (France)

It was Müller's intention for his method to promote the thirteen-keyed clarinet. Müller was always on the defensive in his treatise because of the Paris Commission's rejection of his clarinet. He simply stated: (trans.) "That prejudice always exists when a new innovative system is introduced. The young artist will recognize its superiority over the old system."25 Müller decided that only through his persistence and craftsmanship was a new instrument possible. He chose the B♭ clarinet because it fell between the A and C instruments. Müller

24 Ibid., p. 7.
felt it was his duty to stop the use of *corps de rechange* as a waste of time. (trans.)

It is evident that it (B♭ clarinet) exists for the purpose of accuracy, and not for the purpose of producing brilliant, pathetic, pastoral, dancing, and singing effects (like clarinets of different pitches).  

Within Müller's method was the first distinct change in key construction, especially the pads. (trans.)

... I have invented an elastic pad, the use of which for several years gives me proof of its usefulness. By using these pads, no one fears moisture or dryness as an influence on the action of keys. . . .

Müller felt it impracticable to learn without a teacher to direct the student. (trans.)

I believe a good method is a guide for the teacher rather than the student. Music is transmitted by the air to our ear, mind and senses, it is necessary for a student to listen and conceive that which he should perform.

One important fact about Müller's method was that it provided the first instructions for the thirteen-keyed clarinet. It gave an in depth study of the fingers.

Müller's invention (1815) of the metal ligature was another important development on the clarinet. (trans.)

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26 Ibid., p. 25.
27 Ibid., p. 32.
28 Ibid., p. 21.
... the ligature gives us great facility and prevents having to tie the reed on the mouthpiece with string. ... With only two screws the reed can be put as it aught to be and given its proper opening.29

He emphasized that the metal of the ligature must not be too thick and the screws must turn easily but not too tightly. Müller believed that the reed should be supported by the bottom lip. (trans.)

First the right-thumb becomes useful for fingering because it no longer needs to support the clarinet. Makes up for the gap in the old clarinets by gliding from b' to e''' and from d'' to e'''. Secondly, one has the advantage of being able to put a small piece of paper over the lower teeth preventing the lip being cut. The performer is not obliged to contract his muscles to disfigure his facial characteristics. ... the performer ought to search carefully to avoid anything which might arouse a disagreeable or painful sensation in the listener.30

In writing scales and etudes for his method, Müller used all minor keys. All the pieces were original, written specifically for the thirteen-keyed clarinet.

Of all the tutors in this chapter, Müller's is the most significant work of the period.


Beer (1793-1838), born in Mannheim, began his career as a bassoonist but later changed to the clarinet. His influence on French clarinetists was profound. Beer used the German ideals of tone and refinement and he insisted that his pupils play with the reed upon the lower lip. His tutor was very complete in dealing with the various aspects of clarinet playing. He discussed the origin of the clarinet and the proper method of selecting an instrument. He described the mouthpiece, reed, hand position, embouchure, breath, phrasing, registers, clefs, etc. At the end of his tutor is a brief discussion and table for transposition. (trans.)

This table is necessary to know in which key we should play, and how we should transpose to remain in unison in the key of C major when we are playing the B♭ or A clarinet. For example, the key of C should be played on the B♭ clarinet with adjustments to the signature.31

Conclusion

The majority of clarinet instruction books seldom introduce transposition. Most tutors were very thorough in their presentation of the different aspects of clarinet playing but transposition was not pointed out

specifically. This left it up to the performer to learn on his own or, as some do today, write it out instead of doing it by sight.
CHAPTER V

TRANSPOSITION

Introduction

There are instruments for which music is written in a key or octave other than that of their actual sound. These instruments are known as transposing instruments. Transposition is used for wind instruments such as the B\textsuperscript{b} clarinet. The use of transposing instruments or notation dates from the time (18th century) when only natural tones were available on brass instruments.

