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THE BAROQUE FLUTE AS A MODERN VOICE:
EXTENDED TECHNIQUES AND
THEIR PRACTICAL INTEGRATION THROUGH
PERFORMANCE AND IMPROVISATION

By

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in candidacy for the degree of
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CONTENTS

Acknowledgements	13
Declaration	14
Abstract	15
Introduction	16
Chapter 1. A Brief Introduction to the Baroque Flute	18
Section 1. The Instrument	18
Section 2. Instruments used in this research	24
Chapter 2. New Techniques in Tone Production on the Baroque Flute	25
Section 1. An historical basis for a wider repertoire of tonal possibility	25
Section 2. New Expressive Horizons with Tone	33
Section 3. The Effects of Extended Technique Practice on Conventional Performance Techniques	40
Chapter 3. Articulation: From an Historical Basis to New Techniques	42
Section 1. Articulation from the 18 th Century to Present	42
Section 2. New Techniques in Articulation on the Baroque Flute	68
Section 3. Effects on Conventional Baroque Flute Performing Practice	85
Chapter 4. Practical Musical Integration	87
Section 1. Directional Improvisation using ecosonic fingering practice	87
Section 2. The Integration of new ‘extended techniques’	99
Section 3. Musical Integration of Extended Techniques through Ecosonic Improvisation	104

In Conclusion	115
Appendix A. References in Original Languages	117
Appendix B. Multiphonics: Ecosonic Catalogue	122
Appendix C. Multiphonics: Conventional Fingering Catalogue	179
Bibliography	204
Discography	208

Illustrations

Figures	Page
1.1 The American Standard System	18
1.2 From Mahaut, showing the placement of the fingers and the embouchure on the baroque flute	19
1.3 From Quantz, <i>On Playing the Flute</i> , a fingering chart illustrating the tessitura of the baroque flute	20
1.4 From Mahaut, showing the fully extended range possible on the one-keyed flute	21
1.5 From Tulou, the D Major scale descending	22
1.6 Comparison of F-sharp, a non-cross-fingered note and G-flat, a cross-fingered note	22
1.7 Two examples of cross-fingered notes, A-sharp and B-flat	22
1.8 For comparison: the D-flat major and D-Major scales	23
2.1 An example of a conventional embouchure for the flute	36
2.2 An example of a non-conventional embouchure for the flute	36
2.3 Illustration of the range that is possible when using a non-conventional embouchure	38
3.1 Hotteterre, from <i>Principles of the Flute, Recorder, and Oboe</i> , examples of <i>notes inégales</i> supported by different syllables.	44
3.2 Hotteterre, from <i>Principles of the Flute, Recorder, and Oboe</i> , examples of <i>notes inégales</i> supported by different syllables	44
3.3 Delusse, from <i>L'arte de la flûte traversière</i> , showing the articulation called 'perlé'	45
3.4 Delusse, from <i>L'arte de la flûte traversière</i> . An example of breath attacks	45

3.5	Delusse, from <i>L'arte de la flûte traversière</i> . This is perhaps the most remarkable example because it is so unusual.	46
3.6	Delusse, from <i>L'arte de la flûte traversière</i> . Here the articulation is changed to express syncopation.	46
3.7	From Mahaut, <i>Nouvelle méthode</i> , showing double-tonguing for 'very fast passages'	46
3.8	Lorenzoni, from <i>Saggio per ben Suonare il Flauto Traverso</i> , showing two syllables for single-tonguing	47
3.9	Lorenzoni, from <i>Saggio per ben Suonare il Flauto Traverso</i> . The syllables appearing here are similar to those suggested by Tromlitz and Quantz described below.	47
3.10	Lorenzoni, from <i>Saggio per ben Suonare il Flauto Traverso</i> . Examples of breath attack, used for different degrees of separation between the repeated notes	48
3.11	Lorenzoni, from <i>Saggio per ben Suonare il Flauto Traverso</i> . Here, the syncopation is given a similar effect to that given by Delusse's <i>te-bé</i> in Figure 3.6.	48
3.12	Luke Heron, from <i>A Treatise on the German Flute</i> . Two short examples are given for double-tonguing. The second line is actually what is generally described as triple-tonguing, though the same syllables are utilised.	49
3.13	Quantz, from <i>On Playing the Flute</i> , showing the variety of usage of single-tonguing syllables	50
3.14	Quantz, from <i>Solfeggi</i> . An example of the practical integration of varied articulations including both single- and double-tonguing syllables	51
3.15	Tromlitz, from <i>The Virtuoso Flute Player</i> . This shows examples of how to apply different single-tonguing syllables.	52
3.16	Tromlitz, from <i>The Virtuoso Flute Player</i> . An example of the increased complexity of patterns when the double-tonguing syllables are added	53
3.17	Hugot & Wunderlich, from <i>Méthode de flûte de conservatoire</i> showing the two syllables, <i>tu</i> for slower movement, and <i>du</i> for quicker speeds	54

3.18 Drouet, from <i>The Method of Flute Playing</i> . Here, single-tonguing syllables are given in simple alternation, without exceptional patterns.	54
3.19 Drouet, from <i>The Method of Flute Playing</i> . Two examples of syllables for double-tonguing	55
3.20 Examples from a tutor entitled <i>Tutor for the Flute</i> by T. Berbiguier showing examples of Drouet's 'territory' pattern for tonguing	57
3.21 Berbiguier, from <i>L'art de la flûte</i> . Two examples given for use in learning the double-tonguing syllables <i>tu-gue</i> and <i>du-gue</i>	57
3.22 Berbiguier, from <i>L'art de la flûte</i> . Two examples given for the employment of the double-tonguing syllables <i>tu-gue</i> and <i>du-gue</i>	58
3.23 Berbiguier, from <i>L'art de la flûte</i> . Two examples illustrating the abbreviated versions of <i>tu-gue</i> and <i>du-gue</i> , using the ricochet effect of the tongue for very fast passages	58
3.24 Berbiguier, from <i>L'art de la flûte</i> . An example of the pattern, <i>tu-ru</i> , still commonly used today by modern flautists for dotted figures such as this one.	58
3.25 Boehm, from <i>The Flute and Flute Playing</i> , the example of which he is speaking in the surrounding text	59
3.26 Trevor Wye, from <i>A Trevor Wye Practice book for the Flute</i> , vol. 3, 'Articulation'. This example shows not only the lack of any vowel associated with single-tonguing, but also that he gives only one consonant for single tonguing.	61
3.27 Trevor Wye, from <i>A Trevor Wye Practice book for the Flute</i> , vol. 3, 'Articulation'. An example showing double-tonguing. This pattern is used consistently in all practical examples.	61
3.28 Peter Lukas Graf, from <i>Check-up, 20 Basis-Übungen für Flötesten</i> illustrating similar examples to Trevor Wye's exercises	62
3.29 Joseph-Henri Altès, from <i>Célèbre méthode complète de flûte</i> showing a similar pattern to Figure 3.24, and using a slightly different pattern for articulation	62
3.30 Joseph-Henri Altès, from <i>Célèbre méthode complète de flûte</i> , giving an example of double-tonguing	63
3.31 Marcel Moyse, from <i>École de l'articulation</i> . Two examples illustrating mixed double- and single-tonguing	63
3.32 From <i>Flöte und Flötenspiel</i> , Maximilian Schwedler, an illustration of a double-tonguing exercise to be practised slowly.	64

3.33 Schwedler, from <i>Flöte und Flötenspiel</i> , showing different vowels used for single tonguing in conjunction with double-tonguing	64
3.34 Schwedler, from <i>Flöte und Flötenspiel</i> . A further example of using different syllables to express a dotted figure, similar to examples given above by Altès and Moyse	64
3.35 Schwedler, from <i>Flöte und Flötenspiel</i> . An example given for 18 th -century double-tonguing, with only slight alteration to the syllable given by Quantz	65
3.36 Schwedler, from <i>Flöte und Flötenspiel</i> . A further example of using <i>di'</i> , with alteration of the final (<i>de</i>) vowel for use in triple tonguing	65
3.37 Immediate onset and release of a note	69
3.38 Prolongation of onset and release of a note	69
3.39 Indefinite onset and release of a note	70
3.40 Indefinite onset and release, in conjunction with an overlapping continuing phase of the note	70
3.41 Diagram of the changes required in air speed and embouchure control of spit tonguing according to range	72
3.42 Dynamic ranges for spit tonguing across the three registers	73
3.43 Illustration showing the range and dynamic flexibility of the attack 'j'	78
3.44 Approximate resulting pitches when using tongue ram; fingered note appears first, followed by the resulting pitch	80
3.45 Resulting pitches when using contained-air tonguing, while covering the entire embouchure hole with the mouth; the fingered note appears first, followed by the resulting pitch	82
3.46 Limitations based on range of both vertical and horizontal rapid tongue strokes	84
4.1 The super-row, in binary notation	88
4.2 Comparative notations	89
4.3 Ecosonic numbers corresponding to finger holes	89
4.4 Conventional numbering of finger holes	89
4.5 Comparison of conventional and ecosonic fingerings	90
4.6 An example of an ecosonic finger row sequence	91
4.7 An example of notation from <i>Less</i>	91

4.8	The conventional fingering for A-flat, compared to the ecosonic fingering, 8	93
4.9	From <i>Less</i> , audio time index: 8:07	96
4.10	From <i>Less</i> , audio time index: 11:13	96
4.11	From <i>Less</i> , audio time index: 5:11	97
4.12	From <i>Less</i> , audio time index: 5:00	98
4.13	From <i>Less</i> , audio time index: 7:37	100
4.14	From <i>Less</i> , audio time index: 13:37	100
4.15	From <i>Less</i> , audio time index: 8:22	101
4.16	From <i>Less</i> , audio time index: 3:26	101
4.17	From <i>Less</i> , audio time index: 9:43	102
4.18	From <i>Less</i> , audio time index: 11:34	102
4.19	Fingering sequences for antiphonal improvisation	106
4.20	Ranges of the three registers generally produced during antiphonal improvisation	106
B.1	Notation from natural to highest gradation sharp	124
B.2	Notation from natural to highest gradation flat	124
C.1	The baroque flute, with fingerings designated by numbers	179
C.2	Graphic representation of conventional baroque-flute fingerings	179

Compact Disc Recordings

Audio Disc One, Techniques

Track Numbers:

1. Demonstration of Whistle tones
2. Demonstration of Roar
3. Improvisation using Roar
4. Demonstration of changing the ratio of noise to tone
5. Improvisation using changing ratios of noise to tone
6. Demonstration of Spit Tongue
7. Improvisation using Spit Tongue
8. Demonstration of Spit Tongue with lips as the plosive, lips are tightly drawn over the teeth
9. Demonstration of Spit Tongue with lips as the plosive, lips are drawn around the teeth and into the mouth
10. Demonstration of Spit Tongue with lips as the plosive, lips are very loosely employed
11. Improvisation using Spit Tongue, with all variations of lips as the plosive
12. Demonstration of the syllable, 'F'
13. Improvisation on the syllable, 'F'
14. Demonstration of the syllable, 'N'
15. Improvisation on the syllable, 'N'
16. Demonstration of the syllable, 'P'
17. Improvisation on the syllable, 'P'
18. Demonstration of the syllable, 'S'
19. Improvisation on the syllable, 'S'
20. Demonstration of the syllable, 'W'
21. Improvisation on the syllable, 'W'
22. Demonstration of the syllable, 'Ch'
23. Improvisation on the syllable, 'Ch'
24. Demonstration of the syllable, 'Th'
25. Improvisation on the syllable, 'Th'
26. Improvisation using all non-conventional syllables
27. Demonstration of Tongue Ram
28. Improvisation using Tongue Ram
29. Demonstration of Contained-Air Tonguing, into the flute

30. Demonstration of Contained-Air Tonguing, into the flute, with ricochet
31. Demonstration of Contained-Air Tonguing, with a conventional embouchure
32. Improvisation using all variations of Contained-Air Tonguing
33. Demonstration of Stop-Tonguing
34. Improvisation using Stop-Tonguing
35. Demonstration of Vertical Rapid Tongue Strokes
36. Improvisation using Vertical Rapid Tongue Strokes
37. Demonstration of Horizontal Rapid Tongue Strokes
38. Improvisation using Horizontal Rapid Tongue Strokes
39. Improvisation using several techniques: Contained-Air Tonguing, Tongue Ram and Spit Tongue
40. Improvisation using several techniques: Rapid Tongue Strokes (Vertical & Horizontal) and non-conventional syllables
41. Improvisation using several techniques: Spit Tonguing and Stop-Tonguing
42. Improvisation using several techniques: Changing the ratio of noise to tone and whistle tones

Audio Disc Two, Multiphonics

Track Numbers

- | | |
|------------------------|---------------------------|
| 1. Zero, without key | 17. Eight, without key |
| 2. Zero, with key | 18. Eight, with key |
| 3. One, without key | 19. Nine, without key |
| 4. One, with key | 20. Nine, with key |
| 5. Two, without key | 21. Ten, without key |
| 6. Two, with key | 22. Ten, with key |
| 7. Three, without key | 23. Eleven, without key |
| 8. Three, with key | 24. Eleven, with key |
| 9. Four, without key | 25. Twelve, without key |
| 10. Four with key | 26. Twelve, with key |
| 11. Five, without key | 27. Thirteen, without key |
| 12. Five, with key | 28. Thirteen, with key |
| 13. Six, without key | 29. Fourteen, without key |
| 14. Six, with key | 30. Fourteen, with key |
| 15. Seven, without key | 31. Fifteen, without key |
| 16. Seven, with key | 32. Fifteen, with key |
| | 33. Sixteen, without key |
| | 34. Sixteen, with key |

35. Seventeen, without key
36. Seventeen, with key
37. Eighteen, without key
38. Eighteen, with key
39. Nineteen, without key
40. Nineteen, with key
41. Twenty, without key
42. Twenty, with key
43. Twenty-one, without key
44. Twenty-one, with key
45. Twenty-two, without key
46. Twenty-two, with key
47. Twenty-three, without key
48. Twenty-three, with key
49. Twenty-four, without key
50. Twenty-four, with key
51. Twenty-five, without key
52. Twenty-five, with key
53. Twenty-six, without key
54. Twenty-six, with key
55. Twenty-seven, without key
56. Twenty-seven, with key
57. Twenty-eight, without key
58. Twenty-eight, with key
59. Twenty-nine, without key
60. Twenty-nine, with key
61. Thirty, without key
62. Thirty, with key
63. Thirty-one, without key
64. Thirty-one, with key
65. Thirty-two, without key
66. Thirty-two, with key
67. Thirty-three, without key
68. Thirty-three, with key
69. Thirty-four, without key
70. Thirty-four, with key

71. Thirty-five, without key
72. Thirty-five, with key
73. Thirty-six, without key
74. Thirty-six, with key
75. Thirty-seven, without key
76. Thirty-seven, with key
77. Thirty-eight, without key
78. Thirty-eight, with key
79. Thirty-nine, without key
80. Thirty-nine, with key

Audio Disc Three, Multiphonics, continued

Track Numbers

1. Forty, without key
2. Forty, with key
3. Forty-one, without key
4. Forty-one, with key
5. Forty-two, without key
6. Forty-two, with key
7. Forty-three, without key
8. Forty-three, with key
9. Forty-four, without key
10. Forty-four, with key
11. Forty-five, without key
12. Forty-five, with key
13. Forty-six, without key
14. Forty-six, with key
15. Forty-seven, without key
16. Forty-seven, with key
17. Forty-eight, without key
18. Forty-eight, with key
19. Forty-nine, without key
20. Forty-nine, with key
21. Fifty, without key

22. Fifty, with key
23. Fifty-one, without key
24. Fifty-one, with key
25. Fifty-two, without key
26. Fifty-two, with key
27. Fifty-three, without key
28. Fifty-three, with key
29. Fifty-four, without key
30. Fifty-four, with key
31. Fifty-five, without key
32. Fifty-five, with key
33. Fifty-six, without key
34. Fifty-six, with key
35. Fifty-seven, without key
36. Fifty-seven, with key
37. Fifty-eight, without key
38. Fifty-eight, with key
39. Fifty-nine, without key
40. Fifty-nine, with key
41. Sixty, without key
42. Sixty, with key
43. Sixty-one, without key
44. Sixty-one, with key
45. Sixty-two, without key
46. Sixty-two, with key
47. Sixty-three, without key
48. Sixty-three, with key
49. D-Natural, 1st Octave
50. D-Sharp, 1st Octave
51. E-Natural, 1st Octave
52. F-Natural, 1st Octave
53. F-Flat, 1st Octave
54. F-Sharp, 1st Octave
55. G-Flat, 1st Octave
56. G-Natural, without key, 1st Octave
57. G-Natural, with key, 1st Octave
58. G-Sharp/A-flat, 1st Octave
59. A-Natural, no Key, 1st Octave
60. A-Natural, with key, 1st Octave
61. A-Sharp/B-flat, 1st Octave
62. B-Natural, without key, 1st Octave
63. B-Natural, with key, 1st Octave
64. C-Natural, without key, 1st Octave
65. C-Natural, with key, 1st Octave
66. C-Sharp, 1st Octave
67. D-Natural, 2nd Octave
68. D-Sharp, 2nd Octave
69. E-Natural, 2nd Octave
70. F-Natural, 2nd Octave
71. F-Flat, 2nd Octave
72. F-Sharp, 2nd Octave
73. G-Flat, 2nd Octave
74. G-Natural, without key, 2nd Octave
75. G-Natural, with key, 2nd Octave
76. G-Sharp, 2nd Octave
77. A-Natural, without key, 2nd Octave
78. A-Natural, with key, 2nd Octave
79. A-Sharp, without key, 2nd Octave
80. A-Sharp, with key, 2nd Octave
81. B-Flat, 2nd Octave
82. B-Natural, without key, 2nd Octave
83. B-Natural, with key, 2nd Octave
84. B-Sharp, 2nd Octave
85. C-Natural, 2nd Octave
86. C-Sharp/D-Flat, 2nd Octave
87. D-Natural, 3rd Octave

88. D-Sharp, 3rd Octave

89. E-Natural, 3rd Octave

90. F-Natural, 3rd Octave

91. F-Sharp, 3rd Octave

92. G-Natural, 3rd Octave

93. G-Sharp, 3rd Octave

94. A-Natural, 3rd Octave

Audio Disc Four

Practical Integration

Track Numbers

1. Improvisation: Antiphonal, Live recording
2. Improvisation: Antiphonal, Studio recording
3. Improvisation: Countersinging, Live recording
4. Improvisation: Countersinging, Studio recording
5. Improvisation: Omniana, Live recording
6. Improvisation: Argument & Introspect, Live recording
7. *Less*, for baroque flute and electronic sound, Live recording

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Declaration

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Abstract

The baroque, one-keyed flute has, within the last half century, been rediscovered for performance, particularly within early music settings, and more recently has been welcomed into the area of contemporary music. This research continues to widen the boundaries of the modern baroque flute by building on its rich history in both technical aspects and practical performance, and by continuing to expand its musical and technical horizon through the extension of historical ideas and the introduction of new ideas within a contemporary idiom.

