THE BOEHM FLUTE : ITS ANTECEDENTS AND ITS INFLUENCE UPON THE REPERTOIRE

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A dissertation submitted to the Faculty of Music, University of Cape Town, in part fulfilment of the requirements for the degree of Master of Music (Performance)

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This dissertation studies the physical evolution of the flute in conjunction with the development of the repertoire. A gulf, consisting of more than stylistic differences, appears to separate the flute music of the 20th and late 19th centuries from that of the Baroque and Classical periods. In the former, the furthest resources of the instrument are sensitively exploited by composers, while in the latter, a certain quality of constraint and distance is evident in its treatment of the flute. As compared to the modern repertoire, Baroque and Classical flute works might have been written for an entirely different instrument - as indeed they were. The flute as re-invented by Theobald Boehm is entirely different to the pre-Boehm instrument, possessing an extended range, technical facility, improved intonation and volume, and a sound both brilliant and flexible. The somewhat primitive and unsatisfactory pre-Boehm instrument imposed severe limitations on composers. However, with the Boehm flute came the flowering of a great repertoire and the foundation of a great school of flute playing.

The rise of the flute from humble pastoral origins to the sophisticated modern concert instrument affords much interesting study. The dissertation will consist of examination of the physical development of the flute (with special reference to the work of Boehm), and of how this is reflected in the evolution of the repertoire, with investigation of the links between the French school of playing and much of the 20th century repertoire.

Declaration

I declare that this dissertation is my own, unaided work. It is being submitted in part fulfilment of the requirements for the degree of Master of Music (Performance). It has not been submitted before for any degree or examination in any other University.

Signed by candidate

1 day of October, 1985.

To Lucien Grujon

With grateful thanks and love

CONTENTS

PREFACE

As a young flautist on the brink of professional life, I have always been intrigued by the difference between pre- and post - Boehm flute repertoire. In examining the historical and mechanical development of the flute and the evolution of the repertoire the reasons for this difference will hopefully be made clear to the reader. I have also thought a discussion of the influence of the school of French flute playing to be pertinent, and have touched briefly upon the flute music of the avant-garde.

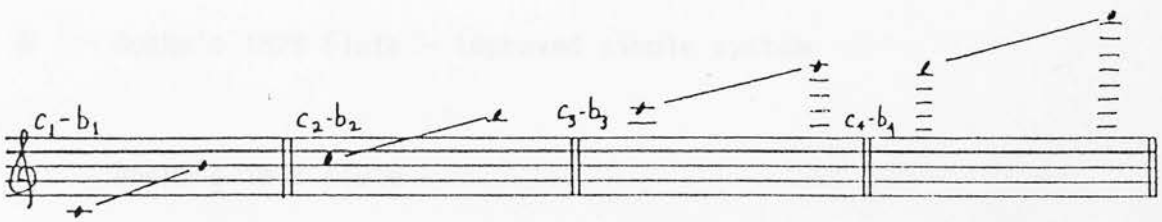
I would like to thank Professor Brian Priestman for his painstaking supervisorship and encouragement and my teacher Lucien Grujon, not only for all that he has taught me, but also for the many interesting discussions we have held on the subject of the flute.

In addition, I would like to thank Alistair McDonald for his continued moral support.

List of Abbreviations

c. (Latin circa)	about
ed.	edition, editor
Fig.	Figure
ibid. (Latin ibidem)	in the same place
op. cit. (Latin opere citato)	in the work cited
p. (plural pp.)	page(s)
vol. (plural vols.)	volume(s)

Notation of pitch register, regardless of accidental.[1]



'Hand digits are referred to thus:

first finger	(index finger)
second finger	(middle finger)
third finger	(ring finger)
fourth finger	(little finger)

1. The Avant-Garde Flute. Berkeley: University of California California Press, 1974

LIST OF ILLUSTRATIONS

CHAPTER 1 THE FLUTE IN THE ANCIENT WORLD

The flute family has been with man since time immemorial. There is scarcely an ancient civilization which does not record the presence of the flute, whether adopted from other contemporary societies or spontaneously developed within the particular culture. The flute species has long consisted of two generic groups, the "end-blown" flutes (recorder-type instruments) and the "side-blown" flutes (transverse flutes).[1] In this dissertation, "flute" refers to the transverse flute, although some discussion of the "end-blown" flutes will of necessity be included in the examination of the historical development of the instrument.

In defining a flute, one can do no better than to quote *The New Grove Dictionary of Music and Musicans*:

> a flute is any instrument housing an air column confined in a hollow body and activated by a stream of air from the player's lips striking against the sharp edge of an opening, producing what acousticians term an "edge tone" ..... a head-joint with the mouth-hole or embouchure[2] in one side (raised in metal flutes to give the hole its proper depth); the body or middle joint with the principal keywork; and the foot-joint with the keys for the right little finger. In the head-joint the bore is terminated by a plug or stopper, usually threaded, which can be shifted to adjust intonation. The tenon of one joint slides into the socket of the other. The junction of the head-joint with the body is also used as a tuning-slide, which can be pulled out to lower the instrument's pitch.[3]

The length of the vibrating air column, and thus the pitch, is altered in the bottom register by opening or closing holes in the tube by means of key and ring mechanisms, and in the upper two registers firstly by

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1 Scholes, P. The Oxford Companion to Music. London: Oxford University Press, 1974, p. 361

2 see Glossary of Terms

3 Sadie, S. ed. The New Grove Dictionary of Music & Musicians. London: Macmillan Publishers Ltd., 1980, vol. 6, p. 679

means of an alteration of the air-pressure (known as over-blowing)[4] and secondly by complex cross-fingerings.[5]

The flute is therefore seen to be simple in principle. The modern concert instrument is, however, a highly complex system, both as far as mechanism and acoustically correct proportions are concerned. How did the reed pipe of primitive peoples, which operates on precisely the same principles as the modern flute, metamorphose into the sophisticated instrument of today?

ANCIENT ORIGINS OF THE FLUTE

Theories abound as to the ultimate origins of the flute - did the wind one day blow upon the edge of a hollow riverside reed, or did prehistoric man, hungrily extracting marrow from a bone, blow one day in such a manner as to produce sound?[6] Evidence is too minimal to define the precise origins of the flute, indeed of any musical instrument. Perhaps the most charming explanation is to be found in the realms of Greek legend: the god Pan, drowsing one afternoon in the summery warmth of Antiquity, catches sight of the beautiful nymph Syrinx. He falls instantly in love, and pursues the terrified nymph to the edge of endurance. Just as he is about to grasp his prize, the Naiads transform her into a bundle of riverside reeds. In sorrow, Pan cuts the reeds down and plays upon them, creating thus the pan-pipe.[7]

Biblical information on the subject is both less charming and less informative than legend: we read the somewhat bald statement in the Old

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4 see Glossary of Terms

5 Bate, P. The Flute. London: Ernest Benn Ltd, 1975, p. 1

6 Bate, op. cit., p. 53

7 Scholes, op. cit., p. 757

Testament that Jubal was the father of all who played upon the harp and pipe, and we hear of an *ugâb*, probably a type of vertical flute.[8]

WHISTLE TYPES AND EXOTIC FLUTE FORMS

Much of the earliest history of the flute is to be seen in the use made of it in currently existing primitive cultures. Flute forms are found which appear not to have appreciably evolved since their first inception. Most, but not all, primitive peoples originated a whistle-type instrument which may be construed as the earliest ancestor of the the modern flute.

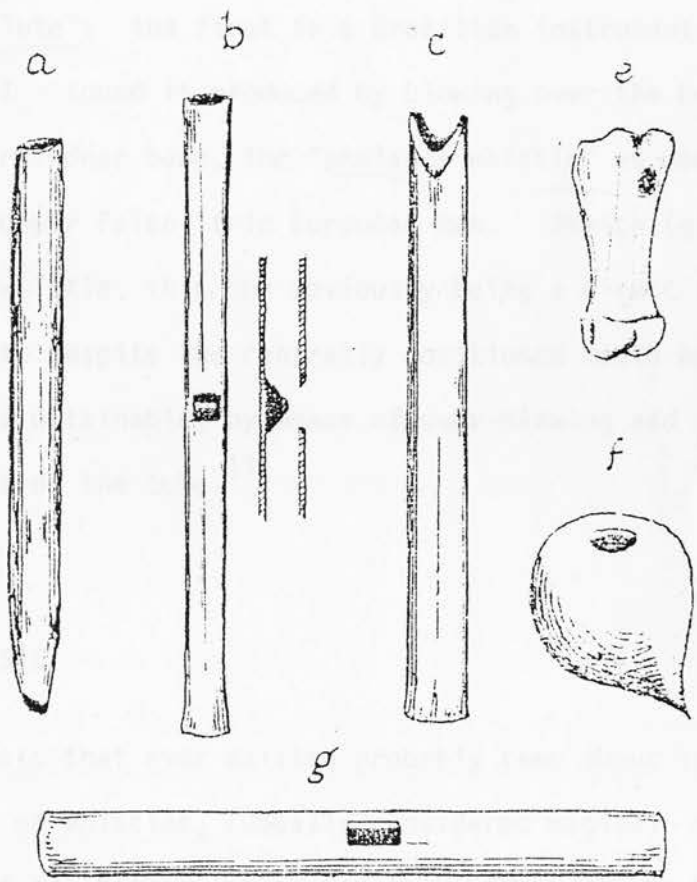

fig. 1. a selection of primitive whistles, illustrating different sound-generating arrangements [9]

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8 New Grove Dictionary, vol. 6, p. 669

9 Baines, A. Woodwind Instruments and their History. London: Faber and Faber Ltd., 1962, p. 172

These whistles appeared in many shapes and guises (see fig. 1) such as the ostrich quill of the "Bushman's flute," (a), in which sound is created by using the tongue as a wind-dividing whistle device. The Amerindian "Mataco Whistle" consists of a bird-bone tube in which, as seen in the sectional drawing (d), air blown through either end is deflected by a lump of resin below a more or less central hole - two notes are thus obtainable, one from each end of the tube.

Sketch (c) represents an end-blown bamboo whistle from South East Asia, the so-called "notched-flute" : the notch flute creates an almost flageolet-like embouchure.[10] In sketches (f) and (e), we have examples of the "globular flute": the first is a Brazilian instrument made from a dried fruit shell - sound is produced by blowing over the hole. The second is made of reindeer bone, the "phalange whistle" as made with care and skill by Upper Paleolithic European man. Sketch (g) shows another Brazilian whistle, this one obviously being a direct forebear of the transverse flute despite the centrally positioned mouth-hole. A number of notes are obtainable, by means of over-blowing and stopping either or both ends of the tube.[11]

THE FIRST FLUTE MUSIC

The first flute music that ever existed probably came about in tribal rites when numbers of whistles, (usually considered magical and sacred, as in the tribes of New Guinea, where women are forbidden to have contact with flutes : due to their shape, flutes appear to have a phallic significance and are associated with fertility rites)[12] were blown by

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10 see Glossary of Terms

11 Baines, op. cit.,pp. 172-174

12 ibid.,p. 174

numbers of different people. Each whistle would be capable of emitting a number of notes by means of harmonics and manual blocking of open-ended tubes. These ancient flutes varied greatly in size (and therefore in pitch), ranging from the monstrous seven-foot notched flute of the New Guineans to the inch-long "phalange whistles" depicted above. "Duets" and "quartets" could be arranged, each participant deciding upon his own particular pitches, and signalling to his partner to play his turn by means of foot pressure.[13] The South Americans tune large flageolet-like instruments in pairs, a minor third apart.

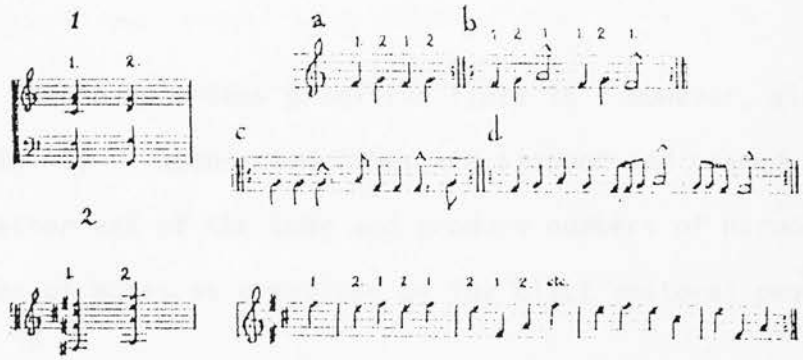

fig. 2. Duets with hole-less giant flutes; (a): New Guinea; (b) : Upper Orinoco, from a recording by P. Gaisseau.[14]

The formation of flute bands contribute to tribal musical celebration, as seen in the Hottentot tribe of South Africa.[15] Numbers of instruments are tuned to the same pitch: different groups of equal-pitched instruments play at ordained intervals to produce tunes much after the style of modern groups of hand-bell ringers. There are as many as two dozen types of flute in one band, ranging in length from six inches to fifty-four, each playing one note only, and sound being produced by a

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13 Bate, op. cit., p. 52

14 Baines, op. cit., p. 176

15 New Grove Dictionary, Vol. 8, p. 731

whistle-embouchure formed by curling the tongue. The notes thus obtained form the tetratonic scale so typical of primitive music.[16]

The next evolutionary step was to take a number of these virtually single-note whistles and join them together in a bundle of graduated lengths to form a pan-pipe. The subject of pan-pipe music is too vast and intricate to be dealt with here: suffice to say, in modern Hungary and Rumania it is played with great virtuosity, notably by Gheorghe Zamfir. A profusion of varieties of pan-pipes is to be found also in the tribes of Melanesia and South America.[17]

Solo virtuosity in the hole-less primitive flute is , however, also to be found (see fig. 3). Open-ended tubes are stopped and opened by a finger at the nether end of the tube and produce numbers of harmonics, creating a series of notes, as practiced by the black pastoral peoples of Southern Africa.[18]

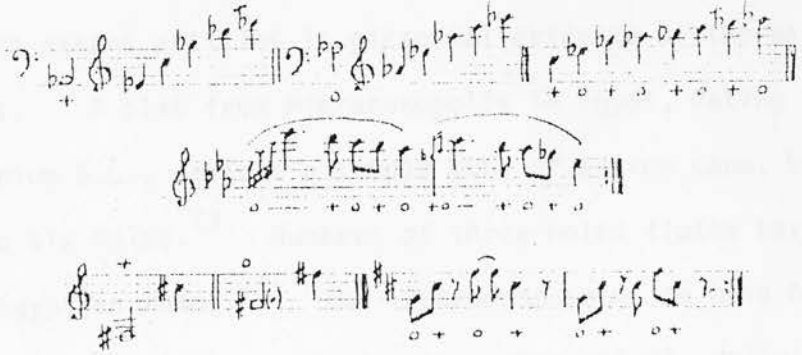

fig. 3. The solo harmonic flute. Top: derivation of a harmonic flute scale. Centre: a Swazi tune, after Kirby. Below: a tune from Gabon, from a recording by Rouget[19]

16 Baines, op. cit., p. 177
17 ibid., p. 178
18 ibid., p. 179
19 ibid., p. 179

Micro-intervals are to be found in the Turko-Balkan *kaval* [20], with its closely-spaced finger-holes and beautiful tone. However, to the Western mind, perhaps the most strangely exotic flutes of all are the nose-flutes of Malaya, Borneo, and especially Polynesia. One finger of the left hand blocks the left nostril, while another finger opens and closes a finger-hole bored lower down on the tube. A tone of great clarity is obtained by blowing with the open nostril across a small hole at the extreme left end of the pipe. The right hand controls another hole down at the foot of the instrument.[21]

Equally fascinating are the central-embouchured flutes (where the mouth-hole occurs in the middle of the flute) of South-East Asia with their pentatonic scale of b^2, $c^3\#$, $f^3\#$, $g^3\#$ and b^3,[22] as well as those of China and the flageolets of Asia, America and Indonesia. However, we shall proceed to examine the first appearances of the transverse flute proper.