Transposing by the instrumentalist can be done by a change of fingerings on the instrument or by the composer or arranger changing the music notation. The B\textsuperscript{b} clarinets play music written for that instrument. The parts are not written at actual pitch. The transposition to be made from the written part to the actual sound is indicated by the interval from C to B\textsuperscript{b}. The music is written a whole-step higher for the B\textsuperscript{b} clarinet.

The explanation of the transposing system involves many questions as to why clarinets were built in this manner and why it was necessary to have instruments built
in several keys.

Theory of Clarinet Transposition

As was discussed in the chapter on history of the clarinet, the chalumeau is a cylindrical instrument and is closed at one end by the reed which causes it to overblow a twelfth. The chalumeau and clarinet have the properties of a stopped-pipe because of the vibrational modes with respect to the fundamental. The clarinet's fundamental note is an octave lower than the corresponding note of either an open-pipe or conical reed-pipe of the same length. Since the tube of the chalumeau and clarinet is closed at one end, it vibrates with modes that are odd multiples of the fundamental or at a twelfth. The chalumeau was built as a family and was pitched in the keys of C and F. Transposition on the chalumeaux was accomplished by a change in fingering.

The earliest clarinets in use in the 1720s were pitched in C or F with no keys for chromatics. The players could play in only the three simplest key signatures of C, G, and F. After 1730, the inadequacy of the clarinet's mechanism made it necessary to build clarinets in many different dimensions and pitches including $B^b$, $A^b$, $C$, $D$, $E^b$, and $A$. With this many instruments, the player could perform in any key the composition called for. However, constantly changing instruments and fingering systems created many problems
for the performer.

The clarinet was divided into several joints (1750) and a new idea of interchangeable joints was used on the five-keyed clarinet (1780). The interchangeable joints idea developed from the use of crooks used by horn players. Composers were encouraged to write music with changes of key signature for the clarinet after the development of these joints.

To the end of Mozart's lifetime (1791), music for the clarinet was often written in short sections and rarely modulated from the home key. A suitable choice of clarinet was made by the performer for each piece and only on rare occasions was it necessary to change. In the late eighteenth century, when the boundaries of musical composition were expanding constantly, there was not yet a parallel improvement in the mechanism and tone quality of the clarinet. The performers liked a certain type of clarinet and were unwilling to make changes. The C clarinet served the keys of C, G, and F; the B♭ clarinet was used for flat keys, and the A clarinet for sharp keys.

The sound of these early instruments was described in an article in *Musikalische Almanach*:

> Playing this instrument . . . is beset with difficulties which if not overcome can result in the most indescribable
coos and squeaks. Run away at such times, if you can.¹

To meet the growing demands for a more capable instrument, the clarinet manufacturers suggested improvements with imaginative and practical results. The results have been mentioned in the previous chapters. As the mechanism improved and players became more proficient, the need for so many different pitched clarinets began to fade.

Because of over-blowing the twelfth, the effective cross-fingerings used on other woodwinds were almost impossible on the clarinet. "One-half of the instrument was in C and the other half in F. Any piece of music would involve more cross-fingered notes in one or the other of the two registers."² This limitation was recognized from the start and was met by the building of clarinets in different keys. With the addition of keys by Müller (1812), and with the new Boehm system (1880), players were able to perform on other members of the clarinet family without learning new fingerings. It was by the means of completing the key apparatus and additionally correcting the acoustical arrangements of all

openings that the $B^b$ clarinet became the standard instrument. The popularity of the $B^b$ clarinet in the military bands was due to. Its similarity in pitch to the brass and the fact that military music was often written in flat keys.

The advantage, according to players, in the use of different pitched clarinets was to avoid the use of more than two sharps or two flats on any one instrument. In addition, composers felt that each clarinet had its own distinctive quality of tone.