This document begins with a general description of the instrument itself, and explains tonal concepts and technical concerns of the baroque flute. An overview of historical ideas regarding tone production with descriptions by musicians of the 18th through the 21st century provides a basis from which to proceed to new techniques for tone production and their expressive potential. Audio examples are given of all new techniques. Lastly, an explanation is given of how the practice of new tonal-technique exercises a positive influence on conventional sound production.

An historical basis is provided by surveying a selection of major tutors from the 18th century through to the 21st and is illustrated with examples showing the evolution of ideas for articulation. An explanation of new, 'extended techniques' focussed on articulation is given and all are demonstrated with audio examples. The effects on conventional flute playing that are enhanced by the practice and integration of new techniques into the musician's sonic repertoire are also described.

Practical musical integration of new techniques into a composition and within ecosonic improvisation is explored. A brief explanation of the ecosonic system is given and the process used in developing directional ecosonic improvisation and new techniques for performance within the piece, *Less*, by Jo Thomas is explained. Notated and sound examples are used to illustrate the aptitude of the baroque flute as a contemporary musical voice. The final section asserts the expressive potential of new techniques, as regards both tone production and articulation, within various models employed through ecosonic improvisation.

Finally, the mapping of multiphonics for the baroque flute is documented in two complete catalogues; one is organised based on ecosonic fingering and the other is based on conventional fingering. Each catalogue entry is demonstrated with recorded examples.

Introduction

The baroque, one-keyed flute is an instrument possessed of unique qualities; within the last half century, it has been rediscovered for performance, particularly in early music settings, and more recently it has been welcomed into the arena of contemporary music making. This research has, in some ways, been a journey in search of balance between historical and modern ideas for playing an 'old' instrument. Because many historical techniques are not generally practised today in performance, they can in some ways be considered 'new, old' techniques because they do not necessarily fit modern expectations, particularly for sound production or articulation, and may even be considered 'extended' techniques for those wishing to rediscover them for use in a modern setting. A logical next step is to continue expanding the musical and technical horizon through the extension of historical ideas and the introduction of new ideas within a contemporary idiom. This allows the baroque flute to maintain all of its historical strengths (and idiosyncrasies) while adding many new layers to its multifaceted expressive potential, for both performers and composers wishing to utilise this distinctive instrument.

This research is divided into five chapters. The first gives a general description of the instrument itself, and is intended to acquaint those readers who may be unfamiliar with the baroque flute with the differences in tonal colour and technical concerns, and how these compare with those of its modern counterpart, the Boehm flute. Particular attention is given to the eccentricities within historical fingering systems and their effect on sound production.

Chapter 2 is divided into three sections. The first is devoted to an overview of historical ideas regarding tone production and includes descriptions by musicians of the 18th through the 21st century; Quantz, Tromlitz, Rockstro, and W. N. James are among those included. This provides a basis from which to depart via the second section, which describes new techniques for tone production and their expressive potential; sound examples demonstrate all of the new techniques included. Section Three outlines the positive influence the practice of new tonal techniques can have on more conventional sound production.

The third chapter focuses on the subject of articulation and is also divided into three sections. Section One provides an historical basis by surveying a selection of major tutors from the 18th through to the 21st century. This is illustrated with examples showing the evolution of ideas for articulation, including modern practices intended for the Boehm flute. The second section explains new, 'extended techniques' focussed on articulation and

illustrates these with audio examples. Section Three explains the effects on conventional flute playing, of practising and integrating new techniques into the musician's sonic repertoire.

Chapter 4 is concerned with the practical, musical application and integration of new techniques into a written composition and within ecosonic improvisation. The first section begins with a brief explanation of the ecosonic system; it then describes the process used in developing directional ecosonic improvisation for performance within the piece, *Less – for baroque flute and electronics* by Jo Thomas. The second section further illustrates the integration of new, 'extended techniques' within the same work. Illustrations and sound examples are used to show the aptitude of the baroque flute as a contemporary musical voice. The final section describes the expressive potential of new techniques, as regards both tone production and articulation within various models used in ecosonic improvisation.

Two complete catalogues of multiphonics are included in appendices. One is organised based on ecosonic fingering the other is organised based on conventional fingering; all are illustrated with recorded examples.

The research presented here is intended for consumption not only by flautists, but also composers. Historical bases are included, not only for the general reader, but to supply context for their modern manifestations and extensions presented by the new techniques that follow them. Both composer and flautist will benefit from the quantification of the techniques shown, with audio reference points further informing the reader/listener. The final chapter in particular combines concerns of both baroque flautist and composer. Issues arising in Chapter 4, **Practical Musical Integration**, show that composers must balance creative desires with practical concerns for the possibilities and limitations of the instrument, particularly within an established system such as ecosonics. For the flautist, the concerns are in balancing accessibility of a learned technical system with the creative possibilities that can be achieved through open mindedness, and further stimulated through collaboration with a composer who may not necessarily adhere to previous precedents.

Chapter 1

A Brief Introduction to the Baroque Flute

Section One: The Instrument

This chapter outlines the practical workings of the baroque flute. A basic knowledge of the instrument, its historical context and its practical performance is necessary for a complete understanding of many of the aspects of the research that follows.¹

The baroque flute, also referred to as the *traverso*, *Querflöte*, German flute or one-keyed flute, is the modern term designating the instrument that was developed in France during the second half of the 17th century. This instrument differed from its predecessor, the keyless, cylindrical Renaissance flute: the addition of a single key, and a change in construction to conical bore, made the instrument fully chromatic and more balanced in tone throughout its range; the low register became stronger and more equal to the middle and high registers. The baroque flute was commonly used at least until the beginning of the 19th century, and in some places was still being used into the 20th century. Most modern baroque flutes are pitched at A₄= 415 hertz, as are all of the instruments that were utilised in this research. All references to pitch in the text are given in the American Standard System as in Figure 1.1. Throughout this document, the baroque flute will be referred to as either the flute or the baroque flute; the modern instrument shall be distinguished by the name Boehm flute.



Figure 1.1. The American Standard System

¹ An extensive study of the history of the flute may be found in: A. Powell, *The Flute* (New Haven & London: Yale University Press, 2002)., R. Brown, *The Early Flute* (Cambridge: Cambridge University Press, 2002)., as well as in N. Toff, *The Development of the Modern Flute* (New York: Taplinger Publishing Co., Inc., 1979).

Typically the baroque flute consists of four pieces, or joints. The top-most joint, or head joint has a single hole, called the embouchure hole, into which air is blown. There are two middle joints; both contain three open holes, each to be covered by the middle three fingers of the left and right hands. The fourth joint, or foot joint, has a single hole covered by a simple lever key, worked by the little finger of the right hand. This is illustrated by Antoine Mahaut (c.1719-c.1785) in his tutor of 1759 in Figure 1.2.²

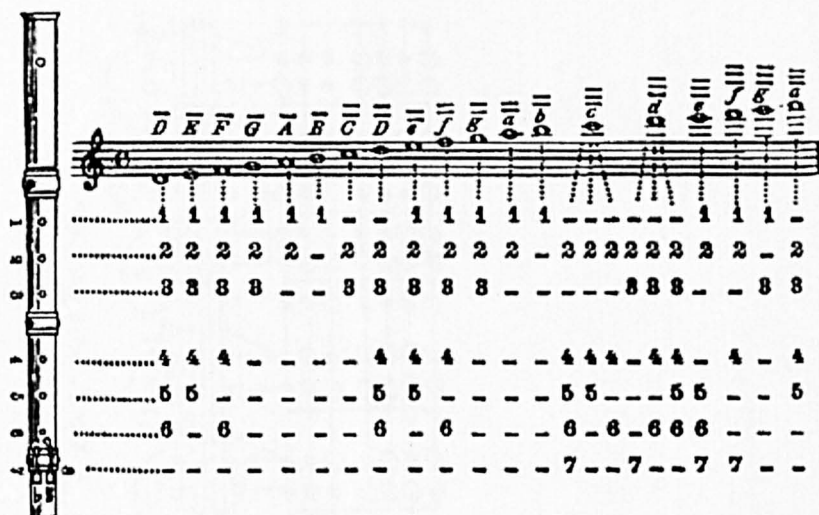


Figure 1.2. From Mahaut, showing the placement of the fingers and the embouchure on the baroque flute

The flute has a standard playing range of nearly three octaves, from D₄ to A₆. The fingering chart in Figure 1.3, from Johann Joachim Quantz (1697-1773) gives fingerings in numerical form, each finger-hole being designated with a number, beginning with the hole closest to the embouchure.³ The second key, which appears in this figure, was an invention by Quantz to enable the player to produce enharmonic pitch differences for D-sharp and E-flat.

² A. Mahaut, *Nieuwe Manier om binnen korten tyd op de Dwarsfluit te leeren speelen. / Nouvelle méthode pour apprendre en peu de temps à jouer de la flûte traversière*, 2nd edn (Amsterdam: J.J. Hummel, 1759; Genève: Minkoff, 1972), p. 5.

³ J. J. Quantz, *On Playing the Flute*, trans. E. R. Riley, 2nd edn (London: Faber & Faber Limited, 1985), p. 42.



The range can be slightly different on each individual flute; most can be extended down to C#₄ and some can reach up to D₇. This extension of the flute's range is fully notated in a fingering chart by Antoine Mahaut in his *Nouvelle méthode pour apprendre en peu de temps à jouer de la flûte traversière*,⁴ though he does stipulate that notes from A#₆ to D₇ are mainly for the *flûte d'amore* and the bass flute.

There are generally two systems of fingering chart notation for the baroque flute. The first is the numerical system shown in Figure 1.3, and is used by Quantz; in Mahaut's chart (Figure 1.4), though he still labels the finger holes using the same numbering system as Quantz, he instead uses a graphic representation of which holes are to be open or closed. Open circles designate open finger holes, and darkened circles indicate those holes covered by the fingers. Circles that are open, but with a small, darkened circle in the centre, mean that one may leave the hole either open or closed. It is important to note that, with regard to the key, a darkened circle will mean that the finger is not pressing the key down, and therefore the hole remains closed, and vice versa for an open circle.

The instrument is naturally pitched in D Major. That is to say that if one plays with all fingers down and removes one finger at a time in succession from the bottom of the flute to the top, a D Major scale will result (see Figure 1.5).⁵

⁴ Mahaut, *Nouvelle méthode*, p. 7.

⁵ J.L. Tulou, *Méthode de flûte progressive et raisonnée*, Op.100 (London, Brussels & Mainz: Schott, c.1835), p. 11.

Vocal Part:

Re Mi Fa Sol La Si Ur Si Re Mi Fa Sol La Si Ur Si

Piano Part:

The piano accompaniment is written for both hands on grand staves. It features a dense texture of sixteenth and thirty-second notes, creating a shimmering effect. The right hand often plays chords or rapid runs, while the left hand provides harmonic support with similar rhythmic patterns.

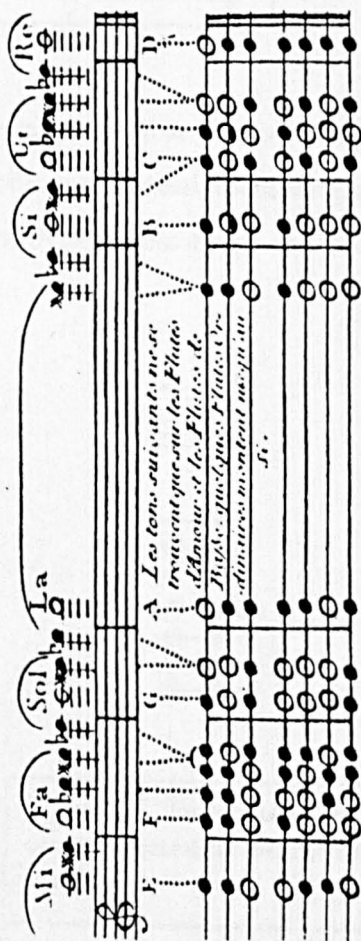


Figure 1.4. From Mahaut, showing the fully extended range possible on the one-keyed flute

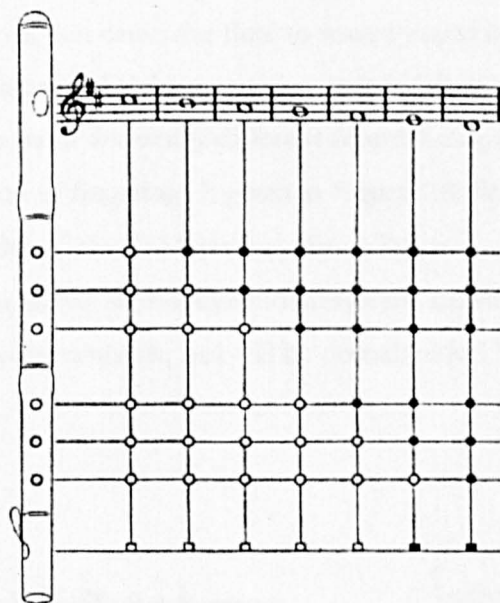


Figure 1.5. From Tulou, the D Major scale descending

To produce notes outside the D Major scale, one must use cross-fingerings, fingerings in which the closed holes are not all adjacent; instead, there are gaps between them. (See comparison of cross-fingered notes with non cross-fingered notes in Figures 1.6 and 1.7.)

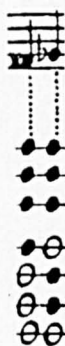


Figure 1.6. Comparison of F-sharp₄, a non-cross-fingered note and G-flat₄, a cross-fingered note



Figure 1.7. Two examples of cross-fingered notes, A-sharp₅ and B-flat₅

Cross-fingered notes sound markedly different from non-cross-fingered notes. Each possesses its individual colour, which varies somewhat from instrument to instrument and according to the control of the flute player. Their sound is generally softer,

and often more veiled than the brighter, more tonally stable non-cross-fingered notes. It is these cross-fingerings that cause the flute to sound varied in colour in each different key. For example, D Major is a bright, strong key as it is full of stable, non-cross-fingered notes; D-flat Major has a drastically different sound, being dominated by cross-fingered notes. A comparison of fingerings is given in Figure 1.8; fingerings for D-flat Major are extracted from Mahaut,⁶ the D Major scale from Tulou.⁷

A recently-created, non-conventional system, called the *ecosonic* system, is also extensively used in this research, and will be described in Chapter 4, **Practical Musical Integration**.

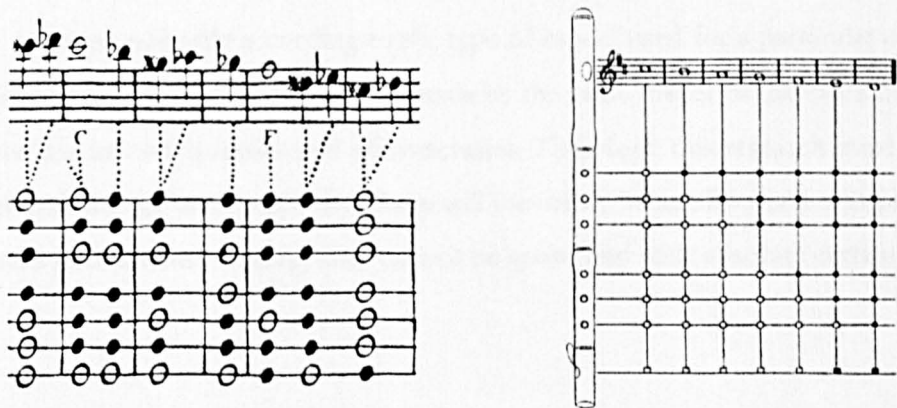


Figure 1.8. For comparison: the D-flat major and D-Major scales

⁶ Mahaut, *Nouvelle méthode*, p. 7.

⁷ Tulou, *Méthode*, p. 11.

Section Two: Instruments used in this research

The instruments used for this research are as follows:

- A four-joint copy of a Carlo Palanca flute in mopane (red ebony), *circa* 1750 by Jean-Jacques Melzer
- A four-joint copy of a Carlo Palanca flute in boxwood, *circa* 1750 by Martin Wenner
- A four-joint copy of a Thomas Lot flute in boxwood, *circa* 1730s by Folkers & Powell

There is variation not only according to the type of model used for a particular copy of each flute, but also between instruments made by the same maker of the same model.⁸ Each flute has its own qualities and idiosyncrasies. Therefore, this research must make some generalisations, and accept that there will inevitably be small variables in pitch, colour, and performance strategy that cannot be quantified with absolute certainty.

⁸ There are currently many makers of modern copies of baroque flutes around the world. A small selection of these includes: Martin Wenner, Singen, Germany; Folkers & Powell, Hillsdale, NY, USA; Boaz Berney, Montréal, Canada; Alain Polak, Barcelona, Spain; Roderick Cameron, Nairn, Scotland; Jean-Jacques Melzer, Gagny, France; and Simon Polak, Zittjaart, Holland.

Chapter 2

New Techniques in Tone Production on the Baroque Flute

Section One: an historical basis for a wider repertoire of tonal possibility

The timbral qualities of an instrument may be considered of the utmost importance; the sound produced by the combination of performer and instrument is an integral part of musicianship, and therefore constitutes a principal potential resource for expressivity, providing a distinctive measure of one facet of a performer's individuality. This aspect is clearly addressed by Richard Shepherd Rockstro (1826-1906) in *A Treatise On The Construction The History And The Practice Of The Flute*, in a section titled, 'General View of Quality of Tone':

The plain English expression, quality of tone, will be used throughout this work, to express those peculiar characteristics of musical sound, by means of which we are enabled, not only to distinguish the tones of different voices and instruments of music from one another, but to appreciate the finer and more delicate shades of variety in the tones elicited by different performers from the same instrument, and also the still more recondite differences between the sounds produced by the same performer from the same instrument at different times.¹

Historically, the most desirable qualities of flute tone have been described in a number ways. But very often, particularly during the 18th century, the ideal quality has been compared to that which is closest to the sound of a beautiful human voice.² This research endeavours to take this ideal a step further, to explore possibilities in which the defining qualities of tone are expanded; namely, that a 'good tone', as defined by its resemblance to the singing voice, is not considered a boundary beyond which the player is forbidden to pass.

Although the tone quality of the baroque flute is unique, differing to a great extent from the more familiar homogeneous sound of the Boehm flute, the sound of an individual player's tone remains a particularly identifying feature for both Boehm and baroque flautist. It can be the exception rather than the rule for a flautist to use the quality

¹ R. S. Rockstro, *A Treatise On the Construction the History. and the Practice of the flute* (London: Rudall, Carte & Co., 1890), p. 77.

² See comments by Quantz, Tromlitz below.

of tone as an expressive means.³ The purity (or lack of any extraneous noise), and the consistency in the focus of the tone is considered paramount, and is often cultivated as a component of instrumental playing, separate from expressive musicality.⁴ It is commonly held amongst mainstream performers today that purity of tone is desirable, regardless of the expressive situation, and a clear tone is used virtually exclusively, and is not affected by a change in emotional content within the musical context. This research maintains that that there is the possibility for the expansion of expression through the use of a wider variety of tone qualities, produced through both conventional and unconventional means. The first section of this chapter begins with a selected historical overview of ideas presented in the tutors of the 18th to the 21st centuries, producing a basis and context from which to proceed to research into the expansion of the expressive repertoire in tone production.