THE ADVENT OF THE FINGERED TRANSVERSE FLUTE

More abundant than extant articles is pictorial evidence of the earliest transverse flutes. A slab from Hieraconopolis in Egypt, dating from the fourth millenium B.C., depicts a simple tube of narrow cane, bored with from four to six holes.[23] Numbers of three-holed flutes have been found buried in Egyptian tombs.[24] The instrument seems to have had pastoral origins and then to have moved into a more ritual, religious sphere of existence. As far as Israel is concerned, references are found in the Talmud to "reed-pipes", both single and double.[25] It was this kind of instrument that the Ancient Greeks named the *aulos* - definitely a wind instrument, but more an oboe-type instrument than a flute.

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20 Baines, op. cit., p. 181

21 ibid., p. 209

22 ibid., p. 186

23 Bate, op. cit., p. 55

24 Galway, J. The Flute. London: Macdonald and Co., 1982, p. 5

25 Bate, op. cit., p. 56

A double-reed instrument, the *aulos* was used in the cult of Dionysus which was "characterised by subjectivity and emotional expression."[26]

The first definitive appearance of a transverse flute occurs, however, in an Etruscan tomb dating from the 2nd century B.C., in which what is definitely a transverse flute is clearly depicted: the instrument is held to the right of the player, both hands cover the finger-holes, and the mouth-hole is in a similar position to that of the modern flute. The Romans absorbed the flute into their culture from an unknown source: a coin, dating from 169 B.C., bears the image of a transverse flute.[27]

It appears, however, that the flute was known in the East long before it appeared in Egypt and the Mediterranean. Literary references to four types of flute occur in Chinese literature of the 11th century B.C. - the *ch'ih* was a bamboo flute, with the upper end stopped, and a mouth-hole bored into the tube - presumably a transverse flute. It was in China, too, that the central - embouchured flute reached its highest point of development, in an instrument with three finger-holes on either side of the central mouth-hole.[28]

In India, however, while whistles were used by shepherds, the flute proper appears first only in the 1st century A.D., depicted in temple carvings. Known as a *murli*, it was the instrument of the god Krishna.[29] The flute appears first in Japan at approximately the same time. As well as the transverse flute, two end-blown flutes were, and still are used in tradition-loving Japan - the pentatonic *shakuhachi* with its ravishing tone, and the flageolet-type *hichiriki*.[30]

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26 Miller, H.M. History of Music. New York: Harper & Row Inc., 1972, p.11

27 Bate, op. cit., p. 60

28 Baines, op. cit., p. 186

29 Galway, op. cit., p. 6

30 Baines, op. cit., p. 183

Although China records the earliest flutes, there is, according to Philip Bate, evidence to suggest that wind instruments, together with string instruments such as the lute, originated in Central Asia, and were absorbed into China at the time of the *Han* dynasty, when her empire spread far and powerfully.[31]

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31 Bate, op. cit., p. 63

CHAPTER II THE FLUTE IN EUROPE

THE SPREAD TO EUROPE

During the first millenium A.D., progress in all spheres of civilization was dominated by the East. The decline of the Roman Empire, and the establishment of Christianity as the principle Western religion, resulted in a deceleration of civilized and artistic progress in the West. From the 4th century onwards, the Mediaeval Church exerted a stifling influence upon music and drama, banning the latter and restricting the former to use in monastic houses. However, after the passing of three hundred years, instrumental music was restored to acceptability during the 7th century.[1] During the intervening years, instrumental music was kept alive principally by the bands of wandering musicians, the troubadours and jongleurs.[2]

England had absorbed the musical instruments of the East principally by way of the Baltic sea-route and Byzantium, and also through ancient commercial links with the Islamic world. The flute appears to have moved from Asia mainly to Germany (via Byzantium), arriving early in the 12th century A.D. From there, it spread to the rest of Europe. Sachs documents the existence of striking pictorial evidence marking the path of the flute through Greece (in c. 800), Hungary (c. 1100), and Russia (also c. 1100 - the flute is depicted in Kiev Cathedral). The transverse flute plays an important role to this day in the folk-music of the Tyrolean and Bohemian countries.[3]

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1 Gardner, H., Art through the Ages. New York: Harcourt, Brace and World, Inc., 1970, p. 274

2 Bate, op. cit., p. 67

3 ibid.,p. 67

From this time on, numerous references to the flute occur throughout European Literature, as in the works of the French poets Deschamps and Machault, and in the English *Hunterian Psalter* of the 12th century,[4] where an illustration of a recorder-type instrument is to be found. In Jeanne d'Evreux's *Book of Hours* (c. 1320), we find an illustration of the contemporary flute: constructed from one solid piece of wood, it was perhaps two feet in length and in the key of D major, and was equipped with six finger-holes. This instrument is referred to in Virdung's writings of 1511 as a "Zwerchpfeiff."[5] Simultaneously, whistle-type instruments aspired to common use in popular dance music and in the songs of the troubadours. A simple three-holed pipe, narrow-bored, high-pitched and with a range of approximately two octaves, was accompanied by the tabor (a small drum), both instruments being played simultaneously by one player. These pipes, together with the military fife, generally made way for the recorder, which was to dominate musical life, as far as wind instruments were concerned, from the 14th century until the beginning of the 18th Century.[6]

fig. 4. Transverse flute from Mersenne's *Harmonie Universelle* 1637[7]

THE RECORDER

It is from this time on that a variety of old instruments are still extant and available for study today, many having been preserved in collections and museums world-wide. There is also much valuable documentation from

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4 ibid., pp. 69-70

5 Toff, N., The Development of the Modern Flute. New York: Taplinger Publishing Company, 1978, p. 11

6 Galway, op. cit., p. 7

7 ibid. , p. 20

the pens of scholars such as Virdung, Praetorius and Mersenne, who appears to have been the first to call for the addition of keys to the flute. More than fifty years were to pass before this was done.[8]

While the transverse flute did not disappear, far greater precedence was enjoyed by the recorder. This was due both to its calm, pure tone (allied in character to the serene purity of the male treble voice, which embodied the tonal ideal of the time), and to its appeal to the amateur musician (the recorder being both technically accessible and relatively cheap.) Consorts of recorders, ranging in size from very large to very small, were cabable of producing a complete range of notes with a perfect organ-like homogeneity of tone. A standard 16th century consort of recorders would consist of the following:

Name	Length in inches	Lowest Note
exilent	eight	g^2
descant	eleven	d^2
descant	twelve	c^2
treble	seventeen	g^1
tenor	twenty-four	c^1
bass	thirty-six and-a-half	F
quart-bass	forty-nine	C
quint-bass	fifty-six	B
Great Bass	seventy-six	F
Great Bass with diapason keys	one-hundred-and-three	C [9]

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8 Toff, op. cit., p. 14

9 Baines, op. cit., p. 248

Nonetheless, the cylindrical, keyless transverse flute, while not as popular as the recorder, was undergoing important transformations in the hands of the instrument makers and musicians in the employ of the French Court, most notably the Hotteterre family.[10] The recorder was to fall from favour in the 18th century, its limited range and soft, piping tone being insufficient for the demands of the developing symphony orchestra.

THE ONE-KEYED FLUTE OF HOTTETERRE

By the year 1690, the keyless cylindrical flute had metamorphosed into a one-keyed instrument, as illustrated in Jacques-Martin Hotteterre's text-book *Les Principes de la Flûte Traversiére* (1699).[11] While the natural key is still D major, the instrument is now constructed in three sections (joined with decorative ivory bands), and has a tapered body - a "cylindro-conical" bore, to use Philip Bate's concise term, the purpose of which was to reduce the fife-like shrillness which resulted from an entirely cylindrical bore.[12] The finger-holes were placed more or less at random, to suit the fall of the hand rather than to comply with acoustic proportions (resulting in intonation that may at the very least be termed uncertain.) These flutes were usually constructed of boxwood, ebony, or cocuswood; ivory flutes and metal linings were sometimes to be found. The key, a closed D #key at the foot of the instrument, was added by Hotteterre in c. 1660[13]. The flute in this form was used by Lully in his ballet *Le Triomphe de l'Amour*.[14]

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10 New Grove Dictionary, vol. 6, p. 672

11 Bate, op. cit., p. 81

12 ibid., p. 77

13 New Grove Dictionary, vol. 6, p. 678

14 Toff, op. cit., p. 16

FLUTE MUSIC FROM 1600 TO 1800

Before 1600, music was not written especially for specific instruments - no specific flute repertoire thus seems to exist before this date.[15] The flute proper is, however, heard of in Europe in the 12th century when it was used by the Minnesingers to provide music in aristocratic circles.[16] The fife and drum provided dance music in Germany and Switzerland throughout the 15th and 16th centuries: this was excessively popular, and corresponded to the pipe-and-tabor (or, as it was sometimes called, whittle-and-dub) music of England. The flute appeared also in consorts of three, and was also used in combination with other instruments, as seen in the light music directed by Lassus in Munich - flute, cittern and virginals. The flute also shared much of the vocal repertoire - music was conceived as being suitable for either voices or instruments.[18] It was only with the advent of the Boehm flute that the instrument began to truly earn its own repertoire.

The flute was largely neglected as a solo instrument until the late 17th century, due to the fact that it was unable to rise to the expressive and technical demands made on it by the emerging music of the Baroque. The flute did, however, make the occasional ensemble appearance, as in Schütz's setting of Psalm cxxxiii (swv 48)[19], and in Monteverdi's *Vespers* of 1610, where we find parts for "flauti" and "fifare"[20], shrill, piccolo-like instruments an octave higher than the flute.

A solo repertoire for flute began to emerge principally from France at

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15 New Grove Dictionary, vol. 6, p. 677

16 Baines, op. cit., p. 222

17 ibid., p. 248

18 ibid., p. 250

19 New Grove Dictionary, vol. 6, p. 677

20 Monteverdi, C., Vespers, Borough Green: Novello, 1961

the beginning of the 18th century. Michel de la Barre (c. 1675-1743) composed the first chamber music specifically intended for the flute: his *Pièces pour la Flûte Traversière avec la Basse-continue* were written in 1702. Jacques-Martin Hotteterre (1674-1763) and Jean-Baptiste Loeillet (b. 1688) were also important composers of the time. Loeillet was one of the earliest and most noted performers upon the one-keyed flute and also, according to Rockstro, the first performer on this instrument to visit England. His numerous works for flute and continuo, and those for two flutes, retain their position in the modern repertoire.[21]

Loeillet's music, and that of his contemporaries, generally consisted of dance movements in binary form; allemandes, gigues, minuets and the like. During the second quarter of the 18th century these dance movements gradually evolved into a form more akin to the sonata. It was now, too, that Italian-type concertos began to be written for flute and orchestra. Michel Blavet (1700-1768), Jean-Marie Leclair (1698-1764), and Joseph Bodin de Boismortier (1689-1755) wrote much important flute music while from Rameau in 1741 came the famous *Pieces de clavecin en trio*, for harpsichord, flute and bass viola. In Italy solo repertoire began to be written for the flute, most notably by Tommaso Albinoni (1671-1750), Francesco Maria Veracini (1690- c. 1750), Pietro Locatelli (1695-1764) and of course Antonio Vivaldi (1678-1741), whose numerous concertos and sonatas remain favourites, with their broadly lyrical melodic structures and brilliant, rapid arpeggiated passages.[22]

In Germany we find Johann Joachim Quantz and his royal pupil King Frederick the Great writing prolifically for the instrument, as did Johann Georg

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21 Rockstro, R.R.A. A Treatise on the Flute. London: Rudall Carte and Co. 1890. Reprinted 1967 by Musica Rara, London, p. 538

22 New Grove Dictionary, vol.6, p. 679

Tromlitz (1723-1797). Pride of place, is, however taken of course by the flute music of Johann Sebastian Bach (1685-1750): the sonata for unaccompanied flute (BWV 1013), four sonatas for flute and obbligato keyboard (BWV 1020, 1030-32), and three for flute and basso continuo (BWV 1033-35), two trios (BWV 1038-39), a concerto for flute, violin, and keyboard (BWV 1044), the B minor Suite (BWV 1067) and the fifth Brandenburg Concerto (BWV 1050).[23]

Moving towards the Rococo, we find a large amount of flute music written by Georg Philipp Telemann (1681-1767): most notable perhaps are the fourteen Fantasies for flute alone. J.C. Bach and C.P.E. Bach also wrote enduring works for the instrument. On an equal footing with the flute works of J.S. Bach, however, are those of G.F. Handel: the sonatas for flute and basso continuo, and the *12 Sonatas pour une traversière un violon ou hautbois con basse-continue* op. 1 (c. 1730) retain an important position in the modern repertoire.[24]

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23. ibid.,p. 680

24 ibid., pp.680-681

CHAPTER III THE FLUTE FROM 1700 TO 1830

The years 1700 to 1800 cover virtually the entire development, both structural and mechanical, of the flute (and indeed of all the woodwinds). The emerging monodic style demanded far greater powers of emotional expression: the requisite dynamic contrasts and tessitural extremes demanded the replacement of the recorder by the transverse flute. The 16th Century predilection for positive, clearly-defined but pure and organ-like sounds (as evinced by the recorder and the male treble voice) began to make way for a demand for an instrumental responsiveness that would reflect the slightest emotional nuances newly required by players and composers.