The Necessity of Transposition

At the beginning of the eighteenth century, clarinets were made in almost every key. One of the reasons for so many clarinets was the poor intonation which resulted when the instrument tried to play in keys other than the one in which it was built. As discussed in a previous chapter, music for the clarinet seldom changed key within a movement. Composers chose a particularly pitched clarinet and stayed with that instrument throughout the piece as shown in Examples 22 and 27. Composers were able to distribute tone-color between flutes, oboes, and chalumeaux (clarinets) creating different tonal colors as shown in Example 30. With the mechanical and acoustical improvements of the nineteenth century, it became easy for the $B^b$ and A clarinet players to transpose parts for the C clarinets and others. One wonders if Haydn, Mozart, and Beethoven wrote for the C clarinet
merely for the convenience of the musicians rather than for tone color.

Why, therefore, should the convenience of composition which the C clarinet provided be discarded in favor of a method of transposition as required by the B♭ and A clarinets? Timbre and uniform tone quality alone cannot provide the answer. It was possible, by the mid-nineteenth century, to build clarinets capable of adequate flexibility of tone production in many keys, regardless of the actual key of the instrument. The answer, then, must involve the facility of performance in various keys.

While it was certainly possible to construct a clarinet which would play (perhaps "function" would be a better word) in many different keys, invariably the performer would find performance to be "easier" in some keys than in others. In order to investigate the manner in which this fact influenced the life history of the A, C, and B♭ clarinets, it is necessary to explain the word "easy."

For purposes of analysis, an "easy" key shall be defined as a key in which the written music contains two or fewer sharps or flats. A "difficult" key shall be a key containing four or more sharps or flats. Keys containing three sharps or three flats shall be termed "transitional" keys. Figure 9 and 10 illustrate the relationships of the "easy," "transitional," and "difficult" keys for A, B♭, and C clarinets.
Concert Keys

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>G</th>
<th>C</th>
<th>F</th>
<th>B♭</th>
<th>E♭</th>
<th>A♭</th>
<th>D♭</th>
<th>G♭</th>
</tr>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>X</td>
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<td>C</td>
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<td>X</td>
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<td>*</td>
<td>*</td>
<td>*</td>
<td>X</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

* "easy" key
X "transitional" key
0 "difficult" key

Fig. 9. The relationships of the "easy," "transitional," and "difficult" keys for A, B♭, and C Clarinets

Minor Keys

<table>
<thead>
<tr>
<th></th>
<th>G♯</th>
<th>C♯</th>
<th>F♯</th>
<th>B</th>
<th>E</th>
<th>A</th>
<th>D</th>
<th>G</th>
<th>C</th>
<th>F</th>
<th>B♭</th>
<th>E♭</th>
</tr>
</thead>
<tbody>
<tr>
<td>B♭</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>X</td>
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<td>*</td>
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<td>*</td>
<td>X</td>
<td>0</td>
</tr>
<tr>
<td>A</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>X</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>X</td>
</tr>
<tr>
<td>C</td>
<td>0</td>
<td>0</td>
<td>X</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>X</td>
<td>0</td>
</tr>
</tbody>
</table>

* "easy" key
X "transitional" key
0 "difficult" key

Fig. 10. The relationships of the "easy," "transitional," and "difficult" keys for A, B♭, and C Clarinets

An examination of Figure 9 reveals the C clarinet as unnecessary. All "easy" keys for the C clarinet are
found to be also "easy" for either B♭ or A clarinets. And the B♭ and A clarinet combine to provide a total of 10 (of a possible 12) "easy" keys. Nor does the C clarinet render any assistance on the "difficult" keys.

Thus, it can be seen that the C clarinet contributes little or nothing to the ease of performance in various key signatures. Nor, as pointed out earlier, does the C clarinet offer any real advantage in terms of quality of sound. The C clarinet became obsolete.

Carrying this analysis a step further, why should the B♭ clarinet increase in popularity at the expense of the A clarinet? One explanation is in the transposition itself. The A clarinet requires a transposition of a minor third upwards, while the B♭ instrument requires but a whole-step upwards. The conceptual ease of this latter transposition cannot be denied. If a clarinet must be chosen to facilitate performance in the flat keys, Figure 9 shows that the B♭ clarinet should be that choice.