Historical Ideals of Tone Quality

Ideas of a ‘good tone’, as expressed in tutors written to teach flute performance, on instruments from the earliest, one-keyed baroque flute through to the present day Boehm flute, have varied widely. There is, however, a general consensus that good flute tone should be ‘clean’, or free from unintentional noise produced by a lack of control to the air stream, causing it to mar the focussed production of sound. During the 18th century, a recurring theme is the desire for flute tone to be as much as possible like a handsome human voice. Writing in 1752, Johann Joachim Quantz (1697-1773) gives the following description of the ideal tone quality of the flute:

In general the most pleasing tone quality (*sonus*) on the flute is that which more nearly resembles a contralto than a soprano, or which imitates the chest tones of the human voice. You must strive as much as possible to acquire the tone quality of those flute players who know how to produce a clear, penetrating, thick, round, masculine, and withal pleasing sound from the instrument.⁵

³ In particular, Wissam Boustany uses a wide variety of tonal qualities, including noise within the sound to expressive purpose, which was in particular evidence in a concert on 1 May 2003 at St. John’s Smith Square London; the performance included *Poison Mushroom* for flute and electronics by Dai Fujikura and *Noa Noa* for flute and electronics by Kaija Saariaho. Michel Debost also uses tonal alteration to expressive effect, in particular on his CD recordings of French flute music, *Flûte Panorama*, and in particular, Volume II, *Chant de Linos*, by A. Jolivet.

⁴ See comments below by W. N. James, pp. 28-29.

⁵ J. J. Quantz, *On Playing the Flute*, trans. E. R. Riley, 2nd ed (London: Faber & Faber Limited, 1985), p. 50; see Appendix A, p. 117, for the original German.

It remains true that the idea of a 'perfect tone' is highly subjective. Although Johann George Tromlitz (1725-1805) agrees with Quantz regarding the necessity of imitating a beautiful human voice, he also admits how greatly taste may vary from person to person and their opinion of what constitutes a fine tone. Describing this in his tutor of 1791, he writes:

Because not all persons are fond of the same kind of tone, but differ amongst themselves in this matter; since one individual likes a strong, full sound, but at the same time not bright and ringing; another likes a strong and shrieking one; still another a thin, biting and sharp one, a fourth a thin and feeble sound, etc., it is therefore impossible to establish a tone-quality that can be recognised as beautiful in general. If the tone is clear, resonant and pleasing, it will indeed please the majority, but there will certainly be some who find something to censure about it here and there. This goes to show that tone is a matter of taste. I have often found that one person can think a tone beautiful while another cannot stand it. So it is difficult, if not quite impossible, exactly to define a sound which everyone considers beautiful. I say: the only model on which an instrumentalist should form his tone is a beautiful human voice; and as far as I am concerned a human voice that is beautiful is one that is bright, full and resonant, of masculine strength, but not shrieking; soft, but not hollow; in short, for me a beautiful voice is full of timbre, rounded, singing, soft and flexible.⁶

Tromlitz continues:

On the flute too [as with the voice], a firm, healthy, full and masculine sound, neither too strong nor too weak, can be shaded at pleasure as to tone colour; one only has to know how to handle the instrument properly.⁷

Tromlitz is writing just before the turn of the 19th century, and he plainly advocates the use of subtle changes of tone colour. This was one of the aspects of the pre-Boehm system flute that was celebrated: the possibilities for different colours, and that different tonalities possessed different expressions of character. In addition, Tromlitz has made it clear that there are a wide variety of opinions regarding beautiful and pleasing tone.

Throughout the 19th century, the instrument was undergoing major changes in its construction. The Boehm flute was being developed alongside countless other designs for improving the stability and consistency of the instrument. With the rise of virtuoso players such as Charles Nicholson, Louis Drouet, and Jean-Louis Tulou, during the first three

⁶ J. G. Tromlitz, *The Virtuoso Flute Player*, trans. and ed. A. Powell (Cambridge: Cambridge University Press, 1991), p. 111; see Appendix A, p. 117-118, for the original German.

⁷ *Ibid.*, p. 114; see Appendix A, p. 118, for the original German.

decades of the 19th century, the ideal of a good tone began to change, as did the perception of what was possible on the instrument in terms of sheer volume of sound.⁸ A metallic, or silvery tonal quality (in contrast to the sound of a human voice as an ideal of sound), is remarked upon by the 19th-century English commentator W. N. James, specifically when he is outlining his views on the great virtuoso, Charles Nicholson. This is the same Charles Nicholson whom the inventor of the modern concert flute, Theobald Boehm, credits with inspiring him to redesign the flute.⁹ Nicholson was reputed to have produced a sound, the volume of which apparently had to be heard to be believed. W. N. James describes his wonder and affection for Nicholson in his *A Word or Two on the Flute* in 1826:

The tone which Mr. Nicholson produces on the flute, is, perhaps, the most extraordinary thing that he does. It is not only clear, metallic, and brilliant, but it possesses a volume that is almost incredible; and this, too, be it observed, in the very lowest notes of the instrument. The similarity between his tone and that of an organ is very striking; and the amazing command which this, of itself, gives him over his instrument is astonishing.¹⁰

From this account, it is evident that Nicholson's abilities were not only remarkable because of the astonishing volume of sound he was capable of producing, but also that he was able to sustain such quality of sound within the lowest range of the instrument. Therefore it seems that idiosyncrasies of tone colour and the unevenness of dynamic flexibility amongst the registers (qualities inherent in pre-Boehm flutes),¹¹ which were present during the 18th century are beginning to be replaced by homogeneity and a quest for ever greater projection and volume. Yet the consistent pursuit of clarity remains. The implication is that a singularly clear and brilliant tone is extremely impressive. However, James states that there are in fact 'three different tones to be produced on the flute' and describes them in great detail.

The first is similar to the tone of the hautbois, or clarionet; and is obtained by blowing on the edge of the instrument, and keeping the upper lip compressed as tightly as possible, and throwing the breath into the embrochure[sic] in a constant and rapid stream.

⁸ See comments below by W. N. James, pp. 28-30.

⁹ Prominent flautists were still performing on old-system flutes, particularly in Germany, and Boehm's redesigned flute would not be fully accepted until after the First World War. Jeremy Montagu: 'Flute,' §II, 4(iii): The Western transverse flute: 1800 to the present (c) The flute after Boehm, *Grove Music Online. Oxford Music Online*. <<http://www.oxfordmusiconline.com/subscriber/article/grove/music/40569>>, accessed 6 March 2008.

¹⁰ W. N. James, *A Word or Two on the Flute* (London, 1826; repr. with an introduction by S. Preston, London: Tony Bingham, 1982), p. 155.

¹¹ See Chapter 1 for discussion of tonal and dynamic descriptions of historical flutes.

The second tone is completely the reverse of the preceding. The breath is conveyed in a larger volume into the flute; and the upper lip is, consequently, made loose. This, I am of opinion, is the natural tone of the instrument, as beginners always produce it, and is of that quality which is called mellow and plaintive. It is, however, very apt to be rough and harsh, in consequence of the breath not being so immediately under the guidance of the upper lip. This tone can often be introduced with much effect, as it forms a striking contrast to the other. Some masters use it when the movement of a composition is to be played very *dolce*. It is of easy attainment; but it should, on no account, be much practised, as it almost destroys the lip for other tones.

The greatest test of a performer's talent in this particular, is in the production of the third tone, which is by far the most beautiful, and is that which is of such difficult acquirement. The best method for the early attainment of this tone is given in another part of this volume. It is of a metallic and liquid character, and its clearness is unrivalled.

But however important tone undoubtedly is, it still must be subordinate to expression; for tone, however fine, will never make an impression alone and unassisted, although good expression will always be effective, let the material consist of what it will... I would therefore, impress upon the amateur the truth of this maxim, which he should studiously endeavour to remember, —'Sacrifice execution to tone, and tone to expression.'¹²

What is of interest about this statement is not only that James advocates three kinds of tone, but that tone must be subservient to expression, that it is expression that is of the greatest importance in a flautist's performance.

Though James advocates several sorts of tone, he seems to be smitten with the power and metallic quality of Nicholson's performances. He comments on several other flautists, markedly famous in their time, and though he remarks once again on the importance of expression, he seems decided on the superiority of Nicholson's tone.

The fault attributed to M. Drouët [*sic*] was, that he was deficient in volume of tone and in expression, the very qualities which Mr. Nicholson excelled in. I do, however, think that he was, in this instance, very severely criticised; for his tone, though certainly not large, was by no means of that weak nature which could bring a charge against him for the want of it. The amazing and transcendent brilliance, too, of its quality, one would imagine, might abundantly recompense for the absence of greater volume; and, with respect to his expression, I firmly believe, that those who made

¹² James, *A Word or Two*, p. 147.

the accusation against him, when he first arrived in this country, were quite ashamed to repeat it when they had a better opportunity of hearing him oftener...¹³

...But the tone which Mr. Rudall produces on the flute is, I think, peculiar to himself: it is of a pensive and pathetic character, and partakes, in a slight degree, of the more delicate tones of the horn. It has little of the metallic brilliancy and majesty of Mr. Nicholson's, or of the liquid and dazzling clearness of M. Drouët; but it is exquisitely soft and mellow, and finely displays the vibrations, of which Mr. Rudall is a complete master.¹⁴

In 1923, Maximilian Schwedler (1853-1949) still suggests the expressive use of various kinds of tone colour, though he does not commit a specific section or chapter to the description of an ideal tone; the subject arises in the course of his discussion titled 'Remarks on Performance'. He gives various recommendations in the use of 'covered' and 'open' notes, referring to the veiled sound produced by some cross-fingerings on the reform flute.¹⁵ When describing the expression of several varying characters of music, Schwedler comments on the differences in tonal usage for contrasting styles of movements. The lack of tonal variety is mentioned specifically with regard to *dolce* style:

The tender (*dolce*), heartfelt, caressing character requires the absence of any roughness in sound, the greatest purity in tone production without any secondary noises.¹⁶

Schwedler often describes various fingerings and their effect on tone colour, giving specific examples for their use, but when giving his recommendations for playing in a comic style, he is more specific about the tonal quality itself, rather than the use of altered fingerings.

The comic, ridiculous, even devilish (*infernal*) character can be given by conscious, abrupt and unexpected contrasts in register, tone color and tempo. Usually these are already written out in the piece. Making the lower notes rough and crude, the highest

¹³ James, *A Word or Two*, pp. 169-170.

¹⁴ *Ibid.*, pp. 178-179.

¹⁵ The reform system flute is notably different from the Boehm system flute. It is of conical bore rather than cylindrical, and is based on the one-keyed flute system with keys added to alleviate some cross-fingerings; there is also alteration of the positioning of tone holes according to the specific maker. See A. Powell, *The Flute* (New Haven & London: Yale University Press, 2002), pp. 198-199.

¹⁶ J. R. Bailey, 'Maximilian Schwedler's "Flute and Flute-playing": Translation and study of late nineteenth-century German performance practice' (DM dissertation, Northwestern University, 1987), p. 424. See Appendix A, p. 118, for the original German.

notes easy, and requires virtuosity and effort if technical insecurities are not to appear.¹⁷

The description is of interest, as it is specific in naming both ‘impure’ (crude, rough) and ‘easy’ tone qualities. It is also of interest that, by the first quarter of the 20th century, to perform in this way successfully, changing of tone colour for expressive purpose ‘without technical insecurities’, is considered by Schwedler to be indicative of a level of virtuosity.

In the 1956 edition of the *Méthode complète de flûte* of Joseph Henri Altès (1826-1895), there is no description of an ‘ideal’ tone, but he, too, suggests the use of various kinds of tonal quality, though in a less specific way than does Schwedler.

However, clarity alone will not suffice for an interpretive artist, who must above all cultivate a sympathetic understanding of the work to be performed. He will then realise that to avoid monotony, the quality of sound must not remain uniform, but must be in turn: energetic, moving, full, mellow, velvety or suave.¹⁸

Though the language here is quite different and much more open to interpretation, it does suggest that Altès recommends that flautists make use of expressive variety of tone in personalising their performance and in expressing the affect of the music.

Although the contemporary performing world of the modern and, to a great extent, the baroque flute have become concentrated on a pure and penetrating tone, modern tutors, such as that by Trevor Wye (b. 1935), still advocate practising the acquisition of different tone colours, though he only specifically names two distinct qualities of tone in his tutor.

The flute is capable of producing a great variety of sounds, more so than any other orchestral instrument. Musical painting is more interesting when the palette has many colours.¹⁹

Wye continues to explain in his exercises the ideas of practising with a) ‘a full strong, rich, dark tone’, and b) ‘a hollow, ‘open’ gentle tone, more like the recorder in colour’.²⁰

Louis Moyse (1912-2007) studied with his father, Marcel Moyse (1889-1984), at the Paris Conservatoire. Marcel is widely recognised as one of the great flute pedagogues of

¹⁷ Bailey, ‘Maximilian Schwedler’s “Flute and Flute-playing”’; see Appendix A, p. 118, for the original German.

¹⁸ J. H. Altès, *Méthode complète de flûte* (Paris: Leduc, 1956), vol. 2, p. 219; see Appendix A, p. 119, for the original French.

¹⁹ T. Wye, *A Trevor Wye Practice Book for the Flute*, (Kent: Novello, 1980), vol. 1, p. 24.

²⁰ *Ibid.*

the 20th century. In addition, Louis also studied with another of the great 'fathers of the modern French flute school', Philippe Gaubert (1879-1941). He has written a number of method books and studies, including a volume entitled *Tone Quality on the Flute* (1991), in which he laments the loss of expressive tone colour.

The art of using different tone-colours as a means to express various moods and feelings (just as Impressionist painters used their palettes) is fast disappearing. It will soon belong to what is now referred to (with some degree of nostalgia, it seems), as the 'Golden Age'. ... Also, the admirable job done nowadays by flute manufacturers, who 'build in' tone colour, doesn't induce the modern flutist to make much effort in that direction.

The following exercises are excellent for developing a different sort of tone-colour, quite the opposite of what flutists normally try to achieve, i.e. a dark and penetrating sound-quality.

I don't propose to start a debate on which sound is the best!

Firstly, there isn't such a thing as *the* best...

Secondly, it is a combination (among other things) of three fundamental factors: the player's personal ability (both natural and acquired), his own taste, and the choice of an instrument with an *adequate mouthpiece*.

I would just like to point out that to have several means of expression at one's disposal is useful, and to study various aspects of flute tone will help to add infinite variety to the expression of feelings; human emotions as expressed in music are limitless!²¹

Moyse seems to accept that the art of developing expressive tone colour in flute playing is vanishing, and very pragmatically and simply outlines the advantages of studying all aspects of tone, toward expanding one's own musical palette, as he calls it.

The narrowing of the expressive use of tone quality has likely been a product of the continual movement of modern flute performance practice towards a constantly increasing need for volume and a homogenous sound. As the volume of sound in orchestras has become greater, the flute is constantly required to project ever more, and the veiled sound of cross-fingered notes would not carry as well as bright, focussed, open-sounding notes. The development of the Boehm flute has certainly affected a great deal of this change by allowing the instrument to have an evenness of tone quality throughout its entire range, an evenness that was impossible (though at the time not necessarily sought after) on the pre-Boehm system flutes. Today, the production of a loud and penetrating tone that is equally audible in the high and the low registers, and is often pressed to the

²¹ L. Moyse, *Tone Quality on the Flute* (Paris: Leduc, 1991), p. 28; see Appendix A, p. 119-120, for the original French.

limit of volume, is a benchmark of a majority of modern flute performances in both solo and orchestral situations. The loss of expressive variety of tone leaves a vast repertoire of possibility, particularly in new music, where the horizon is more open, and there are not the restrictive traditions that are so prevalent in conventional performance.

Section Two: New Expressive Horizons with Tone

There are two main ideas that have stimulated new expressive possibilities for tone production on the baroque flute. The first is the often-used comparison of a good tone with that of a beautiful human voice, though this is chiefly a comparison with a human singing voice, and refers to a less naturally occurring voice quality. Still, the idea draws forth further analogies for expression. Obviously the human voice uses words for the most part to express meaning and emotion. But without the appropriate inflection, the words themselves are considerably less effective and the shades of meaning are substantially diminished. The consistency of a clear and penetrating flute tone therefore does not compare exactly to that of the human voice, particularly the voice with which we are most familiar in an expressive context, but it is recognised that, without inflection and changes in quality and colour, words do not have the expressive quality to move either the speaker or the hearer. T. A. Sheridan comments in 1762 on this topic in his sixth lecture on language and speech, entitled *Tones*.²²

Everyone will acknowledge that the terms anger, fear, love, hatred, pity, grief, will not excite in him the sensations of those passions, and make him angry or afraid, compassionate or grieved; nor, should a man declare himself to be under the influence of any of those passions, would he in the least affect us, or gain any credit, if he used no other signs but words. If any one should say in the same tone of voice that he uses in delivering indifferent propositions from a cool understanding, 'Sure never any mortal was so overwhelmed with grief as I am at this present.' Or, 'My rage is roused to a pitch of frenzy, I can not command it: Avoid me, be gone this moment, or I shall tear you to pieces:' Sure no one would feel any pity for the distress of the former, or any fear from the threats of the latter. We should either believe that he jested, or if he would be thought serious, we should be moved to laughter at his absurdity. And why is this? But because he makes use of words only,

²² T.A. Sheridan, *Course of Lectures on Elocution: together with Two Dissertations on Language; and Some other Tracts relative to those Subjects* (London: W. Strahan, 1762; repr. New York: Benjamin Blom, 1968), pp. 93-111.

as the signs of emotions, which it is impossible they can represent; and omits the use of the true signs of the passions, which are, tones, looks and gestures.²³

Although the comparison of expression through the tone of the flute to that of verbal discourse is not exact, the need for the expression of emotion and meaning through inflection is analogous. A consistent tone colour may express beauty and demand attention or, as in the case of Charles Nicholson, even awe, but it is not emotionally expressive of itself. This research is concerned not so much with issues of tone colour or volume as with qualities of sound and their ratio of noise to pure, focussed tone.²⁴ When related back to the human voice, these are changes in vocal quality recognisable to all people when they are experiencing emotion. Thus, for example, the voices of those who are greatly distraught may break up, while the very angry can produce a massive volume of sound obscuring the tone of normal speech they would otherwise use in less intense moments. These are, of course, only a very few, simplistic examples. Why then, as classical musicians do we so commonly limit ourselves to changes in volume and/or colour in the attempt to express deep or intense emotion within music? Does tampering with the purity of tone within mainstream performance of standard repertoire offend our ears (or those of our audience) too much to be accepted?

A more inclusive approach to tonal technique is certainly not unknown by performers of other instruments, but is more often heard outside the world of classical music as well as in the realm of avant-garde performance on the flute. Players of the Japanese shakuhachi make use of a tonal variety that generally includes a much greater array of tonal make up, often with a higher ratio of noise to 'pure' tone. Sometimes the noise content is very subtle, and at other times, it is nearly complete, with only a residual sense of pitch.²⁵ The use of varied tonal qualities in avant-garde flute music of the second half of the 20th century is well represented by Toru Takemitsu (1930-1996), who was influenced by traditional Japanese instruments, including the shakuhachi.²⁶ This is reflected

²³ Sheridan, *Course of Lectures on Elocution*, p. 100.