The one-keyed flute of Hotteterre was, however, to undergo vast changes before reaching its present happy state of sophisticated excellence. Compared to the string instruments, which had reached great heights of perfection by the 18th century, the flute obviously lacked technical facility and sufficient tonal flexibility and responsiveness. Composers were naturally reluctant to compose for instruments of inferior quality - as late as 1776 we have Sir John Hawkins (author of *A General History of the Science and Practice of Music*) complaining that "the German or Transverse Flute still retains some degree of estimation among gentlemen whose ears are not nice enough to inform them that it is never in tune,"[1] and the reason for Mozart's much-publicized dislike of the flute was the unreliability of its intonation.

Between the years 1700 and 1830 (this year being that of Boehm's first reforms), activity as far as the physical development of the flute is concerned, seems to be divided into two periods - from 1700 to 1800, and

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1 Galway, op. cit., p. 22

then from 1800 to 1830. During the first hundred years, we see mechanical progress, somewhat slow and random. Reforms are empirical and geographically speaking, widely scattered. Quantz is the dominant figure, being joined by Tromlitz at the end of the century. From 1880 on, the picture changes to one of a flurry of activity - a veritable "army of patentees" experiments furiously in the instrumental workshops of Europe and Britain. This is, too, the Golden Age of the Flute Virtuoso - Nicholson, Drouet, Fürstenau, Devienne, Tulou and Berbiguer, to name but a few. Besides being famed for their dazzling solo careers, these artists frequently contributed both to the mechanical development of the flute and to the repertoire of the instrument.

For the sake of convenience, the complex development of the flute between 1700 and 1830 has been chronologically charted. This chart is preceded by a brief review of important contemporary figures connected with the flute, and is succeeded by a consideration of the effects of flute developments on contemporaneous compositional practice.

PROMINENT 18TH CENTURY FLAUTISTS

Perhaps one of the most interesting and prominent figures in the 18th century flute world (and indeed in the entire musical sphere) was Johann Joachim Quantz (1697-1773), today famous principally for his *Versuch einer Anweisung die Flöte Traversiére zu Spielen*, which is a treatise on the flute and flute playing, and deals besides with many aspects of musical practice and thought at the time. The first chapter is quaintly entitled "Of the Qualities of those who would Dedicate themselves to Music"; the eighth, "Of the Appogiaturas and the Little Essential Graces Related to them"; and the sixteenth, "What a Flautist must Observe if he plays

in Public Concerts."[2] Underlying this charming literary style is a wealth of information compiled by a man with vast personal experience in his musical sphere.

Quantz was, by all accounts, a great flautist, overcoming the problems of his instrument and setting a much-envied standard of accurate intonation. The son of a village blacksmith in Germany, Quantz rose to become composer and teacher to King Frederick the Great. Hundreds of concertos, sonatas and chamber works, many of which still find a place in the repertoire, were written for his enthusiastic royal pupil. In addition, Quantz was a prominent mechanical innovator and flute-maker.[3]

His successor at the Prussian Court was J.B. Wendling, principal flute of the famous Mannheim orchestra at the time of Mozart's visit in 1778. Wendling appears to have been the first competent flautist Mozart had ever heard: " one need not always be in terror for fear the next note should be too high or too low; he is always right - he does not imagine that blowing and making faces is all that is needed."[4] Wendling neither composed nor was interested in mechanical improvements to the flute. Upon being shown one of the new six-keyed flutes, he condemned it out of hand as having a poor tone and refuted the keys as useless.[5] The development of the instrument was thus at times hindered by players who were, understandably, reluctant to sacrifice their hard-won expertise on the more primitive one-keyed flute.

Charles Nicholson, the greatest English virtuoso (1795-1837), was in

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2 Quantz, op. cit.,pp.11, 91, 196

3 Galway, op. cit., p. 25

4 Bate, op. cit., p. 182

5 Rockstro, op. cit., p. 562

comparison open-minded and experimental. On his tour of Europe he was acclaimed for his large and powerful tone, the result of having enlarged the finger-holes of his instrument. Nicholson's ideal flute sound was, in his own terms, "as reedy as possible, as much like the oboe as you can get it, but embodying the round mellowness of the clarinet."[6] Apart from his dazzling technique, his improvisatory style charmed with its special effects, ranging from the "glide" - a glissando effect achieved by gradually uncovering the finger-holes, to "vibration" (not a vibrato in the modern sense, which seems to have developed only with the advent of the metal Boehm flute, but a "finger-vibrato", made by trilling upon a key distant from the sounding note)[7]. It was Nicholson who inspired Boehm to try to improve his own instrument - Boehm stated "had I not heard him, probably the Boehm flute would not have been made."[8]

J.G. Tromlitz (1730-1805) was another important figure in the development of the flute - composer, author, performer and flute-maker, he originated the germinal idea of the open key system in use today. He published interesting work on tone production, and is also remembered for his spurious attacks on the worthy and venerable Quantz.[9]

Francois Devienne (1759-1803) was an old-fashioned player, resisting the additions of keys to his one-keyed instrument, and condemning double- and triple tongueing but nonetheless composed thirteen charming flute concertos, some of which are still played today.[10]

Friedrich Kuhlau (1786-1832), a celebrated German player and composer, did much to raise the standard of flute music at the time, which tended to be

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6 Baines, op. cit., p. 317

7 ibid., p. 320

8 Rockstro, op. cit., p. 551

9 ibid.,p. 550

10 ibid.,p. 257

extremely flashy and superficial in character. Known as the "Beethoven of the flute," he wrote a great deal of music, classical in style, which still finds a place in the modern repertoire.[11]

Jean-Louis Tulou (1786-1865) was at an early age regarded as the finest flute-player in France. An extremely colourful character, his brilliant career as a soloist was somewhat hindered by his conviction (reportedly unsupported by any artistic talent) that he would become a famous painter,[12] and by his strong Republican sentiments, which hindered his advancement in the employ of Louis XVIII. According to Rockstro, Tulou embodied in his performance the best of French playing: "The artistic elegance and delicacy of the highest school of French playing."[13] Tulou used and made old-fashioned pre-Boehm flutes, and is recorded as having made the following remarks about the new flute: "..... his flute was .... based on false principles, as he had founded his system on the harmonic sounds, which should always be avoided .... if the true character of its tone is to be preserved ..... The flute had, on the contrary, a thin tone, without roundness."[14] He is mainly remembered for his Grand Solos for the flute, although he wrote prolifically for the instrument.

Like Tulou, the German flautist Furstenau (1792-1852) was a determined opponent of the new flute, remaining faithful to the pre-Boehm flute. Although his style was reportedly refined and expressive he was criticized in the English *Quarterly Musical Magazine* thus: "His execution is brilliant, but his tone is thin: he falls infinitely short of Nicholson. We believe this ..... defect of tone appertains to the instrument now

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11 ibid., pp. 581-584
12 ibid., p. 587
13 ibid., p. 888
14 ibid., p. 315

generally in use throughout Germany."[15] He wrote a number of useful studies which are still played today, although much of what he wrote has sunk into oblivion.

Louis Drouet (1792-1873) also remained faithful to the pre-Boehm flute. As a soloist he inspired the most contrary emotions in the hearts of his audience, being alternately condemned and praised to the skies. Contemporary criticism reveals the flute's state of flux: ".... one would be inclined to think that he had orginally practised on a one-key flute, for in slow execution the defects of his fingering were very perceptible."[16] He is still known today for his excellent flute studies which are much in use.

There were many other virtuosi in this "Golden Age" of the flute, too numerous to mention. Apart from the popularity of the flute in the hands of the experts, it was beloved by the amateur - in about 1776 it was reported that a Mr. Coningham, an equestrian, advertised that, while simultaneously riding two horses, he would play the flute![17]

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15 ibid., p. 595

16 ibid., p. 601

17 Bate, op. cit., p. 113

CHART OF THE DEVELOPMENT OF THE FLUTE FROM 1700 TO 1830

Date	Name of Maker	Description
1511	The flute as described by Mersenne and Virdung	An instrument of clearly Asiatic origins: a keyless cylindrical flute with six finger-holes bored into a single piece of plain boxwood.[18]
c.1690	innovations attributed to the Hotteterre family, especially Jacques Hotteterre	A flute of tripartite or four-part construction, with cylindro-conical bore,[19] somewhat smaller finger-holes and one key at the foot of the flute. The head is retractable to afford tuning. The natural scale is D major; the range "two chromatic octaves and some notes" (according to Hotteterre's *Principes de la flûte traversière*).[20]
date unknown	probably Buffardin	Introduced the register - a slide-like tuning device of inter-fitted metal tubes whereby the length of the foot-joint is altered. This device was condemned by Quantz as being a cause of false intonation but was recommended by Tromlitz.[21] This running slide was the forerunner of the modern tuning-slide.[22]

18 Toff, op. cit., p. 13
19 Bate, op. cit., p. 77
20 Toff, op. cit., p. 18
21 Rockstro, op. cit., p. 151
22 Bate, op. cit., p. 93

Date	Name of Maker	Description
c.1720	unknown	Introduction of *corps de rechange* - a set of six interchangeable upper body joints of different lengths which allowed the player to adjust to the extremely variable 18th century pitch (which differed almost from town to town).[23]
1722	Biglioni	Extended the lower range to include Middle C and C#[24].
1726	Quantz	During Quantz's time, the screw-stopper or end-cork was added to the stopped end of the flute as a tuning device. He himself added a pin-and-socket joint between the head and the body to aid intonation.[25] He also added a second key to the foot-joint to accommodate the enharmonic differences between d^1# and e^1♭ .[26] This resulted in slightly improved intonation, in comparison with the notes of "veiled" quality produced by the complex cross-fingering system. Quantz also began to define more precise measurements for finger and embouchure -holes. He bored the latter in an elliptical shape as opposed to circular.[27] Nonetheless, with its imperfect intonation, the flute could play in virtually two keys only, G and D major (as opposed to the treble recorder, whose best keys were F and B♭ major).[28]

23 ibid., p. 94
24 Toff, op. cit., p. 19
25 Rockstro, op. cit., p. 154
26 Quantz, J.J. , On Playing the Flute. London: Faber and Faber, 1854, p. 31
27 Galway, op. cit., p. 21
28 Toff, op. cit., p. 23

Date	Name of Maker	Description
C.1760-1780	various London makers-Florio, Gedney, Potter[29]	Introduction of four and six-keyed flutes. The first attempts were made to eliminate cross-fingering with the accompanying inconsistencies of tone and intonation. Bores were made with an individual hole for each chromatic note. Thus, new holes were bored between E and F♯, G and A, and A and B. The new F, G♯/A♭ and A♯/B♭ were all equipped with keys[30]. The lower extended footjoint with C and C♯ was improved and keys were added.[31]
1782	Dr J.J. Ribock	Introduced a closed key for c^2.[32]
1786	J.G. Tromlitz	An F hole was bored on the far side of the instrument. Covered by a closed key, it was known as the "long F."[33]
		The flute in this form, having eight keys, was virtually the standard instrument of the late 18th and early 19th centuries. As well as being known as the "eight-keyed flute", it was called the "German", "simple-system" or "old-system" flute, amongst other appelations.[34]

30 ibid., p. 25
31 ibid., p. 25
32 ibid., p. 28
33 Bate, op. cit., p. 98
34 Toff, op. cit., p. 27

Date	Name of Maker	Description
1800	Tromlitz	Introduced an alternative B♭ fingering, known as the "long B♭". He also formulated a scheme for a keyless flute: this is significant as it foreshadows the important theory of the modern "open key" system, in which the keys remain open while at rest.[35]
1803	Dr. H.W. Potgiesser	Suggested, but did not physically implement, various ideas: a more tapered bore, and a joined body and foot-joint. Each finger was to have its own hole: this would, however, have been impractical as there would have been no chromatic keywork and only one key.[36]
1808	W.H. Potter	Introduced the quickly-obsolete sliding keys - the key uncovered the hole by means of a lateral sliding motion, as opposed to being lifted vertically.[37]
1808	Charles Townley	Introduced "a key - causing the bore to lengthen or contract at pleasure," and a sharpening d^1 key.[38]
1808	Rev. F. Nolan	Patented the first device that could simultaneously close an open key and a regular hole by means of attached levers and rings.[39]

35 Bate, op. cit., p. 104
36 Toff, op. cit., p. 31
37 ibid., p. 34
38 ibid., p. 34
39 ibid., p. 35

Date	Name of Maker	Description
1810	George Miller	Proposed to construct flutes from metal.[40]
1811	J.W. Capeller	Introduced a second trill key for d^2.[41]
1812	T. Monzani	Patented cork-lapped, metal-lined sockets, combined the body and foot-joint, and introduced a raised-formation mouth-hole[42].
1814	James Wood	Patented a flute with three tuning-slides.[43]
1815	Claude Laurent	Patented a glass flute with some mechanical advances: the keys were mounted on posts, which were screwed into the wall of the flute. This system replaced that in which a rotating key, mounted on a pin, was held in place by a metal bearing. Lateral "play" was thus eliminated.[44]
1822	Charles Nicholson	Enlarged the finger holes to obtain a more powerful sound, and introduced the fingerings for the notes c^4 and d^4. [45]

40 ibid., p. 36
41 ibid., p. 37
42 ibid., p. 37
43 ibid., p. 38
44 ibid., p. 34

Date	Name of maker	Description
1824	Dr. Potgiesser	Anticipated Boehm's acoustical principles with the construction of finger holes of equal diameter (6,5 mm) except for the $c^{1}\sharp$ and $d^{1}\sharp$ holes (7,9)mm[46]. This may be compared with the more randomly sized finger-holes of Mersenne's flute, which measured from 7 mm to 11,3 mm[47]. He also introduced a ring-key and crescent device, in order to reduce pad-leakage.[48]

A profusion of mechanical devices abounded during the first thirty years of the 19th century, of which the above-mentioned are merely a proportion. The simple bamboo flute of Mersenne had sprouted a strange and ungainly crop of levers, keys, bent-back foot-joints, curved head-joints, clip-on mouthpieces, and various complicated slides and sockets. Flutes were to be found in extraordinarily decorative forms, such as the cut-glass flutes of Laurent (patented in 1806) which dazzled the eye with their jewel-studded end-cork caps and silver keys.[49]

Nonetheless, despite the persistent imperfections of awakward cross-fingerings with their attendant evils of weak, indistinct tone and faulty intonation, much had been achieved. The experimentation of the past one hundred and thirty years had produced the eight-keyed flute, the predecessor of the Boehm flute. With the advent of this flute came changes in the attitude towards the instrument, and its influence upon compositional practice soon became evident.