All instruments of the clarinet family have the same basic technical requisites of performance. The player should be able to use several instruments with facility. This great variety of pitch and tone-color within the same family has led in more recent times to the idea of a clarinet ensemble.

One writer, Henri Sarlit (clarinet teacher) said:
the so-called transposition instrument is a relic of a period of groping and experimentation. It is apparent that Mozart wrote for the C clarinet but that his diapason pitch in Vienna was a tone and a half lower. By playing on the same clarinet all the time, one always has the same position of the fingers and the same distance between holes and keys.  

Even though Sarlit felt transposition was merely experimentation, it appears that transposition settled onto a traditional instrument, the clarinet, with a change in the notation. The composer was responsible for transposing the part for the instrument so the performer played what was on the printed page.

Many performers use only the $B^b$ clarinet and transpose the frequently occurring orchestral parts written for C and A clarinets. It means keeping only one instrument warmed to the temperature of the breath and simplifies tuning problems. Hector Berlioz, in his orchestration treatise, was against the misuse of transposition, and believed each clarinet to possess its own individual tonal characteristics. Symphony conductors demand that lyric or dramatic passages, relying mainly on tone, be played on the specific clarinet called for by the composer. In fast technical passages, conductors prefer

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clean execution on the instrument preferred by the player.

Relationship of Pitches of Several Clarinets

The clarinet furnished an object lesson in the evolution of transposing instruments. All the clarinets have the same fingering system. In playing the instrument, there is an automatic, instinctive translation of the printed note into the proper position of the fingers. It would be impractical to learn different fingerings for each of the differently pitched clarinets. Figure 11 shows the relationship of written notes to actual sound for clarinets in $B^b$, $A$, $E^b$, and $D$.

![Actual Sound Diagram]

Fig. 11. The relationship of written notes to actual sound for clarinet's in $B^b$, $A$, $E^b$, and $D$.

It is by no means impossible to produce, without advanced technical means, a pure-sounding C clarinet which could not be differentiated in sound from the $B^b$ clarinet. The harsh and sharp sounding character of the C clarinet desired by the older composers would disappear, but the performer would achieve the ideal of being able to play the notes in all keys with an adequate modern key apparatus.
and thus the disagreeable transposition could be omitted. Attempts have been made in that direction, but performers and composers rejected this idea in favor of the $B^b$ instrument.

The ability to transpose demands considerable mental agility and it also improves the technique. Better technique is required for musical figurations in awkward fingerings which transposing might cause.

Conclusion

Transposing can be done by a change in fingering or by changing the notation. During the early part of clarinet (chalumeau) development, the player had to change fingerings as he changed instruments. Composers wrote at concert pitch until the clarinet became an instrument with interchangeable joints, then the composer had to change his notation and decide which instrument to use $A$, $B^b$, or $C$. After the development of the key mechanism on the $B^b$ clarinet by Müller and Klosé, the $B^b$ clarinet became playable in all keys. As a result, the performer had to transpose the parts written for other pitched clarinets.

As was shown, the $B^b$ clarinet is easier to play in the flat keys and of course the $A$ clarinet is better for sharp keys. With the two clarinets, there is no need for other pitched clarinets because all of the scales were adequately covered by the $B^b$ and $A$ clarinets. The ease of transposing only a whole-step made the $B^b$ clarinet a more
popular instrument.

By transposing, the player can finger one note and get the sound of another. Music that would be difficult to play is made easier to play and music that is impossible to play is made practicable through the use of transposing instruments. It seems that by tradition, the clarinet became a transposing instrument, since professionals were not willing to try a nontransposing clarinet even if it were a well-made one.
CHAPTER VI

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The chalumeau (single-reed and cylindrical tube) was the prototype of the clarinet. J. C. Denner (1700) transformed the chalumeau into a useful artistic instrument. The improved chalumeau and the clarinet were one and the same instrument. A vital characteristic of the clarinet was the small hole near the mouthpiece, which, when opened, made it possible to overblow at the twelfth.