²⁴ Changing the ratio of noise to tone is in contrast to the extended techniques outlined, by Robert Dick, for example, as 'Extended Timbres.' In which Dick refers to a distinct change of tone colour, but he does not directly imply noise content within the sound. This is instead, a change of colour, described by the prevailing partials present within the tone. See Dick, *Tone Development through Extended Techniques* (New York: Multiple Breath Music Co., 1986), p. 28.

²⁵ See: Shakuhachi Flutes, <http://www.shakuhachichambermusic.com/pages/notatingqt.html> (accessed 15 October 2009). See also: Various Artists on Japan, Shakuhachi, *Shika No Tone (The Far Cries of Deer)*, 2007.

²⁶ There are many other contemporary composers who make use of tonal quality with the inclusion of noise on the Boehm flute, for example, S. Korde, in *Tenderness of Cranes* (Action, MA: Neuma Publications, 1990). and S. Sciarrino in *Opera per Flauto* (Milano: Ricordi, 2001).

in his music, which uses a wider range of tone quality.²⁷ Jazz and pop music players of both brass instruments and woodwinds very effectively employ a variety of tonal qualities, including ‘dirty sounds’ like the growl or scream of the trumpet or clarinet, and the spread, unfocussed sound used by the saxophone, and even flute.²⁸ This is one significant source of inspiration for the use of varied tonal qualities; the other is directly related, and is mentioned persistently, in instructive writings for the flute, a concern that is ideally paramount to all musicians: expression itself. W. N. James states, ‘Sacrifice execution to tone, and tone to expression.’²⁹ The expansion of the repertoire of tonal qualities, particularly variation in the ratio of noise to pure tone, has generated new techniques for developing contemporary idioms of baroque flute performance.

The use of a non-conventional embouchure

Whistle tones

There has always been some discussion of the ideal or acceptable embouchure for the Boehm flute, as well as the baroque flute. Historically, the discussion has ranged from concerns about the size and shape of the player’s teeth to the sex of the flautist.³⁰ This said, it is evident in today’s performers that a great variety of embouchure shape is utilised, and that shape is unique for each player. (An example of a conventional embouchure is illustrated in Figure 2.1.) But this is incidental. What is advocated here is the use of a partial lack of embouchure, or a ‘non-conventional embouchure’, a sound-generating technique, with regard to the upper lip in particular. Because the lower lip is much less mobile, being to some degree immobilised by the placement of the flute upon it, a non-embouchure is achieved by the complete relaxation of the upper lip.

²⁷ For examples of works which include a variety of tonal colours and the inclusion of noise, see T. Takemitsu, *Air* (Mainz, New York: Schott, 1996), and T. Takemitsu, *Voice: pour flûte solo* (Paris: Editions Salabert, 1998).

²⁸ For such ‘dirty’ trumpet sounds, see Dizzy Gillespie performing with his sextet on *The Smithsonian Collection of Classical Jazz*, vol. I, ‘I can’t get started,’ recorded 9 January 1945. A particularly good example of a variety of tone qualities used by both Benny Goodman on clarinet and by Gene Krupa on trumpet can be found on *The Smithsonian Collection of Recordings, Big Band*, vol. II, ‘Sing, Sing, Sing,’ recorded 6 July 1937. For example, Charlie Parker, performing with his All-Stars, on *The Smithsonian Collection of Classical Jazz*, vol. 3, ‘Parker’s Mood,’ recorded September 1948 offer examples of unfocussed saxophone sounds, while Ian Anderson, flautist for the band, *Jethro Tull*, the soloist featured on the album, *The Very Best of Jethro Tull*, including the songs, ‘Locomotive Breath’ and ‘Bourrée’, Chrysalis Records Ltd./EMI Records Ltd. 2001, presents comparable sounds on the flute.

²⁹ James, *A Word or Two*, p. 147.

³⁰ For example, see Quantz, *On Playing the Flute*, pp. 51-52.

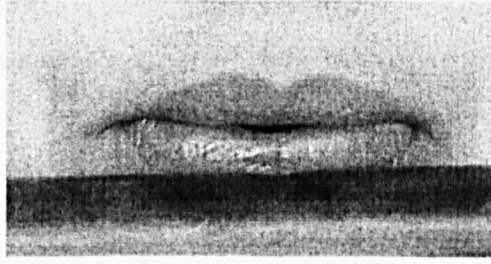


Figure 2.1. An example of a conventional embouchure for the flute

This differs from the clarity of form in the round, 'O'-like shape normally produced by using both lips to form a conventional embouchure. When both lips are used in this way, the surfaces of the embouchure where the air exits the mouth involve a very small area of external lips, and an even smaller area of the internal, or wet, part. When the upper lip is relaxed away from the lower (see Figure 2.2) the area over which air is passed is greatly increased. In addition, both the tongue and the upper teeth may be used to modify the flow of air and the shape of a non-conventional embouchure.

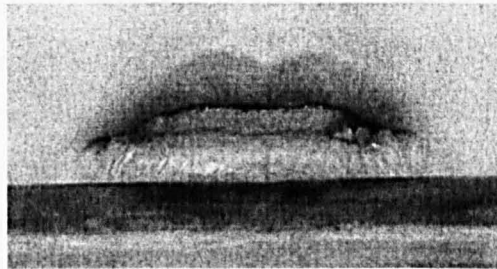


Figure 2.2. An example of a non-conventional embouchure for the flute

It is possible to produce several techniques by employing this non-conventional embouchure. Whistle tones are well known as a technique for the modern flute, and the baroque flute varies little from it in the way they are produced.³¹ The notable difference is the difficulty in producing whistle tones on the baroque flute, largely owing to the

³¹ See: R. Dick, *The Other Flute* (London: Oxford University Press, 1975), pp. 140-141; R. Dick, *Tone Development through Extended Techniques* (New York: Multiple Breath Music Co., 1986), p. 26; and T. Howell, *The Avant-garde Flute: a handbook for composers and flutists* (California: University of California Press, 1974), 26-27.

considerably smaller embouchure hole, and its less incisive edge. Also, when successfully produced with a conventional embouchure, whistle tones are much softer in volume on the baroque flute than they are when played on their modern counterparts. Because whistle tones depend on a very wide air column for their successful production, using the non-conventional embouchure allows for a much greater ease in generating more stable whistle tones of increased volume. It also provides increased flexibility in choosing which partial is produced for a given whistle tone, and makes lower partials more accessible than when attempting lower and louder whistle tones with a conventional embouchure.

Demonstration of whistle tones, with a non-conventional embouchure is on Track 1 of Audio Disc 1, and is also present as part of an improvisation on Track 42.

Roar

The production of a 'roar' effect is similar with regard to utilising a wider air column. With a relaxed upper lip, the tongue may also be raised toward the middle of the mouth. These two actions combined produce the roar by using a wide column of air, which, when combined with a fast, high volume of air created by the performer, makes a very loud sound; the tongue, being raised in the mouth, causes the chamber through which the air passes to be narrower, quickening the speed of the air and allowing the roar to be maintained for a longer time than if the tongue were left depressed in the bottom of the mouth. Because this technique depends on a very open and relaxed upper lip, it is only possible to produce a successful roar in the lowest octave of the flute. Above this range, the upper lip would be necessary to generate notes in higher registers. In the lowest octave, this technique is very effective in producing bursts of sound with an amount of volume otherwise not possible on the baroque flute.

A demonstration of the roar technique can be found on Track 2 of Audio Disc 1, and is followed by a short improvisation that uses roar on Track 3.

Changing the ratio of noise to purity

The purity of tone and fine degrees of flexibility using a non-conventional embouchure are not equal to what is achievable with the use of a conventional embouchure. To achieve a finer degree of control, a conventional embouchure should be used, in conjunction with the tongue, to change the integrity and noise quotient within the tone. However, it is not necessary to limit the use of a non-conventional embouchure to isolated techniques such as the roar and the production of whistle tones; it is also very useful in varying the quantity

of noise within the tone. The degree to which the mouth is open directly affects the integrity of the tone produced. The more open the mouth, the less the tonal integrity, as the amount of control is decreased by the lack of fine adjustments in a large, unfocussed embouchure. As the embouchure is made smaller, either by closing the mouth or by using the tongue, the tonal integrity increases.

If the tongue is used as a focusing agent in conjunction with a non-conventional embouchure, it is also possible for it to be used for the opposite purpose, to obstruct the directness of the air stream and increase the noise content of the tone. This can be done to greater or lesser degrees by, at one extreme, causing the tone to cease when the tongue is extended far enough into the air stream to prevent the production of tone. Alternatively, the tongue can be withdrawn to such an extent that it decreases the content of noise down to a minute amount. Because the mouth is more open, and the embouchure is less finely regulated, the range of dynamic possible is also somewhat limited, and is dependant on the following: how large the core of the air stream is where it exits the lips and within the mouth, and by how narrow the area is made between the middle of the tongue and the top of the mouth.

The use of the non-conventional embouchure does create difficulties with regard to range and dynamics. Because the upper lip is not employed, it cannot be pushed forward to produce notes higher than the B_5 . (See Figure 2.3.)

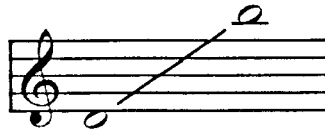


Figure 2.3. Illustration of the range that is possible when using a non-conventional embouchure

In the second octave, the tongue must be used to channel the air through a smaller chamber in the mouth, and an increase in volume of air is required more and more as one ascends from the first octave into the second. As one reaches B_5 , the amount of air required to maintain the second octave begins to exceed the amount it is possible to produce in a single breath. In addition, the degree to which a flautist may specifically alter the amount of noise within the tone is also lessened by the necessity of committing the vast majority of breath to the basic function of producing the tone itself. Additionally, the

duration of the note is limited to a great extent by the sheer amount of air necessary in maintaining a note in the second octave.

When finer control is required, more efficiency is attainable using a conventional embouchure; there is a similar utilisation of the tongue in effecting the ratio of noise to pure tone. The main advantage of the conventional embouchure is that the tongue is not used in its formation and therefore is free to be used independently to affect the content of noise within the tone. The tip of the tongue can be moved by any degree, from just below the stream of air as it travels forward and exits the lips, to the entire distance forward and into the embouchure itself, between the lips, ultimately to the point where the sound ceases as a result of the tip of the tongue completely blocking the air flow.

When a conventional embouchure is applied in combination with potential change in the tongue position (affecting the amount of noise within the tone), the entire range of the flute can be used. The dynamic scope is also considerably increased because of the independence of tongue and lips. With the exception of the use of the tongue in changing the integrity of the tone, the embouchure can behave normally with regard to conventional flute playing, including the range of dynamic and tonal colour, the tongue functioning as an introduced element.

A demonstration of changing the ratio of noise to tone can be found on Audio Disc 1, Track 4. The following Track 5 uses this technique as the basis for an improvisation.

Expressive Effect

The use of tonal alteration to increase the palette of expressive colour on the flute extends the possibilities for 'speaking' through the instrument. A precedent has already been established by contemporary works for the Boehm flute that make effective use of a wider tonal variety. The baroque flute may be considered somewhat limited in its capacity for volume of sound; the roar technique greatly increases, if only momentarily, the volume capacity of the baroque flute. Although whistle tones are naturally extremely soft in volume, the use of a non-conventional embouchure increases their stability and volume, making them noticeably more audible. The introduction of noise into the core of the flute's tone can be used expressively in many ways, some of which will be expounded upon in Chapter 4, regarding their integration into the work by Jo Thomas, *Less – for baroque flute and electronics*.

Section Three: The Effects of Extended Technique Practice on Conventional Performance Techniques

Tone

The search for the ‘perfect tone’ on the baroque flute, or indeed on any instrument, is a perpetual one. Countless exercises exist for the improvement of purity and strength of tone for the modern flute. Curiously, there are few examples of exercises for tone in historical tutors, and more often the author’s idea is explained in prose rather than with exercises, though almost invariably it is suggested that the best guide for the student is to listen well to a favourite flautist or singer and seek to emulate that musician.³² However, in this quest for purity of tone, there is always a great deal of focus on the systematic removal of extraneous noise from the sound. This leads to the danger of limiting oneself to a very narrow palette of tonal colour, if colour may be described as not only to do with a variance of timbre but also of the many components making up the tone as a whole. This must include, even to a minute extent, the amount of noise within, as it is not possible to achieve tone that has absolutely zero content of extraneous noise. The quality generally regarded to be negative is ‘noise’, or any sound within the tone of the flute interfering with, or not contributing to, ‘purity’ of tone. Performers generally limit themselves to practising toward a single goal – that of purity. The study of noise content and various ratios of noise to tone will increase the scope of the possible expressive sound qualities for the performer. This is accomplished through a greater knowledge of both extremes of tone production, and a balance may ultimately be arrived at, once these extremes have been achieved. On one side is virtually absolute (or as much as is possible for an individual player) purity and on the other resides virtually absolute noise content within the tone. Working with balance allows the performer to increase flexibility, expanding familiarity with all components of tonal possibility; limits are lifted and awareness of perceived positive and negative elements is increased.

Flexibility is improved through the practice of a wider variety of tone qualities, much the way stretching improves muscle performance even when extreme extension of these muscles is not required. This flexibility results from assimilation and familiarisation with very minute changes of the shape of the embouchure, the placement of the tongue, and fine control of the air stream. Stretching the boundaries of fluency in tonal variety creates a positive effect – greater ease and more consistent success is experienced in generating a conventional pure tone. The practice of extended techniques with regard to

³² For example, see Rockstro, *Treatise*, p. 440; see also Quantz, *On Playing the Flute*, p. 50.

tone is similar in its positive effect to exercising slurs over large intervals to build strength and accuracy in the embouchure and air stream. As the widest intervals become improved in their execution, smaller intervals become proportionally less demanding as the conditioning of the player's embouchure and control of the air stream improves. A similar benefit is accomplished by practising elements of noise in tonal exercises, producing an outcome that is more profitable than concentrating solely on elements involved in tonal focus and purity. The constructive effect remains even if the new extremes of the extended techniques are never executed in actual performance.

Conclusion

There is little reason for the exclusion of greater tonal variety, including the addition of noise within the tone, in contemporary performance on the baroque flute, particularly within improvisation and new works of music. It is possible that in the quest for a beautiful and projecting sound that the inclusion of 'impure' tone may have been ultimately rejected out of hand. It is not advocated here to forsake the quest for a beautiful and projecting tone, but instead to reject the blanket dismissal of other possibilities for using tone as an expressive vehicle, going beyond the basic pillars of purity and volume on which the majority of mainstream modern flute playing has become based.

Chapter 3

Articulation: From an Historical Basis to New Techniques

Section One: Articulation from the 18th Century to Present

The new techniques discussed in this research have been informed by the writer's foundation of study in both modern and historical flute performance. Though it is the modern flute which has received a great deal of attention through the performance of new and extended techniques, traditional technique of the 20th and 21st centuries has limited the variety of articulation once employed by flute players of earlier eras. Tutors appearing during the 18th and 19th centuries illustrate considerably more diverse ideas regarding articulation and its potential for expressive quality and range.

In order to place the development of a contemporary baroque flute technique in context, it will be useful to summarise the articulation syllables from the early 18th century through to the present day standard techniques of the Boehm flute. Historically, articulation techniques for the baroque flute have varied much more widely than those now typically employed for modern performance. This survey will demonstrate the advantage of drawing upon pre-20th-century articulation syllables over employing only the more limited articulation resources of modern Boehm flute performance practice through a comparison of techniques as they have changed over the last three centuries.

Articulation syllables on historical flutes

Although many 18th-century treatises on playing the flute share similar ideas about the syllables that are generally used in articulation, these tutors are less limited in their practical application, which sets them apart from modern practices of articulation currently in use on the Boehm flute and in many cases, modern practice on the baroque flute. The flute of the 18th century varied in style depending on the preference and/or nationality of the player, but was, in general, of either three or four pieces in wood or ivory, and possessed a single key and six finger holes. The style of articulation was linked to the affect of the music, and could, through its practical application, change the character and emotional affect of the piece.

Jacques-Martin Hotteterre (1653-1727), writing *circa* 1707, uses only the syllables *tu* and *ru*. This seems at first glance to be as limiting as current modern practice, in that he presents only two possibilities for single tonguing; but Hotteterre continues by presenting twenty-one examples demonstrating different permutations of these two syllables in

various time signatures and rhythms. Even within this relatively small pool of examples, there is already a richness of expressive opportunity.

The two syllables also imply *notes inégales*, which is described by Betty Bang Mather as follows:

According to French theorists and Quantz, equally-written quick notes could be played equally (*égal*) or unequally (*inégal*). It must be understood here that while equal notes are equal in a technical sense, absolute equality in an expressive sense is rarely desirable. Unequal notes (*notes inégales*) were most suited to the running succession of small intervals – mostly seconds – found in French airs. They were usually, though not always, performed as long-short pairs. Again, ‘long’ and ‘short’ must be considered as relative terms. Long notes generally corresponded to the first half of the beat and short notes to the second half.

Further:

The degree of inequality varied. In 1696, Loulié notated the inequality of eighth-notes as a 3:2 relationship. Quantz asserted in 1752 that the inequality of equally-written notes should never be as great as 3:1. In 1775, Engramelle allowed a possible ratio of 3:1 in his text, but his examples showed only the less unequal ratios of 2:1, 3:2 (the most frequently used), 5:3, 7:5, and 9:7.¹ The latter three relationships may be perceived simply as an agogic accent by our ears, and that is their function and effect. Engramelle noted that the degree of inequality could also be varied within a movement, especially in expressive pieces.²

Hotteterre’s two syllables imply different lengths; *tu* begins the note with a shorter articulation, and *ru* begins the note with a slightly longer and gentler attack. The result is a slightly dotted, *inégal* effect produced by the different attack characteristics, and is often used in stepwise motion, and as well for notes on the same pitch within a repeated rhythmic figure. This kind of figure is often shown with a varying pattern of syllables rather than with a single pattern repeated for all notes of a given figure. Further, the use of these articulation syllables in support of an *inégal* effect, is in turn, cooperative with the

¹ Marie Dominique Joseph Engramelle (1727-1805) was a builder of mechanical instruments, and also published a guide to notating lengths of notes for pinning the cylinders of these instruments. His guide gives precise notations for various durations of *notes inégales* for this purpose. (Hans-Peter Schmitz and Arthur W. J. G. Ord-Hume, ‘Engramelle, Marie Dominique Joseph’, *Grove Music Online*. <<http://www.oxfordmusiconline.com/subscriber/article/grove/music/08835>>) accessed 6 Mar. 2008.