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46 Bate, op. cit., p. 108

47 ibid., p. 11

48 Toff, op. cit., p. 39

49 ibid., p. 37

THE EFFECT OF THE EIGHT-KEYED FLUTE ON COMPOSITIONAL PRACTICE

Before discussing the effects upon compositional practice of the eight-keyed flute, mention must be made of one of the most famous of all passages for solo flute. This was written for the four or six-keyed instrument - the "Dance of the Blessed Spirits" by Gluck (1714-1784), from his opera *Orfeo et Euridice*.[50] Written in 1762, this opera was the vehicle for Gluck's famous opera reforms. Protesting against the decorative trivialities of the Rococo aesthetic, he replaced them with the noble simplicity and austerity of classical antiquity.[51] These principles are embodied in the passage for solo flute. The form (Da Capo Aria form) and phrases are simply conceived. Gluck spurns tessitural extremes (the highest note being f^3 and lowest , a^1), technical display and florid ornamentation. He achieves great melancholy expressiveness through purity of line in conjunction with judicious use of dynamics. This great solo is, however, chronologically speaking, somewhat isolated - the flute would next be used in a significant context only towards the end of the 18th century, as the Classicists Haydn and Mozart came into their own and the eight-keyed flute gained prominence. Gluck's isolated but successful use of the flute is perhaps best understood when we see that it was by exploiting the flute's very faults that he achieved his effects: Berlioz writes that only the flute, with its "pale colouring" and "feeble, faint, veiled sound" could have expressed Orfeo's " eternal grief.... and profound woe." [52] Gluck also availed himself most effectively of the harsh shrillness of the piccolo in the tempest of *Iphigenia in Tauride*, where two piccolos play a succession of elevenths in the upper

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50 Miller, op. cit., p. 127

51 New Grove Dictionary, vol. 7, p. 469

52 Berlioz, H. Modern Instrumentation and Orchestration. New York: Novello and Co., 1882, p. 117

octave, above the strings.

The four or six-keyed flute was succeeded by the eight-keyed flute. The considerable influence of this instrument may be clearly seen in a comparison of the orchestral works of Mozart (1736-1791), Haydn (1732-1789) and Beethoven (1770-1827). Before the 1780's the flute was seldom heard in Haydn's music, appearing in only one of the five pre-Esterhazy symphonies. His Symphony No. 6 requires one flute, No. 7, two flutes, and No. 8 only one. Thereafter, between 1762 and 1774 the flute is used only seven times in forty-four symphonies.[53] However, after 1780, the flute is regularly used in each one, and in the last symphonies is used always in pairs. In the early symphonies, Haydn uses only the middle range, from f^1 to f^2.

This is later extended both upwards and downwards, as in No. 100 (the *Military*) where the notes from d^1 to g^3 are encompassed.[54] The flute is frequently used by Haydn to convey an atmosphere of gentle serenity, as in the delightful slow movement of the *Clock* Symphony, No. 101.[55]

Mozart, who died in 1791, liked to use the oboe, with its more consistent intonation, as his principal woodwind treble voice.[56] The flute tends to be used principally for additional tonal colour within the polyphonic spectrum. Only one flute is used in the last three symphonies, and none in No. 36 (the *Linz*). Mozart did, however, make fairly extensive use of the flute in his operas, writing florid passages in, for example,

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53 Daniels, D. Orchestral Music. Metuchen, N.J.: Scarecrow Press Inc., 1972, p. 88

54 Toff, op. cit., p. 27

55 Galway, op. cit., pp. 36-37

56 ibid., p. 37

Il Seraglio and the *Magic Flute*. Here Mozart seems to be using the flute more in the context of a "special effect" rather than as an integral part of his serious compositional approach.[57]

Beethoven, by way of contrast, grants the flute solo roles throughout his symphonies. All three octaves of the flute are freely utilized, as in the *Leonora, No. 3* Overture, where the flute ranges from d^1 to a^3 within the space of eleven bars, in a colourful and evocative solo passage.

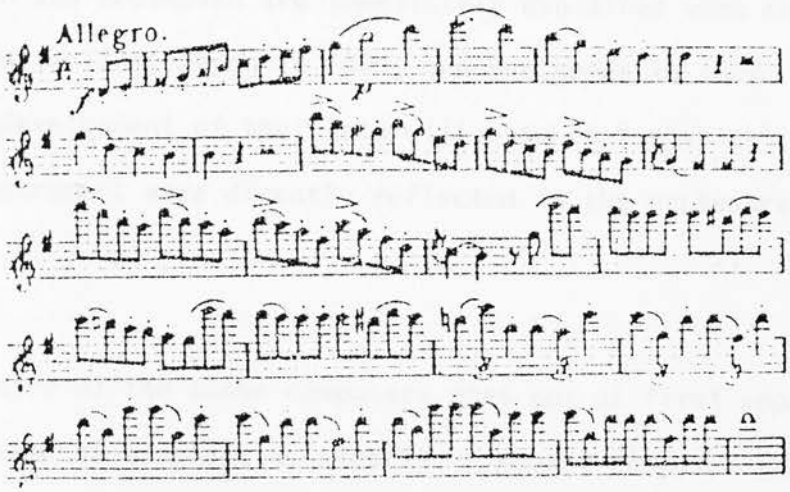

fig. 5. Solo flute passage from Beethoven's Overture, *Leonora, No. 3*[58]

Important pictorial use of the flute is made in the *Pastoral* Symphony. In the same work, Beethoven also uses the piccolo most effectively, as in the fourth movement, when it appears "alone and displayed, above the low tremolo of violas and basses, imitating the whistlings of a tempest whose full force is not yet unleashed."[59] Beethoven, like Haydn, extends his

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57 Bate, op. cit., p. 175

58 ibid.,p. 187

59 Berlioz, op. cit., p. 121

use of the flute's range as the years advance: in the Symphony No. 1, the range encompasses g^1 to g^3. He transposes his melody an octave down in bar no. 51 of the second movement in order to avoid the problematic $g^3\sharp$, although in a successive melodic repetition (this time transposed a fifth lower), he prefers not to resort to octave displacement. In the Symphony No. 3, however, a^3 is heard in the first movement, and $b\flat^3$ occurs in Symphony No. 8 (1814).[60]

The marked differences in the use of the flute in an orchestral context by Mozart, Haydn and Beethoven are immediately explained when one observes that Mozart died in 1791, Haydn in 1809, and Beethoven in 1827. Referral to the charted development of the flute will show that physical developments in the instrument were directly reflected in the orchestral music of the time.

The solo repertoire of the above composers does not at first appear to reflect the charted development as clearly. Mozart composed three important concerti for the flute: those in G and D major (k 313 and 314) and the Concerto for Flute and Harp (k 299). There are also the four "Quartets with Strings" (k 285, 285a, 285b and 298). Haydn left one Sonata for flute and harpsichord, one concerto and a number of trios. While the Mozart concerti occupy a position of prime importance in the flute repertoire (which cannot be said of the flute works of Haydn and Beethoven, who wrote only a rather mediocre Sonata for flute and piano, a Serenade for flute, oboe and viola, and a trio for flute, bassoon and piano) it should be borne in mind that the Concerto in D is a reworked

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60 Toff, op. cit., p. 39

version of the Oboe Concerto in C. The G major Concerto and the Flute Quartets were virtually written under duress, having been commissioned by an amateur flautist. Three months after having been paid for the concerto Mozart wrote to his father, referring to the flute thus: "... as you know, I am quite inhibited when I have to compose for an instrument which I cannot endure."[61]

The Concerto for Flute and Harp was also a commissioned work, being written for the Duc de Guines and his daughter. Apart from the flute, the harp was the only other instrument for which Mozart expressed an aversion. Fortunately, Mozart succeeded in distancing himself from whatever negative feelings he may have had and in writing beautiful music which today is heard to full advantage on the modern flute. Nonetheless, it appears that Mozart's works for solo flute were more the result of financial straits than of a genuine desire to compose specifically for the instrument. Mozart's well-publicized dislike for the flute sprang mainly from its unreliable intonation and uneven tone. It is significant, too, that the three concertos are in the keys of C, G, and D major - virtually the only keys in which the flute of the time was more or less reliable.

It is seen, therefore, that during the 18th and early part of the 19th centuries the flute developed from a primitive reed pipe into an instrument equipped with a fundamental "simple system" mechanism. The eight-keyed flute was the instrument of the "Golden Age" of the famous flute virtuosi, as well as the most favoured amateur instrument. An abundance of music was written for the flute(and transcribed: entire operas were apparently arranged for two flutes![62]) in order to fulfil the insatiable

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[61] Hyatt King, A. Mozart Wind and String Concertos. London: BBC Music Guides, 1978, p. 36

[62] Toff op. cit., p. 44

demand for flashy pyrotechnical display pieces. Very little of this music seems to have been of intrinsic musical value - equally little has survived. Rockstro includes in his *Treatise* an amusing article from a topical periodical, aimed at Nicholson and his fellow virtuosi:[63]

> *"HOW TO PLAY A SOLO ON THE FLUTE.*
>
> "My dear Phunniwistl,
>
> "As soon as your turn arrives, you will of course keep the audience waiting some little time in expectation—it does them good, whets the appetite, and makes them curious; stay until they get tolerably fidgety, and then make your appearance. Now, mind! a grand concerto always begins with a row, or else it cannot be grand; so tell your friend "who just scored it" for you, not to spare the brass. Well, then, you commence with a crash—key of C—all the instruments starting in unison. Now the strain moves onward, *andante maestoso;* you standing watching your music, with your flute cast negligently into the hollow of your arm, and your head as gracefully on one side as you can manage to get it. Having told your friend on what popular air you have composed your concerto or fantasia, he will, if he be a clever fellow, touch upon it a little during the introduction, while you occasionally—*only occasionally*, mind me—will put the flute to your lips, and play a bar or two of it, just to show the folks you *could* play the introduction if it were not *infra dig*, and you happened to be in the humour. However, let that pass. The orchestra are reaching a climax,—climbing, climbing, and bearing your flute on the top of their accumulated harmony, until you all come together upon another crash, more stupendous, if possible, than the first, dominant seventh upon C, you holding the tiptoppermost B flat. The crash over, the orchestra is silent, leaving you floating in the air with your aforesaid B flat, a long, liquid, melting, streamy note, which you will hold out as long as you can without endangering the wind-chest, or getting too red in the face. Then come scattering and tumbling down, as fast as possible, with all sorts of skips and hops, quips and quirks, and trills, and the various other beauties of which the instrument is so susceptible, until you settle somewhere about the middle of the lower octave, upon a serious, right-down, hearty shake, which pump out there as long as your strength lasts; then suddenly pitch it up an octave higher, and then, if you can, an octave higher still, and then drop gradually, and gently, and sweetly, by a chromatic passage, down again into the tune. Now, as to this tune, I will suppose you to have chosen one of the most popular airs of the day—"Polly, put the kettle on," for instance; for in composing either a fantasia or concerto, it is not essentially necessary that the air, any more than the scoring for the orchestra, should be *bonâ fide* your own work. "Polly, put the kettle on" will make an excellent theme, and, from the rarity with which it is heard in a concert-room, will doubtless be the more

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63 Rockstro, op. cit., pp.611 - 613

strikingly effective. Therefore—"Polly, put the kettle on." Having concluded the "favourite air" with two cadenzas, the second longer than the first, and the first too long for anything, the orchestra (you will of course have been "fortunate in securing the services" of Costa and the others) will take it up and play it once through. That being well over, you gather up your features into a look of fierce determination, and come at once to the scratch; you set off almost by yourself, with a something that can be "better felt than described;" something wonderfully and terrifically difficult; something *prestissimo* of course, full of awful skips from the lowest note to the highest, and corresponding dives down again, mingled with chromatic runs, and relieved by occasional groups, triplets, and sextets, and other "lets" and "tets," and whatever those divisions of time are called by which the performer is directed to play innumerable hemi-demi-semi-quavers in the time of one whole one; and then you wind up the variation, if it may be so styled, with a sky-rockety sort of a rush, from the lowest C of the instrument to its veritable antipode *in alt*, by way of a finale. The effect will be inconceivably wonderful, and there will ensue a sort of struggle between the audience and the orchestra, the former making the windows rattle with their plaudits, the latter trying to be heard in "Polly, put the kettle on;" which it repeats, as if on purpose to show how extremely original, and unlike the air, the variation really was.

"Here a pause of some little duration must intervene. Then do you commence again; but under far different circumstances. Your countenance must have lost its joyous gaiety, and have assumed a sombre, lachrymose expression (if you could put on *rouge*, and then contrive, in turning your head round towards the orchestra, to rub it off with your pocket-handkerchief, it would have a capital effect); the flute must be raised slowly and sadly to the lips, while a low, tremulous, sorrowful note will announce to the expectant audience the commencement of the *adagio con molto espressione*. Now, to perform an *adagio*, or compose an *adagio*, is generally held to be a very difficult piece of business; but in this case nothing will be easier. Your *adagio* will simply consist of "Polly, put the kettle on," played in a style of elegant despondency, slow and hopeless, save that you relieve your mind at every other bar by a strenuous shake, or, now and then, a prodigious flight of notes, as if too much grief had made you crazy; and then, for the conclusion, you must touch the heart in a series of pathetic appeals perfectly irresistible. Get up to the top B flat again, shake it gently, then whine down two or three half tones, and give some other note a shake, and so go on whining and sighing,

> and shaking and dying, till all the audience have closed their eyes to hide the nascent tear, and it would evidently be dangerous to add to their distress.
>
> "Grief is dry! You must, therefore, have something particularly spruce and spirited in store wherewith to dispel the gloom you have communicated. The *rondo finale! This* time the air may be given in six-eight measure, just by way of showing your musical invention and research. Extended arpeggios, runs, rushes, rattles, and screams; with a second edition of the hops, skips, flights, and divings of the first variation, together with the air played in *three* parts; that is to say, heard first in the upper regions, with a "phit," "phit," "phit;" then down at the bottom, with a "burr;" and lastly, in the middle passage, bobbling away in the form of an accompaniment. So you will proceed—"phit," "burr," "bobble," "bobble," "burr," "phit,"—settling at last into a brilliant close, which to render positively triumphant, give one more tremendous chromatic scramble, over the whole compass of the instrument (in *two* parts if possible); and then, my dear Phunniwistl, will you come off with flying colours indeed; then will the electrified audience stamp, shout, and rave with delight; then will you make your modest retiring bow, and, descending into the room, shake hands with your pupils, who, by a previous arrangement, crowd to congratulate you.
>
> "Yours sincerely,
> "C. SHARP."