J. C. Denner added two holes (1700) covered by keys to produce a' and b'. Jacob (1720), son of J. C. Denner, added the bell, extended the tube, added the e key, and moved the speaker hole closer to the mouthpiece. The addition of the notes f#, g#, e'b', and c' (1750) extended the chromatic possibilities of the clarinet. This five-keyed clarinet was the standard instrument for the next forty years (1760-1800). Interchangeable joints were made possible when the instrument was divided into six joints (1780). Interchangeable joints allowed the performer to have more control over intonation problems.
and to learn a single set of fingerings instead of a different set of fingerings for each different clarinet.

About 1730-1780 clarinet music was being written in transposed form. The composer now had to specify which clarinet was to be used with each piece.

With each additional key, the clarinet's range was extended, improvements to tone and better intonation were made possible. By the nineteenth century, Iwan Müller introduced his thirteen-keyed clarinet (1812). Müller's intention was to make a clarinet with uniform tone quality and improved intonation by relocating the tone-holes and developing the mechanism. His system was at first rejected, but this rejection was gradually overcome as more performers found their technical possibilities increased.

The clarinet by Klosé and Buffet (1843) was based on Boehm's principles and was an outgrowth of Müller's ideas of the acoustically correct placement of tone-holes. Their improvements were to the mechanical key system by the use of rings, rods, and clutches. Many other systems such as Albert, Oehler, Romero, and others were also introduced, but the Boehm system (1860) became the standard.

The clarinet's acceptance into the orchestra came slowly. During the Romantic period the clarinet was used more prominently. By the mid-nineteenth century, the place of the clarinet as a solo woodwind instrument was assured. All through the years of its increasing use in the symphony orchestra, the clarinet remained an important
expressive voice in the opera orchestra where it had its beginnings. Today, the importance of the clarinet in all styles of music is well established.

The overall primitive character of the early music for the chalumeau points to its limited possibilities. The chalumeau family was pitched in C and F. The composer's choice of chalumeaux and the use of tone-color was a feature of their music. The quality of tones and the effect of various wind-instrument combinations were beginning to be very important in the eighteenth century. Initially, music for the chalumeau progressed to the more technically difficult music as the instrument developed into the clarinet. The earliest clarinet parts were usually written for the C instrument and progressed to clarinets in almost every key.

The early clarinet parts moved diatonically, avoiding large interval skips, and hardly touched the lower register. The clarinet of Haydn and Mozart was the five-keyed clarinet and had interchangeable joints to alter the clarinet in pitch. One of the first scores to transpose the clarinet part was Mozart's *Cosi fan tutti* (1790). Clarinet parts did not attain a vital orchestral role until the early nineteenth century.

It was not until the end of the first quarter of the nineteenth century that the clarinet stood on an equal basis with other woodwinds. With one clarinet being used in all keys without changing joints, composers wrote
transposed clarinet parts on the score. The music was printed for the performer to read and play without changing the music to fit the instrument.

Clarinet tutors were thorough in their presentation of the different aspects of clarinet playing, but transposition was not pointed out specifically. Performers learned transposition by sight or would write it out above the notes or on separate sheets of manuscript paper.

Transposing can be done by altering the fingerings or by changing the notation. During the early part of clarinet history, the player had to change fingerings as instruments were changed for each key. Composers wrote at concert pitch until the clarinet became an instrument with interchangeable joints (1760s), then, the composer had to change his notation and decide which instrument to use, the A, B, or C.

The key apparatus completed on the B clarinet by Müller, Klosé, and Buffet became playable in all keys. As a result of this development, the performer had to transpose the parts written for other pitched clarinets.