² B. B. Mather, *Interpretation of French Music from 1675-1775* (New York: McGinnis & Marx, 1973), pp. 3-4.

desired expressive quality as it is related to the declamation of the French language through the subtle changes in duration of the notes.³

Figure 3.1 shows an example of employing the syllables *tu* and *ru* to assist in the shaping of *notes inégales* for stepwise motion in quavers.⁴ Figure 3.2 illustrates varied articulation on repeated groups of pitches in triple time.⁵

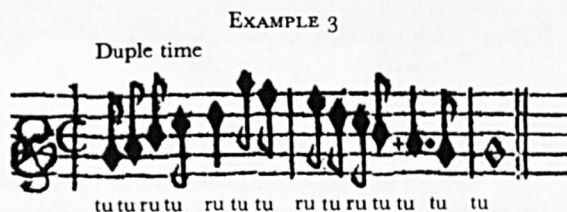


Figure 3.1. Hotteterre, from *Principles of the Flute, Recorder and Oboe*, examples of *notes inégales* supported by different syllables

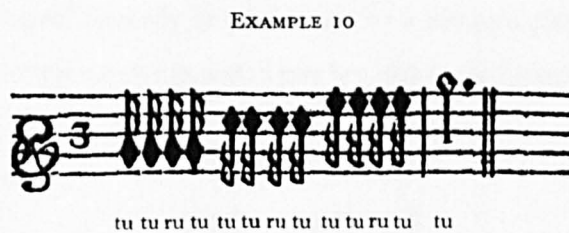


Figure 3.2. Hotteterre, from *Principles of the Flute, Recorder and Oboe*, examples of *notes inégales* supported by different syllables

Although the French style of flute playing, particularly in the 18th century, did not place a great deal of emphasis on varied articulation patterns, there are occurrences of quite remarkable articulation syllables; Charles Delusse (1720-25-after 1775) in his tutor, *L'art de la flûte traversière*, (1761) gives four musical examples (see Figures 3.3-3.6) using four different tonguing syllables, where he varies both the consonant at the attack, as well as the following vowel.⁶ This differs from the usual practice prescribed in many other tutors of maintaining the same vowel for use with all articulation syllables.⁷ Figure 3.3 shows *notes*

³ For further discussion of the relationship between the French declamation and *notes inégales*, see: B. B. Mather, *Interpretation of French Music*, pp. 4-6.

⁴ J. M. Hotteterre, *Principles of the Flute, Recorder and Oboe*, trans. P. M. Douglas (New York: Dover 1968), p. 37.

⁵ *Ibid.*, p. 39.

⁶ C. Delusse, *L'art de la flûte traversière* (Paris, 1761; Florence: Studio per Edizioni Scelte, 1997), p. 10.

⁷ Further reference to the significance of vowels follows below; see: pp. 47, 60-62.

perlées, a form of single tonguing articulated with equality of length, with the beginning and ending of each note shaped the same with a gentle *tu* syllable, resembling a string of pearls.



Figure 3.3. Delusse, from *L'arte de la flûte traversière*, showing the articulation called '*perlé*'

Figure 3.4 shows breath attacks, which lack the crisp attack of a *tu*, and causes a markedly different, soft-edged sound in contrast to that of modern legato tonguing (as this articulation figure would typically be performed by a modern player of the Boehm flute). The *hu* syllable is for use on the repeated pitches; the scale figures are *perlé*.



Figure 3.4. Delusse, from *L'arte de la flûte traversière*, an example of breath attacks

In Figure 3.5 the double-tonguing syllable *louloul* is given, and is only used for rapid repeated notes, reserving the *perlé* articulation for descending motion. In Figure 3.6, Delusse shows syncopations with a typical *T* attack, followed through the note with the syllable, *hé*. Note the change from *hu* in Figure 3.4 to an accented *hé* in this figure. Through this notation, it is clear that syncopations were not accented at the beginning of the note, as is modern practice, but were instead accented within the note towards the strong part of the beat.

DOUBLES COUPS DE LANGUE



Figure 3.5. Delusse, from *L'arte de la flûte traversière*. This is perhaps the most remarkable example because it is so unusual.

SYNOPSIS

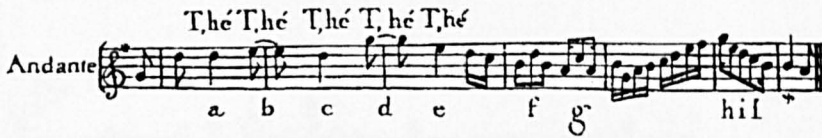


Figure 3.6. Delusse, from *L'arte de la flûte traversière*. Here the articulation is changed to express syncopation.

Antoine Mahaut, in his *Nouvelle méthode pour apprendre en peu de temps à jouer de la flûte traversière*, in 1759, provides more basic examples, including directions within the text of this chapter entitled ‘*des coups de langue*,’ on how to practise single-tonguing with the syllables *tu* and *ru*.⁸ Although he does not include musical examples of single-tonguing patterns, he does give a short example of the use of the double-tongue. (See Figure 3.7.)



Figure 3.7. From Mahaut, *Nouvelle méthode*, showing double-tonguing for ‘very fast passages’

⁸ A. Mahaut, *Nouvelle méthode*, pp. 23-25.

In 1779, an Italian tutor was published by Antonio Lorenzoni (dates unknown) entitled, *Saggio per ben Suonare il Flauto Traverso*.⁹ The musical examples included resemble those of Delusse in some cases, though Lorenzoni gives no examples of double-tonguing. For figures not including syncopation, his syllables, *di* and *ti*, are used to outline the shape of the phrase, with the crisper, *ti* clarifying repeated notes and semiquaver leaps in thirds as shown in Figure 3.8. Lorenzoni's directions for syllables used in syncopations are similar to those of Delusse, and the difference in the syllables *ti* and *ri* mirror those of Hotteterre's *tu* and *ru*, having similar implications for relative consonant vowel duration, with *t* shortening and *r* lengthening the notes to which they are attached. (See Figure 3.9.) A change of vowel takes place entirely within the mouth, and while this does change the timbre produced in the resulting sound, it has no effect on the embouchure.



Figure 3.8. Lorenzoni, from *Saggio per ben Suonare il Flauto Traverso*, showing two syllables for single tonguing



Figure 3.9. Lorenzoni, from *Saggio per ben Suonare il Flauto Traverso*. The syllables appearing here are similar to those suggested by Tromlitz and Quantz described below.

The pattern of *ti-ri* later becomes *ti-di* or *tu-du*, both of which would appear to express degrees of a 'short-long' note relationship, although this is not always clear from the method books because they can in fact be played equally. At the very least, the use of two syllables as opposed to one provides a slightly different inflection and the effect is distinctly different from the repeated use of a single syllable. This configuration becomes

⁹A. Lorenzoni, *Saggio per ben Suonare il Flauto Traverso* (Vicenza, 1779; Forni Editore, 1969), tav. III.

the most common pattern illustrated in flute tutors, and continues to appear into the 21st century.

Lorenzoni also gives the legato tonguing, *hi-bi-bi-bi*, for repeated notes appearing beneath a slur (see Figure 3.10), though the lack of a crisp attack on the first note of these groups is unlike those examples given by both Quantz and Tromlitz.¹⁰ The breath syllable *bi* is also used in the pattern, *di-bi*, not for the beginning of a note, but to shape the inside of syncopated notes. It produces the effect of a slight crescendo toward the stronger part of the beat as in Figure 3.11.



Figure 3.10. Lorenzoni, from *Saggio per ben Suonare il Flauto Traverso*. Examples of breath attack, used for different degrees of separation between the repeated notes



Figure 3.11. Lorenzoni, from *Saggio per ben Suonare il Flauto Traverso*. Here, the syncopation is given a similar effect to that given by Delusse's *te-hé* in Figure 3.6.

The tutor by Luke Heron (dates unknown), *A Treatise on the German Flute*, published in London in 1771, is less detailed in its description of articulation. Heron does not describe any articulation syllables, and there are no examples of syllables to be used for single tonguing. Instead, only the following manner of proceeding is advised:

¹⁰ Lorenzoni, *Saggio*, tav. III. See Tromlitz, *The Virtuoso Flute Player*, p. 179(g); see also Quantz, *On Playing the Flute*, p. 75, fig. 9.

always strictly adhering to the rule, of never sending the breath forward from the breast, but always by a stroke of the tongue; and however long you continue the tone, to finish it, by returning the tongue to the roof of the mouth, or rather to the teeth, from whence it was sent forward.¹¹

At best, this brief description is vague and actually could be interpreted as implying a form of stop-tonguing; that is, that by bringing the tongue back up to the roof of the mouth/teeth after each note, the sound is stopped. It may also simply imply that the tongue is to return to its original position in preparation for tonguing the next note. This interpretation would relate to the ideas presented by Tromlitz in *The Virtuoso Flute Player*. Heron does present brief examples of double-tonguing (see Figure 3.12) to be used as

a method of encreasing [*sic*] the rapidity of this instrument, beyond what was formerly known, and which when well executed has really a surprising effect; this is called the double tonguing, and certainly, in respect to an articulate expression of swiftness, makes it exceed the power of any other instrument.¹²

Of Double tonguing.



Figure 3.12. Luke Heron, from *A Treatise on the German Flute*. Two short examples are given for double-tonguing. The second line is actually what is generally described as triple-tonguing, though the same syllables are utilised.

¹¹ L. Heron, *A Treatise on the German Flute* (London, 1771), p. 18.

¹² *Ibid.*, p. 36.

German articulation and its expressive usage

Johann Joachim Quantz

In contrast to Luke Heron, the German flautist-composers, Johann Joachim Quantz (1696-1773) and Johann George Tromlitz (1725-1805) devote entire chapters to describing articulation syllables and their practical application. Quantz describes how to employ a variety of tonguing patterns in the chapter entitled, 'Of the use of the tongue in blowing upon the flute', with pages of examples demonstrating their use in a range of different passages and different qualities of movement.¹³ Quantz variously employs three different syllables that produce varying degrees of attack and note length to aid in the expression of phrasing in the simple figure shown in Figure 3.13.¹⁴ Beginning with an initial strong first note (*ti*), the semiquavers are played smoothly and slightly unequally, in contrast to the more strongly attacked and detached quavers of the arpeggio and the equally smooth sustained quavers and final crochet comprising the last four notes.



phrase shape, and thus illuminates the character of the excerpt. Figure 3.14 gives no tempo marking, but may be expected to be quite fast, but far from *Presto* as the changes from double- to single-tonguing would not only be unmanageable, but inaudible. In this figure, the middle line of the example is almost certainly to be performed with the same articulations as the opening, which is probably why it has been left unmarked.¹⁶



Figure 3.14. Quantz, from *Solfeggi*. A further example of the practical integration of varied articulations including both single- and double-tonguing syllables

Practical experimentation would suggest that the *louloul* syllable used by Delusse (Figure 3.5) is most likely a Gallicised version of Quantz's *did'll* (Figure 3.14). The action of the tongue within the mouth produces a nearly identical effect, and any difference in the resulting articulations is virtually imperceptible. The *di del* of Mahaut (Figure 3.7) is another variation on this articulation for double-tonguing.

That Quantz considered the use of the tongue in articulating on the flute and its effect on the performance of a piece of music to be of utmost importance is unmistakably confirmed in the first paragraph of the chapter, '*Of the Use of the Tongue in Blowing upon the Flute*'.

The tongue is the means by which we give animation to the execution of the notes upon the flute. It is indispensable for musical articulation, and serves the same purpose as the bow-stroke upon the violin. Its use so distinguishes one flute player from another that if a single piece is played in turn by several persons, the differences in their execution frequently make the work almost unrecognizable. The majority of these differences rest upon the correct or incorrect use of the tongue. It is true that much also depends upon the fingers. They are necessary not only to fix the height or depth of each note and to distinguish intervals, but also to give each

¹⁶ Quantz, *Solfeggi*, p. 4.

note its proper duration. The liveliness of the execution, however, depends less upon the fingers than upon the tongue. It is the latter which must animate the expression of the passions in pieces of every sort, whatever they may be: sublime, gay or pleasing.¹⁷

This tradition of expressive articulation is continued in the tutors of Johann George Tromlitz.

Johann George Tromlitz

The method books of Johann George Tromlitz, in particular his tutor, *The Virtuoso Flute Player*, published in 1791, reinforce the expressive use of articulation by German flute players.¹⁸ Tromlitz also extends our appreciations of the technical means and range for achieving such expression by giving a series of rules alongside extensive examples, and including complete compositions, placing his rules in context. He himself highlights this in the introductory notes to these rules:

On close scrutiny you will notice that the tongue's movements when producing the notes form a species of syllables, and when they are combined, words, and finally a vocabulary*, [**eine Sprache*] which it is possible to apply universally according to a suitable system¹⁹

The following examples (Figures 3.15 and 3.16) show Tromlitz's attention to detail and provide a small sample of the exhaustive examples included in his tutor.



Figure 3.15. Tromlitz, from *The Virtuoso Flute Player*. This shows examples of how to apply different single-tonguing syllables.

¹⁷ Quantz, *On Playing the Flute*, p. 71; see Appendix A, p. 120, for the original German.

¹⁸ Tromlitz, Johann George, *The Virtuoso Flute Player*, trans. and ed. A. Powell (Cambridge: Cambridge University Press, 1991), pp. 150-211.

¹⁹ *Ibid.*, p. 153; see Appendix A, p. 120-121, for the original German.



Figure 3.16. Tromlitz, from *The Virtuoso Flute Player*. An example of the increased complexity of patterns when the double-tonguing syllables are added

Complexity is increased by the greater variety of articulation patterns when double-tonguing syllables are added (Figure 3.16); phrasing becomes more evident through this variety since the different consonants in articulation aid in outlining phrase structure. The use of these intricate patterns of articulation continually shape each note's duration and accentuation, delineating and supporting their distinctly hierarchical, musical significance.

19th-Century Articulation

By the end of the 18th century, the construction of the flute has begun to change. Tromlitz himself adds keys to the flute to improve the intonation of cross-fingered notes, but the core of the instrument is still based on the simple system, one-keyed flute. During the 19th century, there is a great deal of variety in the construction of instruments. Ideas for new systems are being developed and experimented with, and gradually mechanisation comes to the instrument, with a complete departure from the simple-system flute, ultimately resulting in Boehm's design being fully accepted during the 20th century.²⁰

During this time, attention to detail in the use of articulation begins to wane, particularly as the French school begins to gain more influence in the musical world. Published in Paris in 1804 by Antoine Hugot (1761-1803) and Jean-Georges Wunderlich (1755/1756-1819) for the newly founded Paris Conservatoire, the *Méthode de flûte de conservatoire* has drastically different ideas of articulation from those of the Germans such as Tromlitz. Hugot and Wunderlich give examples of only two syllables, already familiar, *tu* and *du*, as given in Figure 3.17.²¹

²⁰ See N. Toff, *The Development of the Modern Flute* (New York: Taplinger, 1979), pp. 30-43.

²¹ A. Hugot, & J.-G. Wunderlich, *Méthode de flûte de conservatoire* (Paris, 1804; repr. with an introduction by D. Jenkins, Buren: Frits Knuf, 1975), p. 6.

Exemple de Traits faits par les deux coups de langue.

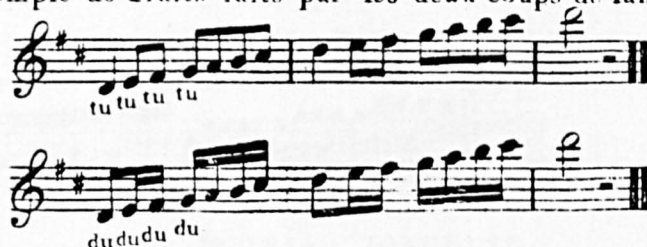


Figure 3.17. Hugot & Wunderlich, from *Méthode de flûte de conservatoire* showing the two syllables, *tu* for slower movement, and *du* for quicker speeds.

The various examples demonstrate their employment, and it is explained that the *tu* tonguing is for slower movement, and the *du* is for quicker. A majority of the subsequent examples is committed to showing other possibilities for patterns of slurring and tonguing as well as detached and legato tonguing. However, all show one of the two syllables, *tu* or *du*, and there is no alternation between the two, unlike the examples of Louis Drouet shown below.

Louis Drouet (1792-1873) was extremely well known in his time as a flute player, and his treatise *The Method of Flute Playing*, published in English in 1830, was very successful. He gives rather basic instructions for using articulation syllables, showing either *ten*, *den* or *reu*. These syllables are shown in examples as exercises (as in Figure 3.18) or as suggestions at the beginning of his progressive *Studies in all Keys* (as in Figure 3.19), appearing toward the end of his tutor, and are used much more predictably than in examples given by Quantz or Tromlitz.



Figure 3.18. Drouet, from *The Method of Flute Playing*. Here, single-tonguing syllables are given in simple alternation, without exceptional patterns.

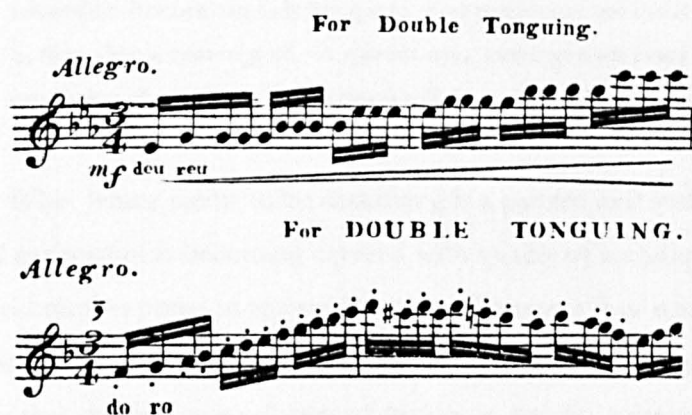


Figure 3.19. Drouet, from *The Method of Flute Playing*.
Two examples of syllables for double-tonguing

Drouet does still maintain some sense of variety however, and gives further, though limited, examples of other syllables used for double-tonguing, as in Figures 3.18 and 3.19;²² however, he employs the articulation in a much more mechanical way than his 18th-century predecessors. Drouet is more concerned with clarity and speed, for which he himself was famous.

Drouet's *Method* shows the beginnings of a decline in detail with regard to the effect of articulation and in the expression of affect in music, focusing instead on clarity and perfection in tone production rather than detail of syllables. Further information, which does not appear in his tutor but which gives a closer perspective on Drouet's own technique for double-tonguing, is given by a contemporary commentator on the flute, W. N. James, in his book *A Word or Two on the Flute*, first published in Edinburgh in 1826, describes this tonguing as follows:

I apprehend, that when M. Drouét [*sic*] made his first experiment for the perfection of the *slur'd staccato*, (for it is only in a staccato of this description), he chose a word that *he* could articulate best, without regard to its general appropriation; and there is no doubt that he altered it somewhat when he was residing in this country. Now, as every note in a staccato passage ought to be distinctly given, the word so much wanted to effect it was to make the reaction of the tongue as perfect as the action. The word that M. Drouét used was 'Territory', because each of these syllables gives

²² L. Drouet, *The Method of Flute Playing* (London, c.1830; repr. with an introduction by R. Rasch & S. Preston, Buren, The Netherlands: Frits Knuf, 1990), p. 66 and p. 98.

distinctly the proper expression to the tongue. This word, however, should be a little qualified and softened; and when made *Teth-thi-to-dy*, will express the four notes admirably. Practice can only bring it to great perfection; but the chief excellence of it is, that, –like a vein of gold, –it spreads over, and improves every possible variety of expression of which the flute is capable.²³

What James seems to be describing is a pattern and technique of tonguing in which musical expression is becoming equated with quality of technique. He is speaking of a solely technical expression toward the ends of uttering four notes ‘admirably,’ and mentioning nothing of the character elicited by the use of this particular articulation. It is possible that the first two syllables of *territory* or ‘*teth-thy*’ were played with some slight inequality which stressed the first note of a group of semiquavers, while the final two syllables, ‘*to-dy*’ were more equal in their effect. The double ‘*th*’ in ‘*teth-thy*’ would seem incidental, used for the sake of clarity in writing rather than in performance, as the stuttering effect that would be produced by pronouncing both would render the double-tonguing, meant to be virtuosic and quick, considerably slower and stumbling.