It seems, however, that such monstrous display pieces had the unforeseen effect of revealing the technical deficiencies of the flute. As a contemporary critic put it, "The imperfections of the instrument are always visible if the performer is too ambitious in playing music of too great execution; he either loses his tone in paying attention to his fingering or *vice versa*."[64]

In an orchestral context, especially, the deficiencies of the flute were becoming all too obvious. In Boehm's *Essay on the Construction of Flutes* he perceives that composers, seldom being flautists themselves, are beginning to write far more difficult and demanding music than previously:

> Thus passages are often met with in music for the orchestra much more difficult than in any concertos composed by flute-players, who, acquainted with the defects of this instrument, are generally prudent enough not to prepare for themselves such stumbling blocks. Among such defects are to be reckoned all those notes which

64 Toff, op. cit., p. 45

> sound with difficulty or uncertainty; those which cannot be sustained in a crescendo or diminuendo without the risk of the tone 'breaking'; and those that require great management of lip to preserve a pure intonation.[65]

Thus, bad intonation disrupted orchestral wind sections and, as regards tone, the flute fell far short of the ideal in both quality and quantity. The flute lacked both the timbral variety increasingly being demanded by composers, who were becoming ever more aware of the orchestral resources at their disposal, and the volume required within the modern symphony orchestra. The mellow tone of the wooden flute was suitable for the blended autumnal colours of chamber music, but was without the brilliance that was fast becoming the tonal ideal of the time (as evinced by the perceptibly rising general pitch.)[66] In addition, the notes in the first two octaves were of unequal strength, and those of the third extremely difficult to produce. This desperate situation was saved by the advent of one Theobald Boehm, perhaps the most important figure in the history of the flute, the inventor of a workable flute system that is the basis of the modern flute.

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65 Boehm, T., Essay on the Construction of Flutes. London: Rudall and Carte, 1882, p. 20

66 see Glossary of Terms

CHAPTER IV THE BOEHM FLUTE

THE LIFE OF BOEHM

Theobald Boehm was born in Munich in 1794, the son of a prominent goldsmith. At an early age, he was proficient with the tools of his father's trade, and by the age of fourteen, was actively engaged in the manufacture and repairing of jewellery. This experience was to be of inestimable worth to Boehm, as in later years he was able to realize in practical form his own theories of flute-manufacture. At an early age, he evinced great musical talent, teaching himself first the flageolet and then the flute. His first flute was a one-keyed instrument which now has a place in the famous Dayton Miller Collection in the Library of Congress, Washington.[1] His second flute, made by himself at the age of seventeen, was a copy of a four-keyed instrument borrowed from a friend. After being self-taught, he received formal tuition at the hands of Johann Nepomuk Capeller (inventor of the d^2 trill key). Having made rapid progress, he became principal flautist of the Isarthor Theatre in Munich, in 1812. He had, in the meantime, manufactured many flutes for himself, his teacher and his friends, continuing to do so until opening his own flute factory in 1828. By this time he was a musician in the service of the Royal Court, and was also acquiring a reputation as a virtuoso, appearing in Paris and London.[2]

It was while in London that Boehm heard the great virtuoso Nicholson. This encounter encouraged Boehm to critically examine his instrument and to

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1 Bate, op. cit., p. 116

2 ibid., p. 117

consider whether the numerous defects of the flute, for so long accepted by flautists as being irredeemable, could be eliminated. Nicholson, playing upon a flute with enlarged tone-holes, elicited a tone that was, in the words of his pupil W.N. James, "not only clear, metallic and brilliant, but possess(ed) a volume that (was) almost incredible; and this too, be it observed, in the very lowest notes of the instrument."[3] Boehm himself wrote of his London visit that "I did as well as any continental flautist could have done, in 1831, but I could not match Nicholson in power of tone, wherefore, I set to work to remodel my flute. Had I not heard him, probably the Boehm flute would never have been made."[4]

It was on this same London visit of 1831 that Boehm met the amateur player Captain Gordon. A most vitriolic and enduring controversy was to arise regarding the two men. It was claimed that Boehm, far from being the honourable and honoured inventor of an innovative, scientifically based, workable flute-system, had in fact filched his ideas from Gordon. Research is, however, of the opinion that the controversy arose principally from the desire of fellow professionals and interested flute-makers to discredit Boehm. Among others, Christopher Welch and Carl Ventzke have each produced lengthy proof of Boehm's innocence. They refute the attacks on Boehm's character and veracity by people such as Victor Coche (a bitterly jealous professional rival, both as flute-player and maker), and the manufacturers Cornelius Ward and T. Prowse, all of whom had much to gain by discrediting Boehm.[5] The controversy, stilled during Boehm's lifetime, was revived by Rockstro, whose otherwise excellent book *The Flute* is somewhat marred by a lengthy and violent attack[6] on Boehm's

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3 Toff, op. cit., p. 46

4 Boehm, T. The Flute and Flute Playing. New York: Dover Publications, Ltd., 1964, p. 8

5 Bate, op. cit., p. 240

6 Rockstro, op. cit., pp. 334-341

character and work. This vituperative attack served, however, to stimulate a great deal of further research, the end result being the proof of Boehm's innocence through careful examination of his own thorough records of his work. The resemblances between the work of Gordon and Boehm are seen to be merely superficial.[7]

Returning to Boehm and his work, it seems that he realized that, despite the enlarged tone-holes of his flute, Nicholson's excellence was due mainly to his own extraordinary powers, and would be beyond the reach of the vast majority of players, condemned to play upon the inferior instrument then in general use: " I was struck with the powerful tone of Nicholson, ... but it required all his extraordinary skill and his excellent embouchure to hide the faulty intonation and the inequality of the tone which were the result of the improper positions of the holes."[8]

In his *Essay* he reasons that these "improper positions" arose thus:

> The instrument-makers of former times, ignorant of key mechanism, could not do otherwise than place the holes - without regard to acoustical principles - at such distances from the others that the fingers could still reach them. Afterwards a better chromatic scale was obtained by the adoption of keys; but as the positions of the holes of the old diatonic D major scale remained the same, their incorrect position (by which the nodes of vibration were often disturbed) and their insufficient size not only diminished the easy emission and pure intonation of some high notes, but also lessened the clearness and power of the tone throughout the instrument.[9]

For these reasons, Boehm concluded that mechanical improvements to the flute would not suffice - an entirely new fingering system would have to be devised. This was achieved in his flute of 1832. In 1846 he undertook the study of acoustical principles under a Professor Schafhäutl

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7 Toff, op. cit., p. 52

8 Rockstro, op. cit., p. 322

9 Boehm, Essay, pp. 17-18

in Munich.[10] These principles were applied in the construction of his "magnum opus", the 1847 flute, with its cylindrical body and so-called "parabolic" head-joint. Boehm died in 1881 in Munich at the ripe old age of eighty-seven, honoured and happy.

THE WORK OF BOEHM

Boehm's 1829 Flute

Boehm's 1829 flute was built on the old system, but incorporated various new features, such as hardened gold springs, longitudinal axle-rods connecting the keys and keys mounted on screw-in pillars (see fig. 6)[11].

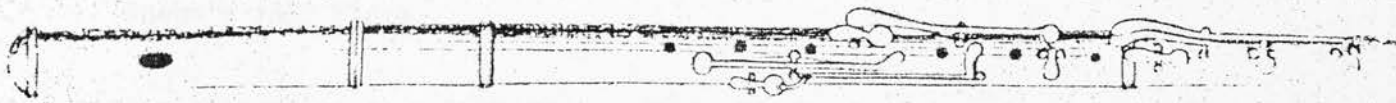

fig. 6. Boehm's 1829 flute - improved simple system [12]

Boehm's 1831 "Patent" flute

After his visit to London in 1831, Boehm felt that "there is no doubt that many artists have carried perfection to its last limits on the old flute, but there are unavoidable difficulties, originating in the construction of these flutes, which can neither be conquered by talent nor by the most persevering practice."[13] Setting to work, he produced the so-called "patent flute" of 1831 - something of a misnomer because Boehm

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10 Boehm, The Flute, p. 12

11 Toff, op. cit., p. 46

12 ibid., p. 46

13 Boehm, The Flute, p. 18

did not in fact feel that the instrument was advanced enough to warrant a patent.[14] The only real departures from the old system flute, were firstly, the placement of the enlarged E, F♯ and G holes lower down in better acoustic positions,[15] and secondly, an improved position for the A hole. Thirdly, the detested cross-fingered F of the old flute was eliminated: this, like the fingering of the new A, was effected by the use of jointed ring-keys[16] - by means of connective axle-rods and levers more than one key could be depressed simultaneously by one finger. Three fingers, therefore, controlled four keys (D,E,F and the key between G and F), so that, although the F♯ was still cross-fingered, the F hole was simultaneously opened, and the disastrous veiling of the tone thus avoided.[17]

Boehm's 1832 Flute

The 1832 flute is remarkable in that all the keys, except for the D♯, are open-standing, paving the way for the modern open key flute, and allowing for the fullest possible venting of the holes. The reason, Boehm explains, is this: "It is necessary, for obtaining a clear and strong tone, that the holes immediately below the one sounding should remain open, for the air confined in the lower end of the tube tends to flatten the notes, and render them less free."[18]

These open keys were controlled by the previously-mentioned rings and axles, enabling a distant key to be depressed by the same finger closing a particular hole.[19] In other words, two keys could be closed simultaneously by one finger. This was necessary as Boehm had determined

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14 Toff, op. cit., p. 53
15 Bate, op. cit., p. 118
16 Toff, op. cit., p. 53
17 Bate, op. cit., p. 118
18 Boehm, The Flute, p. 20
19 Baines, op. cit., p. 321

the correct acoustic positioning of the tone-holes by means of experiments with lengths of wood, the ends of which were progressively cut off to reveal the correct measurement. He then bored holes in a tube corresponding to these measurements. Finding that the pitch of the notes was flat, due to the holes being smaller than the diameter of the tube, he moved the holes upwards, using yet another tube. The six upper holes had to be moved yet again, and altered in size, to improve the tuning of the third octave. The tone-holes were made as large as possible, as Nicholson had done.[20] In silver flutes the diameter of the holes was 13,5 mm, and in wooden instruments, 13mm.[21]

Few of these devices were originated by Boehm - the enlarged tone-holes were the idea of Nicholson; the ring-key devices had been seen in contemporary workshops;[22] Dr. H.W. Potgiesser had insisted on the correct positioning of the tone-holes according to acoustic principles in 1803 and 1824,[23] while Tromlitz had been the first to formulate the open key system in which all keys remain open while at rest.[24] Nonetheless it was Boehm who, with devotion, knowledge, perseverance and mechanical ability, united all these factors into an eminently workable solution. The axle-rods were, however, his own invention, and were most useful in the new fingering system (hence forward known as the Boehm System) necessitated by the new flute. There are some other interesting features in the 1832 flute: the metal tuning-slide is eliminated, being replaced by a number of removable silver rings, and there is a crutch for the left-hand thumb, aimed at improving the ease of the left-hand

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20 Toff, op. cit., p. 55
21 Boehm, The Flute, p. 27
22 Baines, op. cit., p. 321
23 Bate, op. cit., p. 104
24 ibid., p. 104

technique.[25]

Having determined the correct position and size of the tone-holes, Boehm proceeded to formulate the means of controlling the notes in their new positions. Nine fingers controlled fourteen holes (the right-hand thumb being used for support) by means of ring-keys and axle-rods. Boehm states that, in his fingering system, "the fingers do not move out of their natural position from the lower D up to the highest B, with the exception of the little finger of the right hand, to which I left the management of the foot keys ..... there is no more gliding from one key to another, or to a finger-hole."[26]

The fingering of the 1832 Flute

The right-hand fourth finger controls the foot-joint keys of C, C♯ and D♯. This latter key must almost always be kept open, being one of the only closed keys: the pressure exerted by the fourth finger balances the flute in the hands of the player.[27]

The right-hand first, second and third fingers control the F♯, F and E holes respectively. The G hole is covered with a padded cup joined to an axle, from which project the ring-keys for the E and F holes. The G is thus kept closed when either the E or F is depressed. The left-hand first finger can also close the G hole, as the F ring is attached to a long axle, reaching as far as the left-hand B key, which has an arm projecting over the G cup.[28]

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25 Toff, op. cit., p. 59
26 Boehm, The Flute, p. 20
27 Toff, op. cit., p. 58
28 Bate, op. cit., p. 120

In the left hand, an open G♯ key is controlled by the fourth finger, the A and B♭ holes being covered by the third and second fingers. An axle connected to both the B cup and F♯ ring means that the B hole can be closed by the right-hand first finger. Opening of the B♭ hole results in B♮. C is produced by an open hole on the near side of the flute, operated by the thumb,[29] while C♯, further up on the tube, is played by means of an open key and an axle, the left-hand first finger manipulating a finger plate.[30] A closed trill key for $c^2\sharp/d^2$ is placed high up on the body of the flute, being attached by long axles to a touchpiece operated by the right-hand third finger.[31]

fig. 7. Boehm's 1832 flute[32]

The flute between 1833 and 1846

Boehm's 1832 flute (see fig. 7) was only very reluctantly accepted. In Germany, its "open" tone was unfavourably compared with that of the old system flutes, and players were understandably reluctant to relinquish their own hard-won technique and to set about learning an entirely new system of fingering. Between 1833 and 1846 Boehm's interests in the steel industry of Bavaria, amongst other things, took up much of his time, leaving little opportunity for any further flute-making, and

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29 ibid., p. 121
30 Toff, op. cit., p. 59
31 ibid., p. 59
32 ibid., p. 59

in 1839 he closed his flute factory. During these years a number of other manufacturers effected various improvements to the Boehm flute.[33]

Auguste Buffet, the famous French manufacturer, moved all the axles, dispersed by Boehm on both sides of the tube, onto the inner side. In order not to crowd various parts of the mechanism, he instituted a "clutch", an elegant system whereby various disparate elements of Boehm's mechanism were more closely incorporated and at the same time protected from damage (see fig. 8).