As was shown in the analysis in chapter V, the B clarinet is easier to play in the keys of C, F, B, E, and A (concert pitch) and of course the A is better for sharp keys. With these two clarinets, there is no need for other pitched instruments because all of the scales are covered by the A and B instruments. The ease of transposing only a whole-step made the B clarinet the more
popular instrument. It seems that by tradition the clarinet became a transposing instrument and professionals were not willing to try a non-transposing clarinet even if it was a well-made one.

By transposing, the player can finger one note and get the sound of another. Music that would be difficult is made easy to play and music that is impossible is made practicable and effective through the use of transposing instruments.

Conclusions

A cursory examination of the development of the clarinet presents three questions concerning the transposing nature of the instrument. When did the practice of transposition begin? Why was it used? And, why should the Bb clarinet become the most popular instrument rather than the C clarinet, which required no transposition? A detailed study of the history and acoustical properties of the clarinet has provided a plausible answer for these questions.

The clarinet has always been a transposing instrument. From the beginning the soprano and tenor chalumeaux were pitched in C and the alto and bass chalumeaux in F. The composers in the early 1700s wrote music at concert pitch. Consequently, a change in finger- ing by the performer was required in order to change from a C to an F instrument. Jacob Denner (1720) added a bell
to the chalumeau and increased its chromatic possibilities, thus, initiating a gradual change in appearance (and nomenclature) from chalumeau to clarinet. In the 1780s, the clarinet became an instrument with interchangeable joints. In the transition, the instrument now called the C clarinet retained the concert scale and fingerings of the F chalumeau. During this same time, however, clarinets were still being built in several different keys. It was common practice for these instruments to also retain the fingering system of the F chalumeau (the C clarinet). A system of transposed notation became necessary to make this fingering system consistent. Thus, the performer now had greater control over his instrument and could refine his technique.

The $B^\flat$ clarinet was selected by Müller (1812) for his new clarinet. Müller chose this instrument because it fell midway between the $A$ and the $C$ clarinet. His $B^\flat$ clarinet would be closer in pitch to the modern $A$ clarinet because of the change in the pitch standard. Müller's clarinet was the first to have the uniform tone-quality which acoustically correct placement of the tone-holes could provide. Unfortunately, the acoustically correct position of the tone-holes did not accommodate the human hand. Müller devised the mechanical system to adjust to the new position of the tone-holes. Müller's new system was a significant improvement for the performer, who now had an instrument which played well in all key signatures.
The increase in popularity of the $B^b$ clarinet was partially due to the nature of transposition itself. The $B^b$ clarinet requires a transposition of a whole-step upward while the A clarinet required a minor third upward. Therefore, with the popularity of the $B^b$ clarinet increasing, gradual obsolescence began to overtake the C clarinet. Because the C instrument was physically smaller, the placement of the tone-holes was more critical and it was more difficult to construct a high quality instrument in C. In addition, the C clarinet contributed little or nothing to the ease of performance in various key signatures nor in terms of quality of sound did it offer any real advantage.

The transposing tradition of clarinetistry is a strong one. With modern technology it is possible to construct a C clarinet capable of adequate or even outstanding flexibility and uniform tone quality. This instrument requires no transposition but composers and professional musicians are unwilling to accept it.

As was shown in chapter III, the music for the clarinet followed the clarinet's development. As the clarinet improved, so composers also changed their style of writing to fit that instrument. For example, accidentals in music for chalumeaux and clarinets were rare, and changing of keys within a piece very seldom occurred. With each improvement to the clarinet, there was a gradual change in the difficulty of the music. The clarinet became a much more flexible and versatile instrument.
The performer was able to move over the entire range with ease. Improvement made on the clarinet was reflected in the music of Berlioz, Wagner and Stauss. The complexity of music coincided with the improvements on the clarinet as well as on other instruments.

**Recommendations**

Research for this report revealed that there are very few sources which introduce or explain transposition to students. There is a need for instruction books which will teach a student to transpose efficiently. There is no reason why a clarinet player could not be just as well versed in transposition as horn players are. Further, instruction books need to be written to explain the various transposing clarinets and how to go from one transposition to the other if the instruments are not available.