Although Drouet did not illustrate his ‘*territory*’ form of tonguing in his treatise, it does appear an early 20th-century tutor, published between 1901 and 1910 as *Standard Instruction Books: Tutor for the Flute by T. Berbiguier*, but in this case, it is undoubtedly a tutor capitalising on the success and name recognition of the famous flautist, Antoine (Benoît) Tranquille Berbiguier (1782-1838). This so-called *Berbiguier’s Tutor* in fact does not give any other articulation patterns or syllables aside from Drouet’s *territory* or, as the book itself says in almost exactly the way W. N. James put it, ‘*it is better when softened a little into teth – thi – do – dy*’.²⁴ Several examples of various intervals, including a chromatic scale, are given for employing this tonguing, and all are for notes with staccato marking. (See Figure 3.20.)

The genuine tutor of Berbiguier, *L’art de la flûte, cours complet théorique et pratique*, published in 1838, was intended for use by players of a simple system flute of between four and eight keys; this tutor illustrates very different syllables for double-tonguing. Berbiguier advocates the use of what was later to become accepted modern practice for double-tonguing on the Boehm flute. (Further discussion of articulation specifically for the Boehm flute follows below.)

²³ James, *A Word or Two*, pp. 124-125.

²⁴ *Ibid.*, p. 124.

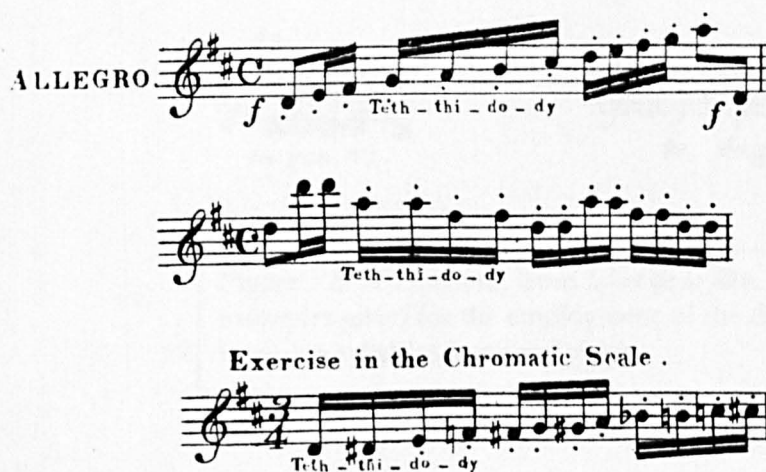


Figure 3.20. Examples from a tutor entitled *Tutor for the Flute* by T. Berbiguier showing examples of Drouet's 'territory' pattern for tonguing.

Berbiguier illustrates this tonguing by systematically showing several exercises to facilitate the learning process for assimilating this pattern, as well as examples for how to practically employ the tonguing, *du-gue* and *tu-gue*, and their abbreviations, *tug* and *dug*. He states that these abbreviations constitute a ricochet of the tongue for the second part of the pattern (the 'g').²⁵ (See Figures 3.21-3.23.) In addition, Berbiguier illustrates examples of the pattern *tu-ru* for dotted figures very clearly (Figure 3.24).²⁶ This rhythm has continued to be articulated in much the same way in many tutors through to the 21st century.



Figure 3.21. Berbiguier, from *L'art de la flûte*. Two examples given for use in learning the double-tonguing syllables *tu-gue* and *du-gue*.

²⁵ T. Berbiguier, *L'art de la flûte* (Paris: Aulagnier, 1838), pp. 79-82.

²⁶ *Ibid.*, p. 81.



Figure 3.22. Berbiguier, from *L'art de la flûte*. Two examples given for the employment of the double-tonguing syllables *tu-gue* and *du-gue*

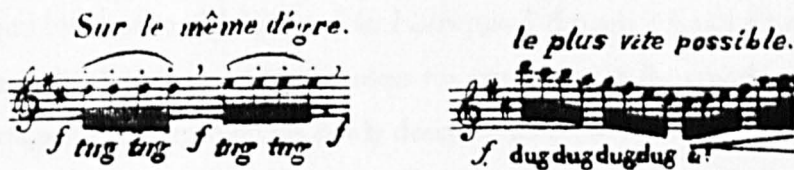


Figure 3.23. Berbiguier, from *L'art de la flûte*. Two examples illustrating the abbreviated versions of *tu-gue* and *du-gue*, using the ricochet effect of the tongue for very fast passages



Figure 3.24. Berbiguier, from *L'art de la flûte*. An example of the pattern, *tu-ru*, still commonly used today by modern flautists for dotted figures such as this one.

Flute methods through the course of the 19th century clearly show that there are new, changing ideas regarding the function of articulation; the nearly obsessive approach of Tromlitz to create expression of character and phrasing by varying the tongue stroke is no longer demanded, and will ultimately lead to the, by and large, more limited selection of syllables used for articulation on the modern flute.

Articulation syllables on the Boehm flute

The advantage of surveying the wide variety of articulation syllables employed for the baroque flute, and of using them within both contemporary and early music contexts, is made apparent when comparing them to the selection of syllables used by many modern Boehm flute players whose techniques for articulation are commonly limited to a few different syllables. With single tonguing for example, syllables are chosen from among several possibilities; the most common are *tu*, *ta*, *du*, or *da*. Notes articulated with the 'T' of *tu* or *ta* are used for a crisp, clear attack, while those initiated with the less percussive 'D' in the articulations *du* or *da* create a softer-edged attack. For double-tonguing, equivalent possibilities are offered by the common use of *ta-ka*, *tu-ku*, *ti-ki*, *da-ga*, or *du-gu*.

In 1871, the inventor of the modern system for the flute, Theobald Boehm (1794-1881) published his treatise, *Die Flöte und das Flötenspiel*. Although it is not a tutor for playing the flute, Boehm does convey his ideas for expression in the emotional content of transcribed songs (to be played on his newly designed flute), in a chapter entitled *Musical Interpretation*. He relates good expressive articulation and quality in flute playing to singing, and goes so far as to give seven examples of songs by Mozart, Méhul and Schubert including the texts, transcribing the vocal line as it should be played on the flute beneath the vocal line. He goes on to describe articulation syllables by placing them in the spoken vernacular context, and chooses an example that allows him to describe in detail how to articulate notes marked with dots under a slur. (See Figure 3.25.)

This tonguing should sound as softly as the second syllable 'de' for example, in speaking the word 'Beide', which serves very satisfactorily for the making of separate syllables. In many cases the expression can be further increased, as is indicated in the following example.

The image shows a musical score for 'Zauberflöte' by Mozart. It features two staves: the top staff is for the voice (Soprano) and the bottom staff is for the flute. The tempo is marked 'Larghetto. (Singulium.)'. The lyrics are in German. The first line of lyrics is 'Dieses Bildnis ist bezaubernd schön, wie noch kein Au-ge je ge - sehn! Ich fühle, ich fühle es, wie dies'. The second line of lyrics is 'Göt-ter-bild mein Herz mit neu-er Regung füllt, mein Herz mit neu-er Regung füllt.' The score includes various musical notations such as notes, rests, and slurs.

Figure 3.25. Boehm, from *The Flute and Flute Playing*, the example of which he is speaking in the surrounding text.

The correct articulation follows here of itself from the declamation of the words. By means of the soft tonguing of the four notes Eb, D, C, and Bb of the first bar, as well as the notes D, C, Bb, and Ab of the third bar, there is given to the words '*ist bezaubernd schön*', and '*kein Auge je gesehn*', considerably more expression than if they were entirely slurred together.²⁷

There are two points to note about Boehm's figuration for the flute, the first of which distances it from earlier 18th-century practice, i.e., that notes marked with dots beneath a slur no longer signify the *notes perlées* performance of the 18th century but more closely resemble the modern *mezzo staccato*. The second (the choice for which Boehm gives as reasons of expression), distancing it from the usual one of the 19th, 20th and 21st centuries, is that of transcribing words articulated in several syllables as notes played *legato* and grouped under a single slur, regardless of their original syllabic separations in the text.

Boehm is able to clearly illustrate his ideas through his exclusive use of song in describing expressive articulation.²⁸ However it seems that his concern is for the prevention of inappropriate slurring or tonguing which is too sharp for its context, rather than for describing small nuances of articulation with various syllables. He clarifies this in the paragraph that follows the excerpt cited above.

Further, it is evident that it is not allowable to slur any note over to the first note of the next measure, since it almost always happens that the note falling in the so-called strong part of the measure must be tongued, in order that the word depending upon it may receive its proper accent...²⁹

This departure from nuanced and varied articulation is an indication of the change of focus in musical writing and style of performance, from the baroque necessity for hierarchical structure and detail, to music in which concern for the larger structures of melody and line are of greatest import.

One of the most widely-used series of tutors for modern flute playing is *A Trevor Wye Practice Book for the Flute*.³⁰ In it, Wye dispenses with the vowel involved in articulation all together. Since there is no mention of the vowel sound attached to the consonant, it is difficult to tell whether Wye regards its production as inevitable, and he appears to present

²⁷ T. Boehm, *The Flute and Flute Playing*, trans. D. C. Miller (New York: Dover 1964), pp. 148-9; see Appendix A, p. 121, for the original German.

²⁸ *Ibid.*, pp. 148-152.

²⁹ *Ibid.*, p. 149; see Appendix A, p. 121, for the original German.

³⁰ There are six volumes of *Trevor Wye Practice Books for the Flute*: Volume 1: 'Tone'; Volume 2, 'Technique'; Volume 3, 'Articulation'; Volume 4, 'Intonation'; Volume 5, 'Breathing & Scales'; and Volume 6, 'Advanced'.

articulation in its most reduced form, as a purely functional means of attacking notes. A further indication of this purely technical and/or functional approach is presented by the tonguing Wye suggests for dotted rhythms.³¹ He gives only the indication of *T* (see Figure 3.26) where most other modern tutors give a different second syllable to facilitate the dotted figure. (For example see Figure 3.24 above.)



Figure 3.26. Trevor Wye, from *A Trevor Wye Practice book for the Flute*, vol. 3, 'Articulation'. This example shows not only the lack of any vowel associated with single-tonguing, but also that he gives only one consonant for single-tonguing.

This technical approach is reinforced by reversing the pattern (K-T-K-T) in order to strengthen the weaker K attack, but in all other cases, the pattern of T-K-T-K (see Figure 3.27) is maintained.



Figure 3.27. Trevor Wye, from *A Trevor Wye Practice book for the Flute*, vol. 3, 'Articulation'. An example showing double-tonguing. This pattern is used consistently in all practical examples.

Trevor Wye is not alone in his approach to functional articulation. Peter-Lukas Graf, in his book *Check-up, 20 Basis-Übungen für Flötisten*, also maintains the very selective use of single- and double-tonguing (see Figure 3.28).³² While superficially this may appear to be no different from double-tonguing practice which has been taking shape since the late 18th century, it is in fact very different from the approach adopted by, for example, Maximilian Schwedler in the 1920s (Figures 3.32-3.36), the revised edition of Joseph-Henri Altès in the 1950s (Figures 3.29 and 3.30), and Michel Debost (b. 1934) writing in the 21st century.³³

³¹ Wye, *Practice Book*, vol. 3, pp. 11-12.

³² P. L. Graf, *Check-up: 20 Basis-Übungen für Flötisten* (Mainz; New York: Schott, 1992), pp. 37-38.

³³ See quote below, p. 66.



Figure 3.28. Peter Lukas Graf, from *Check-up, 20 Basis-Übungen für Flötesten* illustrating similar examples to Trevor Wye's exercises

All of these examples not only continue to include the designation of a vowel subsequent to the attack, but also maintain at least some syllabic variation, particularly when outlining syncopated rhythms.

In contrast, the oldest method for the Boehm flute still commonly in use, the *Méthode complète de flûte* by Joseph-Henri Altès (1826-c.1889), published in a revised edition in 1956, while giving only two single-tonguing syllables, provides both practical studies for their use and a variety of patterns for their employment in both single- and double-tonguing contexts.³⁴ (See Figures 3.29 and 3.30.) Figure 3.29 reinforces the dotted rhythm through the use of two syllables in a way similar to Berbiguier as in Figure 3.24.



Figure 3.29. Joseph-Henri Altès, from *Méthode complète de flûte* showing a similar pattern to Figure 3.24, and using a slightly different syllable for articulation.

³⁴ J. H. Altès, *Méthode complète de flûte* (Paris; Leduc, 1956), pp. 214-217.



Figure 3.30. Joseph-Henri Altès, from *Méthode complète de flûte*, giving an example of double-tonguing

Altès also gives further instructions in the text for additional double-tonguing patterns, although they are not given with musical examples, but are described in the text, including *tu-ku-ku-tu* for groups of four notes, and he indicates which of his studies this pattern is to be practised upon.³⁵

'Mixed tonguing' is illustrated in *École de l'articulation*, written by one of the most influential flautists of the 20th century, Marcel Moyse (1889-1984). This book of articulation exercises, published in 1928, gives similar examples for single- and double-tonguing, which although like the *Practice Books* of Trevor Wye, use only a *t* or *k*, but also includes mixed tonguing, (see Figure 3.31) in contrast to Wye's unvarying patterns of T-K-T-K.³⁶



Figure 3.31. Marcel Moyse, from *École de l'articulation*. Two examples illustrating mixed double- and single-tonguing

Maximilian Schwedler (1853-1940), writing in 1923 in *Flöte und Flötenspiel, ein Lehrbuch für Flötenbläser*, gives many interesting examples of tonguing syllables, which may be regarded as quite unusual. He gives several illustrations (see Figures 3.32-3.36) of familiar

³⁵ Altès, *Méthode*, p. 328.

³⁶ M. Moyse, *École de l'articulation* (Paris: Leduc, 1928), pp. 4-5.

tonguing syllables with few small variations, but also includes directions for using the 18th-century form of double-tonguing, *did'll* or as he has reshaped it, *di'l*.³⁷ (See Figure 3.35.)

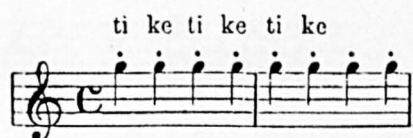


Figure 3.32. Schwedler, from *Flöte und Flötenspiel*, an illustration of a double-tonguing exercise to be practised slowly



Figure 3.33. Schwedler, from *Flöte und Flötenspiel*, showing different vowels used for single-tonguing in conjunction with double-tonguing



Figure 3.34. Schwedler, from *Flöte und Flötenspiel*. A further example of using different syllables to express a dotted figure, similar to examples given above by Altès and Moyse

³⁷ Bailey, 'Maximilian Schwedler's "Flute and Flute-playing"', pp. 59-63.

vehicle for musical expression, rather than for exclusively technical application. Michel Debost writes in *The Simple Flute, A-Z*:

The consonant can be *t* in all forms of single tonguing; *k* for short double tonguing; *d* for *louré* (sometimes called legato in North America); *g* for mellow double tonguing; and *l* for composite single tonguing. The possible consonants are numerous. Even *p* is useful for a soft articulation without the tongue. The only issues are comfort, efficacy, and clarity, not dogma.⁴⁰

Throughout his book, Debost remains pragmatic about the technique of flute playing, and is generally not dogmatic in his approach. He is one of few performers and teachers who stress the importance of an excellent instrumental technique while maintaining its subservience to the more important pursuit of artistic expression.⁴¹ That is, for him, the musical ends justifies the means; perfection of technique alone is not enough and that in fact, technique must always be of secondary importance to musicality.

Conclusion

The aim of this chapter thus far has been to present a brief discussion of historical sources on articulation as a foundation for developing a contemporary practice which is available to performers now, whether they play the baroque or Boehm flute. This is significant in that historical performance instructions, rather than being viewed as extinct technical concepts belonging exclusively to the world of 'early music' practitioners, can instead be thought of as representing unexplored possibilities that can lead to concepts and practices of new articulation techniques on the baroque flute. This body of information is the source of ideas from which to proceed and extend into new techniques for articulation.

The sources cited are wide-ranging in country of origin, author and target reader. Hotteterre, whose method was the very first written for the baroque flute, and the later writer, Luke Heron, were almost certainly writing for dilettante players, as probably were Mahaut and Lorenzoni. The depth of detail provided by Quantz and Tromlitz, both professional players themselves, would indicate that their method books were for serious performers whether amateur or professional. The tutor by Delusse seems to be in a class of its own, with some of the techniques taken directly from the violin method by Francesco Geminiani. It is difficult not to see Delusse as an avant-garde musician pushing

⁴⁰ M. Debost, *The Simple Flute: from A to Z* (New York: Oxford University Press, 2002), p. 27.

⁴¹ Composer/teacher/flautist, Ian Clarke also puts a wide variety of articulation syllables to particularly expressive use. For example, see: I. Clarke, *Zoom tube* (Croydon: Just Flutes, 2004), and I. Clarke, *The Great train race* (Croydon: Just Flutes, 1993).

against the boundaries of standard mid-eighteenth century flute technique, and as such, an interesting model for any player developing the baroque flute as a contemporary instrument.

By the 19th century, flute method books were indeed becoming increasingly methodical, especially in France, where the Paris Conservatoire imprint formalised this approach to teaching by institutionalising it, as ‘officially sanctioned’ books for the training of students. As observed in the section above, **19th-Century Articulation**, the tendency towards treating articulation as a purely functional means of articulating the beginnings of notes, rather than as a way for developing musical expression, spread slowly outwards from France. The large-scale methods by famous players such as Drouet and Berbiguier were probably intended for both the would-be professional and the serious amateur.

Although some variety of practice has been maintained in conventional 20th- and 21st-century flute playing, notably that of Michel Debost, there has arguably been a universal narrowing of articulation techniques to the standardised function of clarifying the beginnings of notes as efficiently as possible and of often equating that efficiency with musical expression. As mentioned in the opening paragraph of **Articulation syllables on historical flutes**, these same standards of functional articulation are being applied by many modern performers of the baroque flute. Schwedler is an interesting early 20th-century exception to the examples given because he was not a Boehm flute player, but played a structurally-improved version of the multi-keyed flute developed in Germany in the previous century.

It goes without saying that no one can know exactly what was practised by 18th- and 19th-century flute players, or have a clear idea of how they actually sounded, but equally this is true of all written indications for playing which remain unheard, regardless of from which century they arise. The relevance of such information is an imaginative and practical stimulus that can be considered and worked on rationally, but also bringing about results that come from the player’s aural imagination.