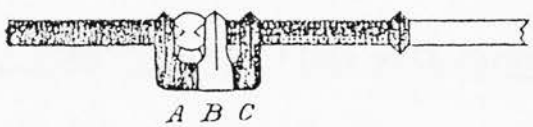

fig. 8. Buffet's clutch[34]

In the clutch, a rod and sleeve device is used whereby the sleeve bearing the B♭ ring, the B cup, the C♯ cup and touch-plate is attached to lug A. The axle bearing the G cup and the E and F rings is fastened to lug B. Lug C is attached to the loose sleeve carrying the F♯ ring.[35] Buffet also used needle-springs in place of Boehm's flat leaf-springs.[36]

Vincent Dorus, a Paris Conservatoire Professor and noted soloist replaced Boehm's controversial open G♯ key with a closed G♯ key. This

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33 Bate, op. cit., p. 121
34 Toff, op. cit., p. 62
35 ibid., p. 62
36 Bate, op. cit., p. 122

was vented to avoid veiling of the tone.[37] Victor Coche, one of Boehm's most bitter antagonists, introduced a number of features, none of which have survived except for the trill key for $C^{2/3}\sharp/D^{2/3}\sharp$, which is operated by the right-hand fourth finger.

As Boehm had not patented his flute of 1832, it was manufactured by Coche and Buffet under the names of "Invention Gordon", "Modification Boehm", and the hyperbolic "Perfectionnement V.Coche." Ward, Clinton, Carte and Rudall, all prominent figures, had adopted the Boehm flute by 1843.[38] The instrument was fast gaining ground, but reached new heights of popularity with Boehm's 1847 flute.

Boehm's 1847 Flute: the "Cylinder Flute with Parabolic Head."

Summarizing what he had achieved with his 1832 flute, Boehm writes thus in *The Flute and Flute Playing*: "As compared with the old flute, this one was unquestionably nearer perfection. The tone-holes were placed in their accoustically correct position and, through my new system of fingering, one could play all possible tone combinations clearly and surely."[39] He proceeds to describe the reasons for the work which resulted in the flute of 1847:

> As regards the sounding and the quality of the lower and higher tones, there was yet much to be desired, but further improvements could be secured only be a complete change in the bore of the flute-tube .... The method of boring, with a cylindrical head and a conical contraction in the lower part .... was far from being in accordance with acoustical principles, as the positions of the finger-holes had been borrowed from the primitive *Schwegel* or *Querpfeife* ..... I was never able to understand why, of all wind instruments with tone-holes and conical bore, the flute alone should be blown at its wider end; it seems much more natural that, with a rising pitch and shorter length of air column, the diameter should become smaller.[40]

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37 ibid., p. 123

38 Toff, op. cit., p. 65

39 Boehm, The Flute, p. 8

40 ibid., p. 10

Having made a number of unsuccessful empirical experiments with flute bores, Boehm undertook the study of classical acoustic principles for two years under a Professor Schafhäutl. Thereafter, he completed his flute in 1847. It was for this "magnum opus" that he received the highest prize at the World's Expositions, in London in 1851 and in Paris in 1855.

In *The Flute and Flute Playing*, Boehm describes his flute thus:

> .... My flutes consist of three pieces ..... When these pieces are joined together, they form the tube of the flute, which is closed above the mouth-hole by a cork plug. The main part of the tube is cylindrical, with an inside diameter of 19 millimetres. The bore of the head-joint is gradually reduced in diameter by two millimetres, from the joint upwards to the cork. The free speech of the tone and the correct tuning of the higher octaves depend upon the particular form of this curvilinear reduction in the diameter.[41]

In 1846 Boehm concluded that

> a more or less important contraction in the bore of the upper part of the flute -tube, and a shortening or lengthening of this contraction have an important influence upon the production of the tones and upon the tuning of the octaves. This contraction must be made in a certain geometrical proportion, which is closely approached by the curve of the parabola.[42]

It seems that, although Boehm arrived at the size and length of his bore and the positioning of his tone-holes by means of mathematical calculations, the form of this contraction in the bore was reached by experiment only. Dayton Miller, puzzled by Boehm's term "parabolic head-joint",

> measured and plotted the curves of perhaps a hundred flutes. Most of these curves do not in any way resemble a parabola; such resemblance as is possessed by the few may be described by saying that the curve which at first departs but little from the straight

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41 ibid., p. 14

42 ibid., p. 16

> line, bends more and more rapidly as it progresses. But sometimes the portion with the greatest curvature is next to the cork and sometimes next to the tuning-slide.[43]

However, there is of course a resemblance in shape between the contracting head-joint and a parabola, although there may be no strict mathematical connection.

Boehm adopted the use of a cylindrical tube after formulating the following principle:

> The divisions of the column of air into aliquot parts, or the formation of vibrational nodes - in short, all phenomena which appear in a vibrating column of air - are exhibited in a cylindrical tube in the most perfect and easy manner; consequently ..... a cylindrical tube is .... best for the construction of a flute.[44]

As far as the embouchure was concened, Boehm preferred to use a hole in the shape of an "elongated rectangle with rounded corners, presenting a long edge to the wide air stream, allowing more air to be effective than would a round or oval hole of equal size."[45] On the side of the embouchure where the lip rests, a small hollow was excavated, thus eliminating much of the hissing which had previously been present.[46]

In theory, Boehm believed that the tone-holes, while being as large as possible, should be graduated in size. The holes in the foot-joint would be the most enlarged, and would become progressively smaller as they approached the head-joint. However, this proved impractical, although most modern flute-makers employ three or four groups of different-sized tone-holes.[47]

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43 ibid., p. 17

44 Boehm, Essay , pp. 34 - 36

45 Boehm, The Flute, p. 21

46 Toff, op. cit., p. 68

47 Bate, op. cit., p. 127

Although the fingering of the 1847 flute was the same as that of Boehm's 1832 model, the enlarged tone-holes required new means of closure, as the holes were now too big to be closed by the fingers. Boehm thus adopted the rod and axle mechanisms of the French flute-maker Buffet. Ring-keys and open holes were replaced by padded hole covers, attached to open-standing keys.[48] Each key cover was attached to its own sleeve and sprung open by a needle-spring. Clutch systems were used to link inter-connected keys. All these various sleeve and clutch mechanisms were sprung upon longitudinal rods which were mounted upon the body of the flute.[49]

After making numerous experiments with flutes made of assorted materials, including brass, German silver, various kinds of wood, and silver, Boehm concluded that the most resonant tone was to be obtained from thin, hand-drawn tubes, of various types of metal, with their greater capacity for vibration. Although in later life he himself returned to the use of the wooden flute, Boehm manufactured silver flutes for the sake of their "unsurpassed brilliancy and sonorousness of tone."[50] Today, of course, silver is almost universally used in the manufacture of flutes, the intimate tonal qualities of the wooden flute being unsuitable within the modern orchestral context, and unable to compete with the pianoforte in volume.

The Bass Flute

It must also be mentioned that Boehm designed an alto flute in G (more commonly known as a bass flute). His intention was to produce an

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48 ibid., p. 127

49 Toff, op. cit., p. 70

50 Boehm, The Flute, p. 54

instrument with an entirely different tonal quality - a "contralto" voice, as it were, as opposed to a "soprano" voice. This instrument has not succeeded as a solo instrument, but is used at times in an orchestral context, as in Ravel's *Daphnis et Chloé* and Stravinsky's *Le Sacre du Printemps*.[51]

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51 ibid., pp.120-123

CHAPTER V THE FLUTE AFTER BOEHM

THE ADOPTION OF THE BOEHM FLUTE INTO GENERAL USE

The Boehm flute was adopted almost immediately by the French: it was taught at the Paris Conservatoire from 1838 onwards (in the form of Boehm's 1832 model), and in 1855 the Boehm flute was awarded the gold medal at the Paris Exhibition.[1] In the United States, teachers such as John A. Kyle and Philip Ernst aided the ready acceptance of the Boehm flute. It was, however, in England and in Germany (Boehm's own homeland) that the adoption of his flute was most resisted. This was due to a number of factors: the lack of qualified teachers; resistance on aesthetic grounds (some German conductors being of the opinion that the tone of the flute did not now complement the remainder of the woodwind section[2]); and objections to the new system of fingering, seen by many as being unnecessarily complicated. In 1870, John Radcliffe wrote thus:[3]

> I am aware that there are still many flute players trembling on the verge of a transition from the old to the new class of flutes, desiring, but hesitating, whether or not to take this step. Convinced as they are of the superiority of the tone and tuning of the New Flutes, but knowing well their old Flutes, and having perhaps in some measure succeeded in managing them, so as partially to conceal their defects, they fear to take a leap in the dark as to the altered fingerings.

In England and Germany this fear of the new fingering led to a great deal of further experimentation and modification by people such as Cornelius Ward, Abel Siccama, Richard Carte, Richard Rockstro and John Radcliffe, to name but a few.[4] Nonetheless, the Boehm flute retained its supremacy,

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1 Toff, op. cit., p. 76

2 Fitzgibbon, H.M. The Story of the Flute. London: William Reeves, 1929, p. 57

3 Toff, op. cit., p. 116

4 Bate, op. cit., p. 136-155

becoming a standard fixture in the symphony orchestra in the second half of the 19th century. Important orchestral repertoire began to be written for the flute, but a solo repertoire of value developed only towards the end of the century.

MODIFICATIONS MADE TO THE BOEHM FLUTE

With some alterations, the flute in general use today remains faithful to Boehm's 1847 prototype. These alterations include the introduction of perforated keys by the French flute makers Louis Lot and Clair Godfroy in 1848[5]. This key system, now known as the "open-hole" or "French" model, is today preferred by the majority of professional players to the "closed-hole" system. Additional venting is obtained by means of removing the "core", as it were, from the A,G, F♯, E and D keys, transforming them into ring-shaped keys, which are closed directly by the fingers themselves. In the opinion of Albert Cooper, one of the most respected modern flute-makers, this venting affords greater clarity of tone in the middle register.[6] The open keys also impart a certain additional vibrance to the instrument, as well as making available certain avant-garde techniques whereby micro-tones may be produced by gradually uncovering one or other of the holes.

The Briccialdi thumb lever is one of the few permanent mechanical alterations made to the Boehm flute. Boehm's thumb key produced B♮, the B♭ being obtained by pressing the right hand index finger while B♮ was being played. Briccialdi added a facilitating thumb B♭, providing a second key connected to the B♮ thumb plate - B♭ could thus be

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5 Toff, op. cit., p. 72

6 Galway, op. cit., p. 57

obtained merely by depressing the thumb and first finger of the left hand. The second mechanical alteration now in general use is the closed G ♯ key, introduced in 1839 by Vincent Dorus in Paris.[7]

During the 20th century, the flute has undergone various alterations. New scale systems have been introduced, offering improved intonation, the most notable being the Cooper Scale. Nonetheless, the Boehm flute has remained largely unchanged and is responsible for the flowering of a new repertoire of flute music.

MUSICAL SIGNIFICANCE OF THE BOEHM FLUTE

The musical importance of the Boehm flute stems largely from its technical perfection. Composers and players, freed from the serious technical limitations imposed upon them by the pre-Boehm instrument, became far more concerned with utilizing the timbral and tonal qualities of the instrument. The preoccupation with digital technique died away: instead, the revolutionary idea that "the tone is the soul of the flute"[8] began to take root. Naturally, the improved mechanical possibilities resulted in the composition of works of far greater technical exploration, while the extended range has been utilized ever since the late 19th century. Alternate fingerings for especially difficult passages are afforded by the combination of a flexible and complex fingering system, and the easy production of harmonics. Most important, however, is the responsiveness of the Boehm flute. It is this factor which makes the Boehm flute one of the most sensitive of all orchestral instruments, with an unlimited range of tonal colours and dynamic subtleties. The modern instrument

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7 Toff, op. cit., p. 65

8 Cameron, R. "The Flute - Its Story and Practice", Etude Music Magazine 49 (Oct. 1931), p. 708

has also proved itself particularly suited to the requirements of avant-garde music, and has inspired a large amount of music of this genre. All these factors will be dealt with in greater detail, but in order to observe the development of the modern flute repertoire, it is necessary to return to the time of Boehm and to the French Conservatoire, the cradle of modern flute-playing.

CHAPTER VI POST-BOEHM REPERTOIRE

THE FRENCH SCHOOL OF FLUTE PLAYING

Before examining the development of the French School, its characteristics should be noted. The French School may perhaps be said to aim at the achievement of perfect musical expression through the medium of technical perfection and tonal control. Delicate manipulation of tone colour is essential to the promulgation of the principle that "the tone is the soul of the flute."[1] A typically "French" sound is generally acknowledged to be bright, liquid and shimmering in character, as opposed to the darker, broader type of sound preferred by English and German players. These differences in sound are obtained by means of different embouchure formations: in a French-style embouchure the musculature is as relaxed as possible, with the fleshy, inner part of the lips being more fully utilized than in other embouchure formations. These others are characterized by a firmer muscular control, with far more of the flute mouth-hole being covered by the mouth of the player. The French believe that less than a third of the mouth-hole should be covered by the mouth, the corners of which should be turned downwards.[2] In comparison, the English cover up to a half or more of the hole, turning their lips upwards in the celebrated "flute-player's smile."[3] These differences result in the limpid, bright upper register peculiar to the French School, and in the strong bottom register typical of the English tradition.[4] This English tradition, which may be seen to have its origins in the playing of Nicholson, was further developed by Robert Murchie, Gareth Morris, and more recently

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1 Cameron, op. cit., p. 708

2 Taffanel et Gaubert, Méthode Complète de Flûte. Paris: Alphonse Leduc, 1958, p. 5

3 Bate, op. cit., p. 231

4 ibid., p. 231

by players such as William Bennet and Trevor Wye.[5] The English school also differs from the French in its use of vibrato: in the former, vibrato is slower, broader, and is used only where deemed suitable. The French vibrato is, generally speaking (as vibrato is very much a matter of personal taste), more rapid and pronounced, and is used virtually all the time in such a manner as to impart shimmer and life to the tone, as well as to project the sound. For the French, vibrato is very much an integral part of the sound, as opposed to being an expressive device to be used as required. It seems that the French-style embouchure and use of vibrato was first developed by Paul Taffanel, and later promulgated by his pupils Louis Fleury and Marcel Moyse.[6]

Early and pre-Boehm flutes were apparently played without vibrato.[7] Paul Taffanel appears to have been the first to develop and promote the use of vibrato in order to modify the tone, which he did during the late 19th century. In his book *The Avant-Garde Flute* Thomas Howell states that: "... the modern conception of vibrato production was not developed until ... after the flute as we now know it was invented by Theobald Boehm in 1847.... The changes necessary to enable modern tone production are very small details involving the construction of the lip-plate in order to reduce blowing resistance .... as far as personal contact with .... flautists who were active before the 1920's has revealed, the early Boehm flutes were played without vibrato altogether." [8] Thus it was only with the adoption of the metal Boehm flute that this quality of tonal intensification (which is today so much an integral part of flute playing) developed.