There is a need for literature dealing with the development of transposition and what effect music had on this development. At the present, information on transposition is scattered in many different areas dealing with the clarinet.

The scope of this project did not include an analysis of solo and chamber music for the clarinet. Each of these areas could be researched in other projects to show their importance in the development of clarinet transposition.

It is important for a clarinet player to understand
his instrument and how it functions. There is a need for courses to be set up just for woodwind players dealing with their instruments in depth. As more clarinetists become more interested in the history and function of their instrument, possibly more discoveries about the clarinet will be made.
APPENDIX I

Source of Plates

Plates

I. Musical Wind Instruments by Adam Carse
II. The Clarinet by Oskar Kroll
III. The Art of Clarinetistry by William Stubbins
IV. The Clarinet by Oskar Kroll
V. The Art of Clarinetistry by William Stubbins
VI. The Art of Clarinetistry by William Stubbins
VII. The Clarinet by Oskar Kroll
VIII. Photograph of Personal Clarinet
APPENDIX II

Description of the Clarinet From
Dictionary of Music by Dr. J. Calcott

"The clarinet is a wind instrument played with a flat reed and is used as a treble instrument in military bands. The clarinet differs from the oboe not only in the manner of the forming but also in the compass of its scale, where its advantages are great; confined as to scale, not having more than two or three in which it can be perfectly used. Hence arises the necessity of having several clarinets of different pitches as $B^\flat$, $C$, $D$, and $A$ which $B^\flat$ and $C$ are most common."

All other wind instruments form their octaves by the same fingering with a greater force of breath; but the clarinet is so contrived that by keeping down the upper key behind the instrument all the notes become a twelfth.

This alteration affects the tone of the notes and contributes two different parts of the instrument and the lower called chalumeau being from the similar old instrument of that term. The higher called clarinet a diminutive of clarino, signifying a little trumpet being the most powerful instrument used in military service.

The clarinet has commonly eight holes, stopped
with the fingers and five which are opened by keys. The
left hand is used for the upper four and the chalumeau
notes are thus made. The two higher keys cover the hole
behind with the left thumb marked thus $+$, then let the three
fingers of the left hand stop the three holes in front and
the instrument by blowing gently will sound $g'$. By the
preceding scale, it appears that the clarinet sounds $g'$
the clef note when not touched with either hand (note
that all these observations relate to the C clarinet alone).

The three lower keys are distinguished by their
length and distance from the reed. To play the clarinet,
notes stop the left hand holes, entirely closed keeping
however the highest key behind continually down and the
same note as $g'$ chalumeau will be the upper $g''$ twelfth
higher. The right holes and lower keys are played with
little fingers and of which the longest is most fre­
quently used form the clarinet notes ($b' - g''$). The
left hand being still untouched and all the holes closed
except the clarinet key, the remaining chalumeau notes
are stopped exactly the same manner without the clarinet
key behind and form a series of notes from $e$ to $g''$. The
only difference consists of adding the clarinet key.

The clarinet notes are very unequal in tone, the
force behind diminished by the number of keys which are
necessary for the great compass of the scale; an extent
far exceeding that of any other wind instrument compre­
hending nearly three octaves.
APPENDIX III

Analysis of The Clarinet Tone

The same physical properties which give the clarinet its characteristic sound also make the instrument more complex than the other woodwinds. Strong odd harmonics cause the clarinet to overblow the twelfth, but the presence of even harmonics can be detected, as shown in Figures 1-3 for three chalumeaux (soprano, alto, and tenor) and clarinets (B♭, A, and C). The spectra were obtained by computer analysis of wave forms recorded photographically.