Section Two: New Techniques in Articulation on the Baroque Flute

Introduction

Articulation has undergone many changes in execution and philosophy throughout the history and development of the flute. Such changes have often mirrored the strengths or weaknesses in the construction of the instrument at a given time in history. The one-keyed flute has a smallness and intimacy that has been lost somewhat with the Boehm flute, an intimacy that enables details such as varying syllabic attacks to be used with expressive purpose. An 18th-century musician and audience were highly concerned with expressing the emotions and with moving the listener as an ultimate goal. Particularly in Germany, the use of articulation for expressive means is much written about;⁴² these ideas seem to have become somewhat removed from modern performing practices, but they constitute a considerable resource, a resource that can be extended further.

The extended techniques outlined in this section are largely concerned with an area of performance practice that has not been well explored for the baroque flute.⁴³ As the baroque flute continues to join the ranks of modern instruments in being utilised for new works of music and contemporary improvisation, aspects of tone and articulation outside commonly accepted constraints of purity and convention should be explored.⁴⁴ In addition to newly developed articulations, historical ideas for articulation may also be considered in some way to be 'extended techniques' as they have, with few exceptions, fallen out of common usage in the last century. Though they have been rediscovered by the revival of period instrument performers during the second half of the 20th century, they are not always employed for modern performances of canonical works, as they often do not conform to contemporary sound expectations. Without a living memory of what they actually sounded like, it is difficult to recreate these techniques. The object of this research is to expand upon historical techniques, particularly those that are less commonly used today, and explore new ideas for articulation with guidance for their usage in order to add to the wealth of possibility in expressive articulation.

⁴² See Tromlitz, Quantz, Chapter 3, pp. 50-53.

⁴³ For discussion of the performance and notation of extended techniques for the Boehm flute, see N. Toff, *The Development of the Modern Flute*, pp. 203-239.

⁴⁴ In addition to the 21st-century works mentioned on pages 87 and 104, see also the listings in L. Pereksta, 'Twentieth-Century Compositions for the Baroque Flute' (DMA dissertation, Florida State University, 2001).

Articulation and Note Anatomy

Though the term ‘articulation’ with regard to instrumental playing generally refers to the note-attack, the term can also be used to describe the connection of different parts of a whole, in this case, the different parts of a note.

The anatomy of a note is divided in three essential parts: the onset or very beginning of the note, the body, or continuing phase, and the ending or release of the note. When the beginning of a note is absolutely clear as to its point of onset, this can be illustrated with absoluteness as an arrowhead; this is equally true for the exact point of release. In Figure 3.37, the two vertical arrows point to finite moments of onset and release, with the note head signifying the continuing phase, or body of the note.

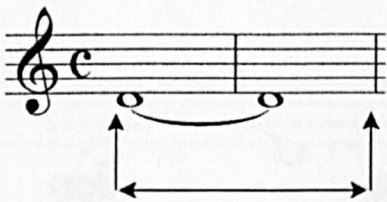


Figure 3.37. Immediate onset and release of a note

These points of onset and release can also be prolonged, as in Figure 3.38. The body of the note remains unaffected, as indicated by the superimposed arrows, while the exact onset and release points occur gradually, although this could be relatively rapid.

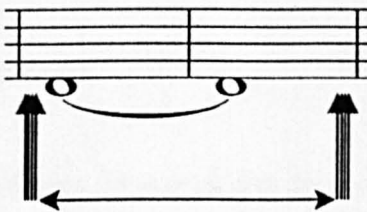


Figure 3.38. Prolongation of onset and release of a note

In some forms of attack and release the area in which the articulation occurs covers an even longer duration, becoming more indefinite as the onset point moves more gradually into the continuing phase. In Figure 3.39, the cluster of arrows signifies this ambiguity. The horizontal arrow implies that the body of the note becomes clear through the middle

part of its duration, but this is not necessarily always the case, and the exact point when the attack phase becomes the continuing phase may overlap, as in Figure 3.40.

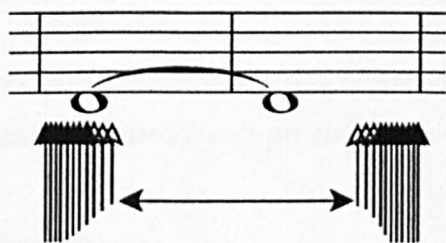


Figure 3.39. Indefinite onset and release of a note

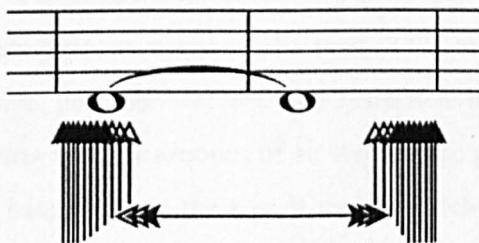


Figure 3.40. Indefinite onset and release, in conjunction with an overlapping continuing phase of the note

Categorisation

The techniques for articulation are categorised according to their formative note-phases.

Those involved in beginning a note are onset-based techniques:

- Spit tongue
- Spit tongue with lips as the plosive
- Tonguing with non-conventional syllables

Techniques that engage in affecting the continuing-phase of a note, but do not affect either the attack or release:

- Rapid tongue strokes, vertical
- Rapid tongue strokes, horizontal

Those articulations changing the ending of a note are release-based techniques:

- Stop-tonguing
- Contained-air tonguing
- Tongue ram

Each technique is described with regard to its advantages and limitations of usage as well as the skills required for its production.

Spit Tongue

This technique has been adapted from a familiar extended technique for the Boehm flute, and is used in contemporary composition as well as in popular Latin music, pop music and jazz.⁴⁵ It is called *spit tongue* or *pizzicato tongue*. The tongue holds back an amount of air, which is then suddenly released by allowing the tongue to move downward and away from its holding position against the roof of the mouth, behind the teeth; this produces an explosive, percussive effect. This technique is in essence the same as for the modern flute, excepting that the amount of air required to produce an explosive effect is much less. This added ease is due to the size of the embouchure hole and the smaller dimensions of the baroque flute.

The percussive attack of the spit tongue can be produced with varying degrees of force and pitch coherence. With the strongest attack, pitch is still present and the sound content approaches pitched noise. This particularly percussive result is most achievable in the lowest register. Higher notes are possible, but the percussiveness must be lessened because of the necessity for a more controlled embouchure to maintain the higher-register pitch. The higher the pitch, the more tightly the embouchure must be controlled to maintain an identifiable pitch. (See Figure 3.41.) An intermediate attack is also possible, allowing for a more percussive beginning to the note and producing both high and low register pitch simultaneously.

A 'break' on the instrument occurs at approximately A₅, though the stability of pitch with the most extreme percussive attack begins to deteriorate immediately with the second register on the instrument, beginning with D₅. To some degree, the deterioration of pitch stability can be compensated for, by rolling the flute outward away from the lips. This is effective for D₅ through approximately G₅. At this point, there is a greater chance of producing (either desired or unintentional) a split between the upper and lower octaves of the pitch.

⁴⁵ See: R. Dick, *The Other Flute*, p. 139.

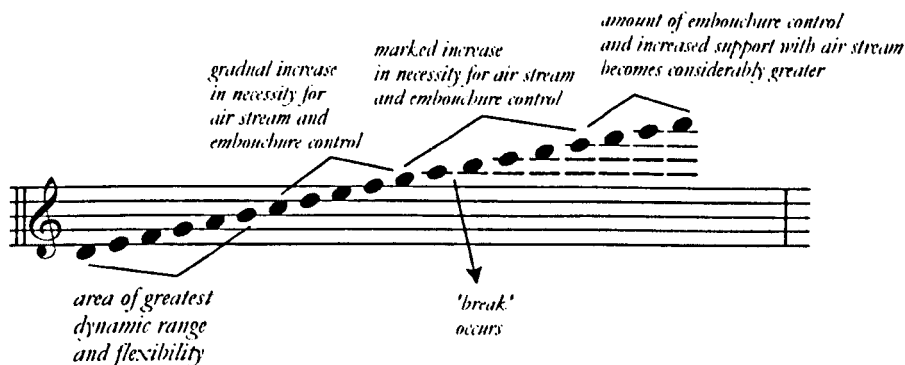


Figure 3.41. Diagram of the changes required in air speed and embouchure control of spit tonguing according to range

It is not possible to produce a percussive attack in the third register that is equal to that which is achievable on any note in the lowest octave. The higher the pitch of a note begun with a spit tongue attack, the less reliable is that note's octave, in proportion to the degree of percussiveness in the given attack. The amount of modification to the embouchure and air stream required is also proportional to a note's register. In the third register, the explosive effect of a markedly percussive spit tongue attack is not compatible with the control of embouchure required. It becomes necessary to move the tongue forward, as close to the inside of the embouchure as possible before releasing the tongue for the attack, while embouchure must be tightly held in place so that it is not disturbed by the percussiveness of the attack. A high level of embouchure control will usually prevent the note from cracking and/or dropping to a lower octave.

In addition to the gradual increase in control of the embouchure from the low register to the high, the volume of air should also be increased, further supporting stability in the upper registers. Within the lowest octave of the flute, the amount of air expelled is flexible, from very little to as much as possible. A percussive attack will sound the lowest pitch on a given fingering if the embouchure is employed in the most basic way for playing in the low register. That is, there is flexibility for the embouchure to be effective from a very relaxed position to a more controlled stance in directing the air into the flute. The action of releasing the built-up air from behind the tongue is enough to sound the notes of the lowest octave without a finely controlled embouchure. Necessity for an alteration to the air stream changes gradually through the second octave. As the embouchure becomes more controlled to maintain the integrity of the pitch, the amount of air required increases

throughout the second and third registers. The change is gradual through the top of the first octave and very strongly in the area of A₅ to B₅. From this point upward, the impetus of releasing the air at the point of attack is not sufficient to sound the second octave. Without increasing the amount of air, in both the attack itself and directly after, the note will 'break', dropping to a lower register. The notes in the third register require 'support' by a diaphragmatic push; a supportive increase of air must continue directly after the initial explosive attack to prevent the octave from dropping immediately after. By combining embouchure control with a proportionally greater volume of air, the spit tongue can be used in all registers.

The dynamic range also varies according to register. (See Figure 3.42.)



Figure 3.42. Dynamic ranges for spit tonguing across the three registers

The range and flexibility of dynamic is directly related to the limitations of the percussive attack in the various registers. Dynamic range is greatest in the first octave because very little air is required to cause the note to sound; the intensity of the percussive effect can be varied from extremely slight, to exceedingly pronounced without over-blowing the note. The embouchure must remain relaxed and not given to tension, which may otherwise cause an overabundance of the higher harmonic (second octave) to sound. The lowest register is also the most effective in maintaining a sense of pitch when the attack used employs a very high ratio of noise to tone; in this range, the flute's natural resonance is greatest, allowing pitch to be more evident without effort at all levels of dynamic. In the second octave, a relatively wide spectrum of dynamic is possible when supported by a controlled embouchure and increasing volume of air. In the third register, dynamic range is smallest. The requirement for support with the air stream and finely controlled embouchure makes very low levels of dynamic extremely difficult to achieve consistently and effectively.

A demonstration of spit tongue can be found on Audio Disc 1, Track 6, followed by an improvisation on Track 7, using this technique.

Spit Tongue with lips as plosive

A second form of the spit tongue articulation uses the lips rather than the tongue as the plosive. This gives a rougher sound to the attack depending on the force with which the air is expelled; further variation in the sound of the attack can be produced by altering the shape of the lips. There are several possibilities:

- Lips drawn tightly over the teeth, producing a ‘brittle’ sound
- Lips drawn around the teeth and into the mouth, producing a moderately to greatly explosive effect
- Lips very loosely employed, producing a less explosive effect

When making use of the lips as a plosive, there is a danger of producing sound with the action of the lips themselves, a sort of ‘popping’. Because of this, the range of volume and intensity in the attack is limited. If too much air is used in conjunction with the lips as plosive, this popping will occur. If volume of both air and tonal content is not required, there is considerably less danger, and the lip plosive produces an effective ‘puh’-sounding attack if used for an entirely attack-based note.

The tessitura possible when employing lip plosive spit tongue is also limited. Because the lips are involved extensively in producing the attack, they are not able to aid in forming the embouchure required for the second and third registers. A buzzing can result in the attempt to use the lips in both ways as once. Therefore, it is most effective to limit upper register notes in their duration, as a short burst of air with the plosive attack can in most situations substitute for a sufficient embouchure. When producing sound with the lip plosive spit tongue in the upper register, it helps to brace the lips hard against the teeth in order to stabilise the embouchure.

Audio examples demonstrating spit tongue with the lips drawn tightly over the teeth, can be found on Audio Disc 1, Track 8. Track 9 demonstrates the lips drawn around the teeth and into the mouth, and Track 10 shows this technique with the lips very loosely employed, producing a less explosive effect. Track 11 is an improvisation utilising all of these techniques.

Tonguing with non-conventional/non-traditional syllables

Mainstream modern performing practice on both the Boehm flute and the baroque flute generally limits to a large extent the syllables used for the attack of a note. This was outlined in detail in the preceding section, **Articulation from the 18th Century to Present**. In addition to the inclusion of historical syllabic variety, and in continuing to expand the boundaries outside of clarity, there are innumerable other syllables which can be used to initiate a note. The following syllables are the most useful and accessible.

Each technique is demonstrated in audio examples, and practical usage is shown through brief improvisations with the exclusive use of a specific syllable.

f

The syllable, *f*, slows the onset of the attack. There is no exactness in the initiation of the note, and duration of the onset is directly related to the speed and volume of the air stream used. The onset of the note can be compressed to be more immediate if a large amount of air is expelled with a high degree of speed behind the syllabic *f* attack. When a slower air speed is used, and/or less air expelled, the attack can be prolonged. With a very slow air speed, the actual attack can be sustained for as long as the breath is maintained. This syllable may be used in all registers, but is most comfortable and flexible from B₄ to A₅. Above A₄, there is the possible side effect of dropping to the lower octave due to the combination of a slow attack speed and the alteration to the embouchure necessary to produce the *f* syllable. This occurs in one of two ways, the first results from the shaping of the embouchure; the fine control needed to produce the higher octave is incompatible with the formation of the *f* syllable; secondly, there is the possibility of producing the lower octave simultaneously with the upper, which requires less cohesion of the embouchure.

Because the speed of this syllable's attack is slow, and it does not produce an absolutely clear beginning point to the note, the tonal integrity is medium to low, and becomes lower when the speed of attack is slower. However, in a gradual attack such as this, the integrity can be improved quickly, as the embouchure necessary for the *f* attack is not an extreme position, but rather a very slight alteration in the use of the lower lip.

The dynamic range of this syllable is limited by the nature of its formation. The syllable, *f* produces a rougher and slower attack than that created with conventional embouchure. Because the lips must be in a different position from the 'O' shape of a

typical embouchure, a greater volume of air is necessary for maintaining notes in the upper registers. As there is a limit to the amount of air it is possible to use, there is also a proportional limit to the dynamic level. The natural tendencies of the flute also come into play at this point, as the necessity for using air volume rather than embouchure finesse means that the upper registers will be louder. At lower levels of dynamic, the upper registers (above A₅) will also necessarily contain more noise as a result of the altered embouchure being pushed further forward to maintain the octave.

Audio examples are found on Audio Disc 1, Track 12 (demonstration) and Track 13 (improvisation).

‘n’

The syllable ‘n’ is a very subtle variation to the more commonly used ‘l’ found in Quantz’s and other 18th-century tutors double tonguing *did’l*. The physical difference lies in which parts of the tongue are used for generating the attack. For the ‘l’ it is the tip of the tongue that makes contact directly behind the teeth. To create the ‘l’ sound, the sides of the tongue must not be in contact with any part of the mouth. This differs from the motion of moving the sides of the tongue away from the teeth, while at the same time using the ‘l’ tongue stroke behind the front teeth producing Quantz’s *‘did’l*’ articulation. In contrast, ‘n’ uses a much greater proportion of the front and sides of the tongue. The sides of the tongue can either remain touching the teeth, or be allowed to touch at the point of the attack, concurrent with the motion of the tip of the tongue from directly behind the teeth to a position slightly further back before it is released from contact with the top of the mouth. It is at this point that the sound of the attack is heard. Coordinating the exact moment of the attack with both the stroke of the tongue and the onset of the air stream is challenging. This problem is avoided if the syllable is used to re-attack a note already initiated. The result is a pulse within the tone, as the embouchure is not affected by the formation of this syllable.

The onset of a note is lengthened and somewhat obscured by using this articulation, but only to a very small degree. This syllable is extremely subtle and because of this it is not always easily audible when used to initiate a note. It is considerably more effective when used during a long note, sounding more like a pulse or waver in the sustained sound. In this case, the articulation can be used at any level of dynamic and in any register.

Tonal integrity is not of itself affected by the use of this syllable because the formation of the ‘n’ is entirely within the mouth and does not change the shape of the lips

in the creation of the embouchure. It also can therefore be used in conjunction with any variety of tone quality produced by an alteration of the lips.

Audio examples are found on Audio Disc 1, Track 14 (demonstration) and Track 15 (improvisation).

‘p’

To be distinguished from its counterpart - a spit tongue with the lips as plosive - an articulation using *‘p’* must be gentler, without an explosive quality. This fact restricts the level of dynamic possible during its use, particularly in the low register. This articulation is easily utilised in all registers, and the dynamic level follows the natural tendencies of the baroque flute. The lowest register will be of lower volume and there will be increasingly higher dynamic levels as one ascends to the higher registers.

In contrast to the syllables so far named, *‘p’* increases the clarity of the moment of the attack. Because the release of air by the two lips is quick and unmistakable, so too is the sound of the onset of the note; this is true in all registers.

Audio examples are found on Audio Disc 1, Track 16 (demonstration) and Track 17 (improvisation).

‘s’

As with *‘f’*, this syllable slows the onset of a note, and can be sustained after the attack to become an alteration to the tone itself. Unlike *‘f’*, *‘s’* contains some extraneous noise made by the formation of the syllable. This noise can be more or less present, depending on the placement of the tongue within the mouth. When the surface of the tongue is brought closer to the top of the mouth, the *‘s’* quality is more apparent, but the noise content is increased. If the tongue is edged away from contact with the top of the mouth, the noise content can be reduced until it is nearly imperceptible.

Flexibility with regard to dynamic contrast is limited by tessitura. Best results are attained between D₄ and A₅. A ‘break’ exists on the note B₅, and both the embouchure and air stream must be adjusted to compensate for the interference posed by the tongue, which causes the coherence of the air stream to be split within the mouth. The embouchure must be pushed forward much more than for conventional tone production, and the amount of air must be increased to maintain the upper octave. As a result of this increased volume and speed of air, dynamic level can be controlled to some extent from B₅ to F₆; from F-sharp₆ to A₆, dynamic level cannot be controlled beyond some difference between *forte* and *fortissimo*. In this extreme high register, the attack *‘s’* is most achievable with a quick, loud burst of air. (See Figure 3.43.)