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5 ibid., p. 231

6 ibid., p. 231

7 Toff, op. cit., p. 212

8 Howell, T. The Avant-Garde Flute. Berkeley: University of California Press, 1974, p. 10

THE CONTRIBUTION OF FRANCE TO THE REPERTOIRE

One of the most important figures in the flute world at the end of the 19th century, Paul Taffanel (1844-1908) is commonly regarded as the father of the modern French school of flute playing.[9] He was a pupil of Dorus, under whom the Boehm flute was first officially recognised and taught in France, and succeeded Altés as the flute professor at the French Conservatoire in 1893. Before this, in 1879, he founded the influential *Société des Instruments à Vent*. His performing style was reportedly one of consummate musicianship, and as flute professor he attracted and influenced a new generation of brilliant young flautists, who were to disseminate his methods world-wide.[10] His teachings are preserved in the *Méthode Complète de Flûte*, which remains the most comprehensive and sound flute tutorial. He also composed a number of chamber works in which he exploits the best qualities of the flute. His *Andante Pastorale et Scherzettino* written in the romantic style of the late 19th century, makes full use of the flute's lyrical qualities and its capacity for brilliant articulation. Taffanel resurrected the flute works of Bach and Mozart, which had largely been neglected in favour of the 19th century "fireworks style."[11] His consistently high standards of performance inspired the composition of works for flute by Enesco, Huë, Godard, Widor and Saint-Saëns.

Taffanel was followed by Georges Barrère (1876-1944), who founded the *Paris Société Moderne des Instruments à Vent* in 1895, thereby giving added impetus to the composition of new woodwind music. In 1905, he joined the New York Symphony Orchestra and exerted a profound influence

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9 New Grove Dictionary, vol. 18,p. 521

10 ibid., p. 521

11 Toff, op. cit., p. 125

upon American flute playing. Teaching at the Institute of Musical Art, he conveyed the French style to succeeding generations of Americans.[12]

Another of Taffanel's most famous pupils was Philippe Gaubert (1879-1941), who completed Taffanel's *Méthode Complète* after his death. He functioned as solo flautist in the principle Paris orchestras, was a popular conductor, became the flute professor at the Conservatoire, and was made a Commander of the Legion of Honour.[12a] He wrote a large number of flute works, including the *Nocturne et Scherzando*, *Ballade*, *Fantaisie* and the three Flute Sonatas. His flute music combines lyrical, expressive melody with flowery decorative passages. His harmonic idiom is chromatic, his style romantic.

Louis Fleury (1878-1926) became, in addition to the flute professor at the Conservatoire, a director of the *Société Moderne des Instruments à Vent*, and was responsible for the commissioning of many new works for woodwind. He did much to promote the Boehm flute through his acclaimed virtuosity, and was the dedicatee and inspiration of many important flute works, such as Debussy's classic *Syrinx*.[13]

Marcel Moyse (1889-1984) is one of the most famous and important figures in the 20th century flute world. A pupil of Taffanel, Hennebains and Gaubert, he became a celebrated virtuoso, appearing as soloist under the batons of Walter, Toscanini, Mengelburg and Klemperer, amongst others.[14] As a teacher, he has been most influential, his teaching career having spanned three-quarters of a century. Nearly every flautist of international repute, and many more besides, has passed through his hands. His

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12 ibid., p. 125

12a New Grove Dictionary, vol. 5, p. 231

13 ibid., vol. 6, p. 640

14 ibid., vol. 12, p. 661

pupils include Jean-Pierre Rampal, James Galway, Maxence Larrieu, Aurèle Nicolet, Christian Lardé and many others. Even those flautists who did not have personal lessons with the great Moyse remain deeply in his debt - a large proportion of modern teaching material has been formulated by him. No serious student of the flute avoids working through Moyse's *de la Sonorité* (an indispensable system for the proper development of tone), and his numerous books of scalic exercises and technical studies constitute a staple technical diet. Like Fleury, he has been the inspiration of many important flute works: he gave the first performance of Ibert's Flute Concerto (which was dedicated to him)in 1933.[15]

These great French flautists, who were the first to show what could be done on the Boehm flute, inspired a vast new repertoire for their instrument. Another factor which has stimulated the growth of the repertoire is the French Conservatoire system, whereby new works are commissioned every year as contest pieces- the celebrated *Morceaux de concours du Conservatoire National Superieur de Paris*, which are usually technically demanding works of generally acknowledged intrinsic musical value. The new repertoire is characterized by timbral exploration combined with technical display.

Cecile Chaminade (1857-1944) composed much romantic salon music, principally for the piano. Regarding the flute, she is remembered for the *Concertino* for flute and orchestra which is extensively performed.

In a different class altogether, is Claude Debussy (1862 - 1918) who wrote one piece only for the flute. *Syrinx* , for solo flute, is a standard work in the repertoire and is probably performed more often than any

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15 New Grove Dictionary, vol. 12, p. 661

other, being ideally suited in its brevity and descriptiveness as an encore and as a recital item. The work is based upon the Greek Legend of Pan and Syrinx,[16] and while not being particularly difficult technically, is very demanding as regards interpretation. A fluid melodic line, elaborately changing tempi, rhythmic complexities, and striking dynamic and tonal colouring combine to produce one of the most evocative works for flute ever written.

Gabriel Pierné (1863 - 1937), a pupil of Franck and a class mate of Debussy, wrote prolifically, composing operas, ballets, and orchestral suites. As far as the flute is concerned, he reworked his Violin Sonata to provide a work of major proportions that is perfectly suited to the temperament of the flute. In addition, he wrote various smaller works, such as the *Serenade* and *Canzonetta*.[17]

Jules Mouquet (1867-1946) was trained at the Paris Conservatoire and wrote extensively for the flute. *La Flûte de Pan*, *Cinq Pièces Brèves*, *Danse Greque*, *Eglogue:* all these works for flute and piano are romantic in style: expressive melody, often characterized by syncopated rhythm, sings above lush harmonies. Mouquet frequently demands of the performer extreme agility in florid passages of great rapidity.

Albert Roussel (1869-1937) was for many years an officer in the French Navy before devoting himself entirely to music. His work is thus imbued with cosmopolitan influences. He is the composer of four famous descriptive miniatures for flute and piano, the *Jouers de Flûte*. The

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16 Bobby Finn, record notes

17 Marc Pincherle, record notes

first, "Pan" inevitably inspired by the god of that name, is improvisatory in style, and is decorated with pan-pipe-like runs. The second, "Tityre", is a charming pastoral confection of brief runs and staccato intervals, named after one of the shepherd boys in Virgil's *Eclogues*. "Krishna" is meditative and introspective recalling a prayerful song in an Eastern temple. By way of contrast, "Mr de la Péjaudie" is cheerful and debonair - according to legend, it is named after an old flute professor with a wooden leg, whose uneven tread along the Conservatoire passage as he pursued an attractive female pupil is perfectly represented by Roussel's lop-sided rhythm.[18] Roussel also wrote an *Andante et Scherzo* for flute and piano.

Charles Koechlin (1867- 1950), a pupil of Fauré and Massenet, is perhaps one of the most under-rated composers of the century. He writes with a great "sense of classical form, ... and an individual sense of harmonic and contrapuntal style."[19] Many of his works,reputedly of great originality, remain unpublished - Koechlin appears to have been a retiring and scholarly individual, not overly concerned with his own promotion.[20] His works for flute include *Quatorze Pièces* (remarkable for their pure melodic line and simple, yet colourful and evocative harmonies), and the *Sonate pour Flûte et Piano*. In addition, he wrote several chamber works in which the flute is used.

Edgard Varese (1883-1965) is known for his piece for solo flute, *Density 21,5*,commissioned by Georges Barrère for the inauguration of his platinum

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18 notes provided by Lucien Grujon, pupil of Marcel Moyse and principal flautist of CTSO 1975-1985

19 Thompson, O., ed. The International Cyclopaedia of Music and Musicians. New York: Dodd, Head and Co., 1975, p. 1126

20 ibid. , p. 1126

flute. The title refers to the density of this metal, and the piece utilizes the full range of the flute (including the top d^4). Sharply contrasting dynamic levels and altered fingerings for certain notes offer opportunities for colouristic effects, and a percussive sound (obtained by slapping the keys down with the fingers) add interest.[21]

Jacques Ibert (1890-1962) is yet another scion of the Paris Conservatoire. His works show a fine sense of orchestral colour, and often contain jazz-elements and Mediterranean influences. His Flute Concerto (1934), dedicated to Marcel Moyse, was a Paris Conservatoire test piece. The Concerto is brilliant and testing: the *Andante* is demanding of the expressive powers of the soloist and the virtuosic finale is characterised by rhythmic wit and Gallic polish.[22] He also wrote an *Entracte* for flute and harp, and the *Pièce* for solo flute, as well as *Jeux*, *Aria* and *Histoires* for flute and piano.

Darius Milhaud (1892 - 1794) became a member of "Les Six" after spending a number of years in Brazil in the diplomatic service. After some time, however, he broke away from the group in order to explore his own individuality.[23] The *Flûte Sonatine* (1922) dates from before his most experimental stage, but contains hints of polytonal counterpoint, with its counter-rythms and melodies. The work alternates between sunny evocations of the French countryside, sinister Brazilian drum-beat rhythms, and gentle saracasm. The agility of the Boehm flute is exploited in the octave displacement of the last movement, and in the rapid scalic runs and decorative bird-calls of the first. Throughout the work, extreme dynamic changes and subtle tonal colours are demanded.

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21 Pellerite, J.J. A Handbook of Literature for the Flute. 2nd ed. Bloomington, Indiana: Zālo Publications, 1965, p.73

22 Alan Frank, record notes

23 New Grove Dictionary, vol. 11, pp. 305-307

Francis Poulenc (1899 - 1963) and Oliver Messiaen (b. 1908) have each contributed one important work to the flute repertoire. Poulenc's Sonata for Flute and Piano consists of three movements, the first two pensive in mood, the last vivacious and sparkling. The piano part has recently been orchestrated by Sir Lennox Berkeley in order to remedy the lack of a flute concerto by Poulenc.[24] Messiaen's *La Merle Noir* is extremely atonal and rhythmically irregular. Simulated bird calls are produced by means of technical devices, such as flutter-tonguing, violently-contrasted dynamics, widely-deviated intervals, and varied methods of note-attack.[25]

Henri Tomasi (b. 1901) composed a number of works for flute, including the *Concertino*, *Le Petit Chevrier Corse*, *Le Tombeau de Mireille*, *Concerto de Printemps*, and the Concerto in F. This, however, is so difficult as to be virtually unplayable. For flute alone, Tomasi wrote a *Sonatina* and *Les Cyclades*.[26] Tomasi's contemporary, André Jolivet (b. 1905), composed two works for flute and piano, the *Chant de Linos* and *Fantaisie Caprice*.[27]

Henri Dutilleux (b. 1916) is known for his *Sonatine* for flute and piano. In it, he exploits the flexibility of the flute in long, wide-ranging melodic lines and in rapid, bird-song-like cadenzas. A Conservatoire contest piece, it demands a high degree of dexterity from the player in the fast-moving finale, as well as proficiency in rapid articulation. The work is typical of Dutilleux' creativity in its restrained elegance, Gallic wit and cool lyricism.[28]

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24 Alan Frank, record notes

25 Pellerite, op. cit., p. 91

26 Alphonse Leduc Catalogue

27 ibid.

28 Pellerite, op. cit., p. 90

Eugene Bozza (b. 1905), born of French-Italian parents, is known principally for his chamber music for wind instruments. He has written extensively for the flute: his works include *Agrestide*, *Aria*, *Fantaisie Italienne*, *Soir dans les Montagnes*, *Concertino da Camera*, *Cinq Chansons sur des Themes Japonais*, *Interlude*, *Phorbéia* and *Image*, the last three being for solo flute.[29] Bozza's work is characterized by elegantly expressive melodic lines, irregular and intricate rhythmic patterns, and the frequent interspersion of improvisatory, cadenza-like passages. His idiom is modern, coloured occasionally by hints of late 19th century Romanticism, and Impressionism.[30] In all his flute works, Bozza explores the most sensitive resources of the instrument, as regards both technical possibilities and tonal colourings.

It would, of course, be impossible to enumerate the entire contribution of the French School to the flute repertoire within the scope of this dissertation. Important contributors include Fauré, whose *Fantaisie* for flute and piano is a standard work in the repertoire, Marcel Bitsch, Huë, Desenclos, Charpentier, Busser, Rhene-Baton, Chaynes and Migot, amongst others. Why is it that the French have contributed so considerably to the repertoire? In the words of Alan Frank,

> it is perhaps not too fanciful to suggest that the qualities and characteristics of the flute accord closely with those we commonly associate with the arts and culture of France; when, for example, we use the phrase "typically French": the delicacy of the flute, its quick-witted agility, its gentle, rather sophisticated lyrical quality, its predilection for persuasive understatement rather than the blatantly rhetorical gesture. It is not surprising, then, to find that a high proportion of the flute repertoire .... stems from France.[31]

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29 Alphonse Leduc Catalogue

30 Carol Spero, record notes

31 Alan Frank, record notes

OTHER IMPORTANT CONTRIBUTIONS TO THE REPERTOIRE

Nonetheless, major works have of course been written for the flute by composers of other nationalities. Carl Joachim Andersen(1847-1909), the Danish composer known as the "Chopin of the flute", is renowned for his very beautiful (and difficult) studies.[32] In addition, he composed several works for flute and piano, but these,although well-crafted and containing much that is of interest, have fallen out of the general repertoire. Andersen's countryman, Carl Nielsen (1865- 1931), wrote one very difficult and brilliant concerto.