It has been said that the clarinet tone consists only of the odd harmonics. An analysis of a steady clarinet tone shows the presence of even-numbered harmonics having an amplitude sometimes greater or comparable to those neighboring odd ones. Modern measurement technology has allowed researchers to accurately measure the weak even harmonics of the clarinet. Thus, the clarinet does not function exactly like a closed cylindrical pipe. Spectral analysis shows the presence of the even harmonics in Figures 1-3. The experimental procedure for spectral analysis follows.

The wave forms of selected notes for each of the
tested instruments were photographically recorded using the apparatus shown in Figure 4. A sensitive microphone of uniform frequency response was placed 24 inches from the bell of the instrument being tested. An amplifier was used to increase the amplitude of the microphone signal by a factor of approximately 100 - to a level convenient for oscilloscope display. The oscilloscope was adjusted to display from 1 1/2 to 2 1/2 cycles of the waveform. A photograph was made of the oscilloscope display for each of the selected notes.

In order to analyze the spectra of each of the tested notes, it was necessary to reduce the photographically recorded waveform to a series of 32 sampled points equally spaced over one complete cycle of the waveform. After processing, the photograph of each oscilloscope pattern was projected onto a sheet of graph paper, and 32 equally spaced points were selected and the value of the waveform at each point was manually recorded on a computer punched card.

The Nyquist theorem assures that if a periodic waveform is sampled at a rate equal to or greater than twice its highest frequency component, the waveform can be completely reconstructed from the sampled data. Thus, the 32 sample points extracted from each recorded waveform are sufficient to analyze the waveform in terms of not more than its first sixteen partials.
A computer program was prepared by James Giammanco (husband) to analyze the sampled data from each of the recorded waveforms. The program was written in FORTRAN IV Level G1, and executed on an IBM 360/45 computer.

The program accepted the data from punched cards and calculated the Fourier Series for each waveform and combined the sine and cosine terms into a composite value indicative of the strength of each partial. To allow comparison of the relative spectral composition of different notes, the Fourier Series terms were adjusted so that the amplitude of the first partial (fundamental) of each note was normalized to zero decibels. The relative strength of each partial of the note (referenced to the 0 db fundamental) was then printed by the program. Positive numbers indicated partials stronger in amplitude than the fundamental, negative numbers indicated partials of weaker amplitude than the fundamental.

This analysis showed that the F chalumeau had the best characteristics associated with a stopped-pipe instrument and why the earliest development took place on that instrument by Denner.
Fig. 1. Spectral analysis of chalumeau waveforms
Fig. 2. Spectral analysis of clarinet and chalumeau waveforms
Fig. 3. Spectral analysis of clarinet waveforms
Sony
ECM-18
Electret
Condenser
Microphone

LM-381
Low-Noise
Amplifier

Camera

Tektronix
5002
Oscilloscope

Fig. 4. Schematic Diagram of Apparatus Employed to Record Waveforms for Spectral Analysis
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Unpublished Materials


Periodicals


**Tutors**


VITA

Gloria McIlwain Giammanco was born on March 12, 1948, in Monroe, Louisiana.

Mrs. Giammanco received her high school education at Ouachita Parish High School in Monroe and graduated with honors in May of 1966. She attended Northeast Louisiana University from 1966-1970. She majored in applied music (bassoon) and performed with the Symphonic Band, Symphony Orchestra, Concert Choir, and Woodwind Quintet. She received the Bachelor of Music degree with honors in August, 1969 and the Master of Music degree in August, 1970.

Mrs. Giammanco was on the band staff at Northeast Louisiana University from 1966-1969 and was a graduate assistant from 1969-1970.

While in residence at Louisiana State University she performed with the Marching and Symphonic Band, Wind Ensemble, Louisiana State University Orchestra, and the Baton Rouge Symphony.

She is a member of Delta Omicron, Tau Beta Sigma, and Phi Kappa Phi honor society.

Mrs. Giammanco is currently a candidate for the Doctor of Philosophy degree while in residence at Louisiana State University, expecting to receive that degree at the May commencement exercises of 1978.
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