Sergei Prokofiev's (1891-1953) only work for flute, the *Sonata in D Major* op. 94 (which was originally conceived for flute and later reworked for the violin),is of major proportions and of great difficulty. A work of lyrical and lucid beauty, it reflects the beauty of the central Asiatic surroundings in which Prokofiev found himself during the German invasion of Moscow.[33] Although a beautiful work, it is in some ways not particularly well written in respect of the capabilities of the flute: the delicate sound of the Boehm flute is at times overpowered by the heavy piano writing, and the music occasionally requires (in the finale, for example) strength and aggression which do not really lie within the scope of the flute. These deficiencies are, however, compensated for by the loveliest of liquid melodies and the charm of the work as a whole.

Bohuslav Martinu (1890-1959) is noted mostly for his Sonata No.1, for flute and piano: a charming work, it combines expressive, lyrical melody with pungent rhythmical interest.[34]

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32 Grove Dictionary of Music and Musicians, vol. 3, p. 577

33 Carol Spero, record notes

34 Pellerite, op. cit., p. 82

In England, Sir Lennox Berkeley (b. 1903) has written one sonata and one concerto for the flute, dedicating them to James Galway.[35] While it is impossible to enumerate and describe the entire flute repertoire of the 20th century, the following people must be mentioned for contributing to the standard flute repertoire: Ernest Bloch (1880- 1959), who contributed the *Suite Modale*, *Concertino* and *Two Last Poems*[36] for flute and piano; Paul Hindemith (1895-1963), whose *Sonata* for flute and piano is a major work, Matyas Seiber (b. 1805) who wrote a charming *Pastorale and Burlesque* and the Swiss composer Frank Martin (b. 1890) , noted for his *Ballade*.[37] Finn Mortensen (b. 1922) and Walter Piston (b. 1894) each wrote a Sonata for flute and piano[38], while Endre Szervansky (b. 1912) and Gordon Jacob (b. 1895) each wrote a Concerto for flute and orchestra.[39] Sigfrid Karg-Elert (1877-1933) wrote the celebrated *Thirty Caprices*, a *Sonata* for flute alone, and the *Suite Pointillistique*,[40] while K. Fukushima (b. 1930) wrote two works for alto flute, *Hi-Kio* and *Ekagra*.[41]

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35 Berkeley, L. Sonata for Flute and Piano. London: Chester Music, 1979

36 Chapman, op. cit., p. 68

37 Pellerite, op. cit.,pp. 87, 91

38 ibid, pp.91, 92

39 ibid.,pp. 87, 81

40 ibid., pp.10, 61, 90

41 ibid., pp.79,80

THE BOEHM FLUTE IN THE ORCHESTRA

The Boehm flute made available to composers an extended range of homogeneous quality: in pre-Boehm flutes, the notes above g^3 were virtually unusable. Now, however, the range was extended upwards to include d^4 (and even some notes above this, although these are not particularly well in tune, are difficult to produce and are not in common use: Milhaud is almost alone in using $g^4\sharp$, as he did in his Symphony No. 2[42]). The note d^4 is fairly frequently found: it occurs in the *Finale* of Prokoviev's *Classical Symphony* and in Strauss' *Also Sprach Zarathustra*, while $c^4\sharp$ is to be found in Strauss' *Till Eulenspiegel*. C^4 occurs regularly, as in Mussorgsky/Ravel's *Pictures at an Exhibition*.

As well as offering an extended upper register, the lower register of the Boehm flute was much improved in power and quality, although not as much as might perhaps have been desired. Nonetheless, the bottom register is capable of producing a peculiarly haunting effect: in *Der Freischütz*, Weber uses softly sustained pianissimo low notes: the effect is described thus by Berlioz: "There is something ineffably dreamy in these low holding notes of the two flutes, as during her melancholy prayer, Agatha contemplates the summits of the trees silvered by the rays of the night planet."[43] In Mussorgsky/Ravel's *Pictures at an Exhibition* we find the bottom register of the flutes being used in oscillating thirds to excellently sinister effect in "Baba-Yaga."

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42 Read, G. Thesaurus of Orchestral Devices. New York: Greenwood Press, 1969, p. 44

43 Berlioz, op. cit., p. 2

The low B below Middle C is obtainable when a B foot-joint is used: this incorporates the optional B♭ key (the standard concert flute, with a so-called C foot-joint is without this key).[44] This low B is required, for example, in the third movement of Tchaikowsky's Symphony No. 6.

It seems that even the faults of the Boehm flute have been put to good use within the repertoire. One of the most problematical notes on the Boehm flute is $c^2\sharp$: in order to correct the extreme sharpness of this note, it is necessary to alter the normal position of the embouchure. The resulting note, albeit in tune, is thin and veiled in quality. Was it perhaps this very quality that cuased Debussy to choose it as the pivotal note around which the famous flute solo from *l 'Après-Midi D'Un Faune* is built?[45] Without the Boehm flute, this beautiful solo would never have been as effective: with the advent of the Boehm flute it became possible to produce a more fluent chromatic legato, unhindered by discrepancies in the fingering and intonation.

The Boehm flute made natural harmonics available as a compositional device for the first time. On pre-Boehm flutes it was not possible to completely eradicate the fundamental tone: an unpleasant series of parallel fifth "chords" was all that could be obtained.[46] Harmonics have since been used by several composers: once again, Mussorgsky/Ravel's *Pictures* provides a good example, as does Stravinsky's *Divertimento.* Harmonics are also used by performers to facilitate some particularly difficult passages; this can be done, for example, in Strauss' *Also Sprach Zarathustra:* the five bars preceding Figure 19 are much facilitated by the substitution of a harmonic fingering.[47] One of the first, and most

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44 Howell, op. cit., p. 2

45 Toff, op. cit., p. 158

46 ibid., p. 78

47 Strauss, R. Also Sprach Zarathustra. Vienna:C.F. Peters, 1924

famous instances of the use of flute harmonics is in Ravel's *Daphnis et Chloé*: at Figure 44 all three flutes, including the bass flute, play a scale pattern using harmonic fingerings.[48]

One of the qualities of the Boehm flute which has had a vast influence upon the repertoire is, without doubt, its technical versatility and flexibility. As Berlioz points out, it is the most agile of all the wind instruments, being well suited to playing the most rapid of passages, whether staccato, legato, diatonic or chromatic. Extended intervals and arpeggiated figures are all possible on the Boehm flute.[49] Nonetheless, it does have certain technical limitations - not all trill combinations are possible on it, although, to quote Berlioz, "shakes are practicable on the notes of the very extreme upper part of the scale ... moreoever, they are incomparably more true of intonation (than on the old flute.)"[50] Without the Boehm flute, it is doubtful that the repertoire would have been enriched by virtuosic flute solos such as the "bird solo" from Prokoviev's *Peter and the Wolf*, and those in Hindemith's *Symphonic Metamorphoses* and Saint-Saëns' *Carnival of the Animals*.

As important as the technical capabilities of the Boehm flute is its quality of immediate and easy response. It is this that enables the flute to produce a wide spectrum of tone colours and dynamics: the Boehm flute responds immediately to the most minute changes made to the embouchure or to the cavity between palate and tongue. It is these changes, as well as those made in the strength of air pressure,and in the degree of openness within the throat of the player, that produce effects of light and shade, brilliance and darkness, liquidity and angularity. It is due to the

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48 Ravel, M. Daphnis et Chloé. Paris: Durand, 1911

49 Berlioz, op. cit., p. 24

50 ibid., p. 24

availability of these different colours that so many expressive orchestral solos have been written for the flute. The flexuous and brilliant flute writing in Ravel's *Daphnis et Chloé* seems to produce an effect of a thousand different shimmering colours.

This quality of easy response is also partly responsible for the remarkable case of articulation which is possible on the flute (it is also aided by the lack of a sound-generating reed.) Double-tongueing and triple-tongueing may be produced at great speed on the flute: triple-tongueing is used to sinister, throbbing effect in Ravel's *Alborada del Grazioso*. Rapid double-tongueing is found throughout the modern orchestral repertoire: Rimsky-Korsakov's *Scheherezade* is a prime example. Flutter-tongueing (which involves trilling the letter R with the tongue while playing[51]) is used by Richard Strauss in various works, by Milhaud in *La Creation du Monde* and by Mussorgsky/Ravel in *Pictures*.

THE AVANT-GARDE FLUTE

The Boehm flute has shown itself to be admirably suited to the music of the avant-garde. A large number of special effects and new techniques are available to composers, and even conventional aspects of flute playing have been put to novel use.

Vibrato has become a compositional device, as opposed to being a permanent and integral part of the sound production process. The speed and intensity

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51 Scholes, P.A. The Concise Oxford Dictionary of Music. London: Oxford University Press, 1964, p. 570

of the vibrato may be varied: Harley Gaber, in *Chimyaku* for solo flute, uses a sliding scale from one to ten, one being considered as denoting non-vibrato and ten denoting a vibrato of maximum intensity.[52]

Harmonics are of great importance in avant-garde flute music. The peculiar timbre of natural harmonics is obtained by overblowing the regular fingerings from b^1 to $d^2\sharp$[53]. As opposed to natural or simple harmonics, complex harmonics are "fingerings designed to support the common harmonic of two or more fundamentals."[54] These fingerings are generally used to facilitate the production of sustained pianissimo high notes of virtually normal timbre - they are generally sharp-pitched, thus enabling the player to produce these notes without becoming flat.[55]

A Multiphonic fingering is "a fingering that generates a group of two or more pitches sounding simultaneously."[56] Multiphonics are thus similar to the "double stops" obtainable on a string instrument. Despite their unconventional intonation they are popular amongst avant-garde composers, being used in Bruno Maderna's *Honeyreves* (1963) for flute and piano, and in Krenek's *Flute Piece in Nine Phases* (1959).[57]

Special fingerings are also used at times to produce a note of considerable power. The flat pitch of some of these fingerings will ascend when the note is blown loudly. Fingerings are also altered to give rise to weak tones, in which distorted timbre is often alternated with ordinary timbre.[58]

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52 Howell, op. cit., p. 11
53 Toff, op. cit., p. 206
54 Howell, op. cit., p. 16
55 ibid., p. 16
56 ibid., p. 32
57 Pellerite, op. cit., p. 90
58 Howell, op. cit., p. 20

One of the most popular avant-garde flute techniques is that of percussive key-slapping, used either in conjunction with blown notes or alone. The key-slap was first used as a compositional device by Edgard Varèse in *Density 21,5* (1936). It is also used, together with many other avant-garde techniques, by Berio in *Sequenza* for solo flute.[59]

Articulation is an aspect of flute technique which has been further developed by the avant-garde. In addition to commonplace single, double, triple, and flutter-tongueing, various "attack syllables" are demanded: to quote Thomas Howell, "any unvoiced explosive, sibilant or fricative consonant except nasals may be used to initiate a flute attack."[60]

Whistle tones (soft, thin tones obtained by blowing without pressure across the lip-plate of the flute), coloured noise (produced by directing air through the instrument without setting it in vibration), and lip buzzing (produced by "using the flute as a sort of lip-reed instrument like the brass family"[61]) are all devices employed by avant-garde writers, such as Patrick Pursewell in *It Grew and Grew* for solo flute.[62] Singing while simultaneously blowing the flute is also possible, as is bending of the pitch by rolling the mouthpiece inwards (which flattens the pitch) and outwards (which sharpens it), as practiced by popular Jazz musicians such as Herbie Mann.[63] A glissando-type effect may also be produced by gradually uncovering the perforated holes of the flute, and by very slowly lifting the depressed keys. This is required, for example, in Maganini's *Tuolumne*.[64]

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59 Pellerite, op. cit., p. 82
60 Howell, op. cit., p. 25
61 ibid., p. 28
62 ibid., p. 28
63 ibid., p. 30
64 Read, op. cit., p. 77

It is the Boehm flute that is responsible for the development of these new techniques. The musical validity of the work of the avant-garde will be tested only by time, but it is evident that in the 20th century the flute is earning its own extensive and valuable repertoire.

GLOSSARY OF TERMS

ARTICULATION — "The manner in which successive notes are joined to one another by a performer ... opposite kinds of articulation are staccato and legato ... Techniques of articulation in most wind instruments include various patterns of tongueing."[1]

EMBOUCHURE — The mode of application of the lips to the mouthpiece, or the relation of the lips to the mouthpiece. It can also refer to the mouthpiece itself.[2]

FIFE — "A small cylindrical transverse flute, but with a narrower bore and hence a louder, shriller sound than the flute proper."[3]

FLAGEOLET — "A kind of fipple flute (that is, an instrument of the flute family in which the sound is generated by directing the player's breath through a fixed channel and against a rigid sharp edge) .... with fewer finger holes than a true recorder .... the three-holed pipe of the Pipe and Tabor combination.[4]

OVERBLOWING — "Under certain physical conditions an air-column can break up into aliquot parts each of which will vibrate at a frequency that is in direct proportion to the fundamental frequency. Thus it is sometimes possible for a tube of a given length to sound not only its fundamental but also the octave, 12th etc., of its lower notes as

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1 New Grove Dictionary, vol. 1, p. 643

2 Concise Oxford Dictionary of Music, p. 181

3 New Grove Dictionary, vol. 6. p. 540

4 ibid., vol. 6 p. 623

'harmonics' in a manner somewhat analogous to the behaviour of a lightly stopped violin string. In woodwind instruments this phenomenon provides the basis of their second and higher registers. The harmonic behaves virtually as a new fundamental at twice, thrice, etc, the frequency of the original. 'Overblowing' is the term applied to the process by which the player brings about the conditions necessary for these higher modes of vibration in his air column. With the flute it includes an increase in blowing pressure, modification of the shape of the jet of air issuing from the lips, and the angle at which this strikes the far edge of the mouth-hole."[5]

PITCH

"The particular quality of a sound (e.g. an individual musical note) that fixes its position in the scale."[6] Until the 19th century, pitch was extremely inconsistent: between 1511 and 1693 pitch appears to have varied from a^1 = 360 Hz to a^1 = 480 Hz. According to technical evidence provided by Praetorius in the early 17th century in *Syntagma Musicum*, a common pitch of the time was a^1 = 425 Hz. During the late 18th and early 19th centuries, pitch developed a distinct tendency to rise. Successive tuning forks used in the Dresden opera house illustrate this: in 1815, 1826 and 1861 respectively, their pitch was a^1 = 423,2, a^1 = 435 and a^1 = 446. The present-day pitch of a^1 = 440 Hz is the recommendation of the International Organization for Standardization, although there does seem to be a tendency to rise higher than this.[7]

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5 ibid., vol. 14, p. 32

6 ibid., vol. 14, p. 779

7 ibid., vol.,14 pp. 779-785

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