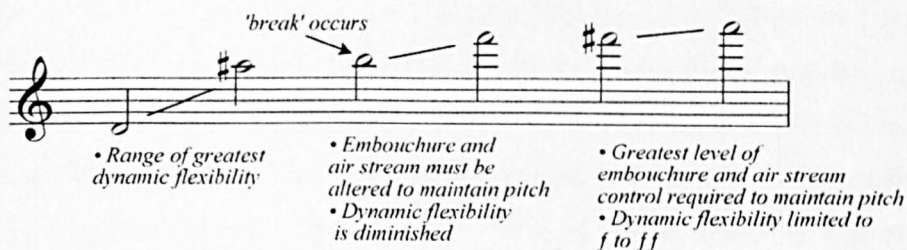


Figure 3.43. Illustration showing the range and dynamic flexibility of the attack 's'

Tonal integrity is of course affected by the position of the tongue within the mouth, impeding the exit of air from the mouth. However, as with the syllable, 'n' the embouchure itself is not affected from D₄ to A₅ and purity of tone can be recovered quickly by relaxing the tongue back into a conventional position within the mouth.

The speed of attack is from moderately slow to very slow. The attack can be used with a quick burst of air, which, although the burst itself is quick, the exact point of the note's beginning is obscured by the syllable. The attack can also be prolonged into the body of the note itself, becoming an alteration to tone production after the initiation of the note.

Audio examples are found on Audio Disc 1, Track 18 (demonstration) and Track 19 (improvisation).

'w'

There is a subtle difference between the use of 'w' for attack and using a breath attack, which is effectively the syllable 'bah'. Whereas 'bah' provides a definite point of attack, 'w' slows the onset of the note, obscuring the exact point of initiation of the sound. It requires a very small alteration of the embouchure, a closing of the lips slightly, changing the quality of the tone to aid the perception of this attack. This attack has no limitations for use with various levels of dynamic and is effective in all registers.

Audio examples are found on CD 1, Track 20 (demonstration) and Track 21 (improvisation).

'ch'

The attack *'ch'*, as in the word *'chirp'*, is useful in all registers and at all levels of dynamic with little exception. Only the two highest conventional notes, G-sharp₆ and A₆ are significantly more difficult in maintaining their octave, and because of this, it is noticeably more demanding to produce these notes at the level of *piano* or softer. It is possible, but is aided by allowing more noise content to the tone of the attack. When this approach is taken, these lower levels of dynamic are feasible.

The speed of attack is slower than more conventional syllables, such as *'t'* or *'d'*, but only slightly. The onset of the note is still very apparent as the attack is easily distinguished from the body of the note. This is directly related to the tonal integrity which is decreased by the syllable at the moment of the attack, but resolves instantly after that moment as the tongue is then in a position that does not interfere with tone production.

Audio examples are found on Audio Disc 1, Track 22 (demonstration) and Track 23 (improvisation).

'th'

This syllable is easily utilised in all registers with general ease. The only exception to this generality is the top note of the flute's range, A₆, which is curiously much more difficult to attain when attacking with *'th'*. As with *'ch'* the use of increased noise in the tone makes production less difficult, but playing at lower levels of dynamic still remain most difficult on this note. For the remainder of the range, all levels of dynamic are possible.

The speed of attack is slow; this is true for two reasons. The first is that the tongue must be set into an extreme position, the tip must be extended in front of the teeth, this is necessary to distinguish this attack from that of *'t'*. There is also a comparatively great amount of movement for this attack as the tongue must travel from in front of the teeth back into the mouth and to a relaxed, more conventional position. Second, an amount of time is required to reset the tongue to this forward position before beginning a new note.

The slowness of attack also effects tonal integrity, inserting noise into the tone at the point of attack. Purity of tone (if desired) can be quickly recovered as the position of the tongue after the initial *'th'* attack is relaxed and in a conventional placement within the mouth, making normal tone production immediately possible after the attack has been executed.

Audio examples are found on Audio Disc 1, Track 24 (demonstration) and Track 25 (improvisation).

Track 26 contains an improvisation utilising all syllables described above.

Tongue ram

This technique is also familiar in modern performance by Boehm flautists.⁴⁶ For the execution of the 'tongue ram,' the embouchure hole is entirely covered by the mouth. A fast stream of air is used for each attack, and is then blocked by the forceful stopping with the tip of the tongue, completely filling the embouchure; this produces a sound much like the word '*but*'.

There is a varying content of discernible pitch when using the tongue ram; however fingered notes do not correspond to the resulting pitch, which can be difficult to discern, owing to the percussive attack. Only the lowest octave can be produced with the reverberation of the tube of the instrument. The discrepancy between the fingered note and the resulting pitch varies. (See Figure 3.44.)



Figure 3.44. Approximate resulting pitches when using tongue ram; fingered note appears first, followed by the resulting pitch

There is a considerable amount of dynamic contrast possible when utilising this technique. The dynamic level is directly related to the volume of air being used. However, the proportional level of dynamic is still limited by the fact that there is no conventional tone being produced. The resulting sound is the resonance of the tube in addition to the noise of air being forced through. When playing notes in which a majority of finger holes are covered, the best level of resonance and the highest possible volume is achieved with this technique.

⁴⁶ See: R. Dick, *The Other Flute*, p. 139.

Because an entire breath of air must be expelled as quickly as possible, endurance can become an issue. When higher levels of dynamic are desired, this technique is very taxing; if used several times in a row, light-headedness can result. This limits the number of times the tongue ram can be used in quick succession at higher levels of dynamic. At lower levels, this is much less of an issue, as more than one note can be produced with a single breath, enabling the performer to more easily regulate the amount of air taken in.

An audio example demonstrating an ascending chromatic scale, with several attacks on each fingering is found on Audio Disc 1, Track 27, and is followed by a brief improvisation on Track 28.

Contained-air tonguing

In ‘contained-air tonguing’ the action of the tongue is similar to that employed in the tongue ram. Rather than using the air stream to propel the tongue forward to its stopping point, the tongue itself produces the percussive end of the note. The sides of the tongue act as an anchor to the main part of the tongue, helping to keep the air from either escaping backwards or being used to blow outwards; the tip of the tongue moves from the bottom of the mouth to the area just behind the front teeth (completing the seal, so to speak) and producing a percussive effect without the use of air stream. The percussive quality is dependent on the rapidity of the tongue motion.

An extension to this is to add a release immediately following the contained-air tonguing. The production is identical to regular contained-air tonguing, but includes a ricochet of the tip of the tongue, or very rapid withdrawal of the tip of the tongue backwards or downwards directly after the action of the tip of the tongue. This produces two sounds with the quality of an ‘action-reaction’. The two parts of this double attack have differing sounds. The initial contained-air attack more closely resembles an open vowel, such as ‘uht’ or ‘oht’; the ricochet is slightly more closed, sounding like the syllable ‘ti’.

As this technique does not involve expelling air, the dynamic range is limited. Using contained-air tonguing while maintaining a conventional embouchure will yield dynamic levels from barely perceptible to, at most, *mezzo piano*. If one covers the embouchure hole completely with the mouth, while using contained-air tonguing, slightly more volume can be produced. This added volume comes from the more present resonance made by directing the sound directly into the tube.

Tessitura is also limited as a result of a lack of air stream. Only the first octave is attainable when using a conventional embouchure. When the articulation is directed into

the embouchure hole by covering it completely with the mouth, an octave lower can be sounded. The resulting pitches differ from the fingered pitches, and vary to some degree. The content of pitch in these notes is obscured owing to the percussive sound of the tonguing itself. Some minute alteration to the pitch is possible through shaping the inside of the mouth and opening or closing the throat. Figure 3.45 shows discernable resulting pitches when a relaxed, unaltered mouth and throat position are used.



Figure 3.45. Resulting pitches when using contained-air tonguing while covering the entire embouchure hole with the mouth; the fingered note appears first, followed by the resulting pitch

Demonstration of an ascending chromatic scale of contained-air tonguing into the flute can be found on Audio Disc 1, Track 29, contained-air tonguing with ricochet Track 30, and contained-air tonguing with a conventional embouchure is on Track 31. An improvisation follows on Track 32 using all three variations of this technique.

Stop-tonguing

Stop-tonguing is a physical action similar to contained-air tonguing, but requires the conventional expulsion of air without anchoring the sides of the tongue; it can therefore be used at the end of any note, at all levels of dynamic. The air (and resulting tone) is stopped by the action of the tongue making contact with the front of the mouth, behind the teeth. The sides and middle of the tongue are free to be used in altering the speed of the air flow through the mouth. The further upward in the mouth the sides or back of the tongue are placed, the more narrow is the passage through which the air passes, changing the timbre and quality of the tone before it is stopped with the tip of the tongue.

The stop-tongue differs from the tongue ram mainly in that the tongue ram is only used in conjunction with covering the entire embouchure hole with the mouth and blowing directly into the flute; stop-tonguing is used with a conventional embouchure, though it can also be employed when blowing directly into the embouchure hole. In addition the force of the tongue stroke in stopping the air stream and tone is much greater with the tongue ram, as it initiates the greatest amount of resonance in the tube of the instrument. The tongue ram is also limited by its taxing nature and certain constraints with regard to dynamic level and tessitura; stop-tonguing can be used at any dynamic range and in any register.

Demonstration of stop-tonguing can be found on Audio Disc 1, Track 33, followed by an improvisation on Track 34.

Rapid tongue strokes

Both the vertical and horizontal forms of this articulation do not function in the same way as regular tongue strokes; they do not initiate or terminate a note. Instead, the strokes are continuous throughout, with the possibility for variation in the speed of the strokes, altering the sound of the continuing phase of a note.

In the case of the vertical variety, the tip of the tongue moves rapidly up and down just behind the embouchure, that is, not close enough actually to stop the sound being produced. The tip of the tongue is kept rigid in a similar attitude to that assumed when pronouncing the 'u/ll' repeatedly in rapid succession. The rapidity will vary according to the strength and/or skill of the performer.

The horizontal version of this varies only in that the tongue stroke proceeds from side to side, rather than up and down and the tip of the tongue may be lower in the mouth, striking either side of the lower teeth at the sides of the mouth, or the side to side motion may be made at the top of the mouth, striking either side of the top teeth. Any variation in between these two positions may also be used. The effect of the tone produced will be most marked when a medial position is used, directly behind the embouchure. Again, the rapidity of the tongue stroke is dependent on the skill and/or strength of the player, as is the endurance of this physically demanding technique.

Both varieties of this tongue stroke may be used throughout the range of the flute, but effectiveness varies significantly. From D₄ to G₅, these techniques are most flexible, and are audible at any dynamic level while maintaining control of the pulsing quality. Above G₅, the strokes naturally become less audible. (See Figure 3.46.)

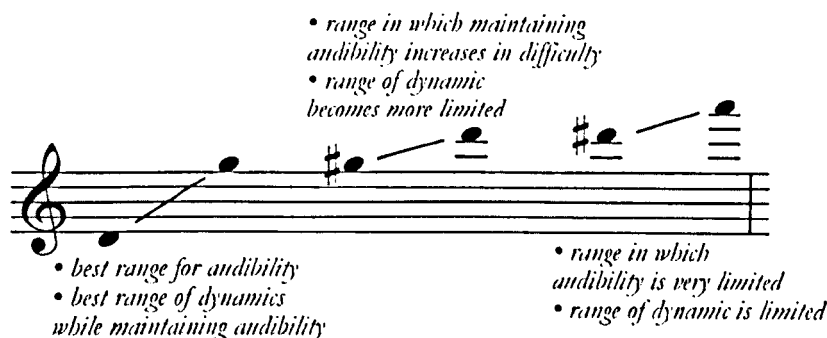


Figure 3.46. Limitations based on range of both vertical and horizontal rapid tongue strokes

In addition, dynamic levels above *mezzo forte* also cause the strokes to lose audibility. However, rapid tongue strokes can still be used even at the highest octave, but the stroke itself must be moved as close as possible to the opening of the embouchure within the mouth. This closeness causes more inconsistency in the regularity of pulsation but increases the degree of audibility. It also carries the danger of stopping the tone entirely by blocking the embouchure hole with the tip of the tongue. The optimum tessitura for rapid tongue strokes, for the sake of both flexibility and audibility is the lowest octave and a half of the instrument.

Demonstration of vertical rapid tongue strokes can be found on Audio Disc 1, Track 35, followed by an improvisation on Track 36; a demonstration of horizontal rapid tongue strokes is on Track 37, with an improvisation on Track 38.

Further practical audio examples of improvisation utilising more than one technique:

Audio Disc 1:

Track 39 – Contained-air Tonguing, Tongue ram and Spit tongue

Track 40 – Rapid tongue strokes (vertical & horizontal) and a variety of non-conventional syllables

Track 41 – Spit Tonguing and Stop-Tonguing

Track 42 – Changing the ratio of noise to tone and whistle tones

Section Three: Effects on Conventional Baroque Flute Performing Practice

It is evident that the pursuit of absolute clarity leads to the tendency toward the restriction in the syllables deemed appropriate and most effective for performance. The cost of this preoccupation with clarity is often measured in expressive limitation. It may therefore be regarded as an extended technique for the modern flautist to make use of a wider variety of non-standard articulation syllables, as this practice has long passed from the mainstream of both performance and pedagogy.

In the performing world today, for both modern and baroque flute, the degree to which extended techniques have been integrated into a musician's repertoire varies with each individual. This may be said to be particularly true with regard to baroque flautists, who are generally not required to make use of extended techniques for the mainstream repertoire of the instrument. This lack also extends to many modern flute players who are seldom required to master a comprehensive repertoire of extended techniques unless they possess an interest of their own or are employed in a position requiring this practice. The pursuit of perfection in conventional technique is more than enough to occupy any musician, but there are many positive effects to be gleaned from utilising and maintaining new techniques within the sonic, technical repertoire of any baroque flautist, regardless of whether it is intended for use in contemporary musical performance or simply for private practice.

The expressivity of articulation syllables themselves is largely subjective, but the effects of assimilation into one's repertoire become evident through practice. To achieve the greatest possible technical scope, it is necessary to explore the boundaries of any technique in order to become familiar with what is possible. To neglect this kind of practising inevitably imposes arbitrary limitations, built by mental expectation, and which inhibit musical potential. The inclusion of the widest possible variety of articulation syllables stretches both physical and mental technique, honing skills more finely to achieve new sonic results outside the possibility presented by conventional techniques. Once the wider palette of syllables and techniques have been integrated into a player's abilities as a whole, control of standard techniques is markedly improved and there is also a new sense of ease. It is similar to training one's mind and body for a marathon, but on race day only being required to run a fraction of the distance.

Beyond the technical advantages, there are expressive reasons for the inclusion of extended articulation techniques. Standard syllables in mainstream usage in performance constitute what might be subjectively described as black and white, with a few shades of grey. The addition of innumerable ways of beginning, continuing and ending notes

contributes new possibility, adding colour to the potential expressive range. It is true that some of the techniques described in this research, within a conventional setting would constitute very garish colours indeed, inappropriate to standard playing. But in having included these colours as a part of the sonic repertoire as a whole, more commonly accepted colours would become richer for their comparison and relationship to all others, rather than existing in the more sterile isolation of black and white.

The attractiveness of extended techniques is as subjective as the attractiveness of any contemporary music outside the mainstream norm of music making. The use of these new (and old) techniques opens many possibilities for expressivity and for much finer honing of standard articulations. These effects on the musician as a whole should not be overlooked by the baroque flute player, whether interested in contemporary music or not.

Conclusion

Conventionally perfect execution of tone and technique may strike us as beautiful, but it does not of itself communicate emotion, one of the major goals of music itself. It is the nuances of performance that include articulation and myriad other details of individuality in presentation that creates personal expressivity. A wider gamut of articulation adds to the repertoire of a musician's potential to connect with and move the listener. This rich resource for communication should not be left untapped.

Chapter 4

Practical Musical Integration

Introduction

Quite recently, composers have begun to take notice of this versatile and adaptable new voice from the past.¹ Contemporary works have been composed specifically for the baroque flute, and a new system for improvising with the instrument has been created, called the 'ecosonic' system. My own work, in addition to extending the expressive vocabulary of the baroque flute, together with types of articulation and methods of sound production, also includes the adaptation of ecosonic technique for improvising based on graphically indicated directional shapes.

This discussion is divided into three sections. The first introduces and explains the ecosonic system, its foundation and the way in which ecosonic improvisations are created. The second section explains the adaptation of ecosonic technique for improvisation, its incorporation with the directional and graphically indicated improvisational shapes used in *Less – for baroque flute and electronics* (2004) by Jo Thomas. The final section illustrates further research into the integration of new techniques, including sound production and articulation, undertaken in close collaboration with the composer.

Section One: Directional Improvisation using ecosonic fingering practice

The Ecosonic System

Created by Stephen Preston, the ecosonic system is not based on conventional or traditional technique for playing the baroque flute. It is the culmination of ideas about music and music making, and especially about improvisation. Though its inception is a process of great interest in itself, the focus here is on a brief introduction to the system and its practical workings for use in improvisation.²

¹ In addition to the work by Jo Thomas featured in this chapter, composers who have recently written works for the baroque flute include John Thow, *To Invoke the Clouds*, for solo baroque flute, Carlos Duque, *Blue* for solo baroque flute and Sergio Roberto de Oliveira, *Faces*, for two baroque flutes.

² For specific description regarding the inception of ecosonic technique and improvisation, see Stephen Preston, 'Birdsong as a basis for new techniques and improvisational practice with the Baroque Flute' (PhD dissertation, University of Plymouth, 2004), Ch. 2-3.

The ecosonic system is not based on any structure of tonality. Instead, the flute is treated according to its most fundamental form, as a tube with six holes.³ As illustrated in Chapter 1, using conventional technique results in very complex fingering when playing in keys with many flats or sharps or when playing chromatically. The ecosonic system was created with the aim of forming improvisations with birdsong as their basis. Birds sing with great volubility, and for a system to begin to enter their sound world, it must facilitate a great ease of finger movement and seemingly effortless skill. This is achieved by employing an unconventional method of fingering that avoids difficult cross-fingerings and opposing motion; only a single finger moves at any one time.

All fingerings are organized into a pattern of *finger-rows*, which form the ‘super-row’ of ecosonic fingerings; the pattern proceeds horizontally from left to right. In order to describe this system one uses binary arithmetic and fingerings are expressed as a series of ones and zeros. As notated in binary arithmetic, fingerings are as follows: an open hole is symbolized as a zero (0), a closed hole as a one (1). All fingerings are shown in the super-row where all finger-rows are arranged in order.

Figure 4.1 illustrates all finger-rows in order, beginning with 0 at top left and moving horizontally from left to right, ending with 63 at bottom right. The fingering pattern begins with the hole furthest from the embouchure, next to the key. With all holes open, this is zero (0). Each finger hole is referred to by its corresponding number within the super-row. The super-row is broken up into smaller finger-rows, each consisting of eight fingerings, much as traditional Western diatonic scales consist of seven tones and semitones in a specific order. The binary notation translates into single numerical designations from zero to sixty-three; Figure 4.2 shows the first eight fingerings and their corresponding binary notation.

000 000	000 001	000 010	000 011	000 100	000 101	000 110	000 111
001 000	001 001	001 010	001 011	001 100	001 101	001 110	001 111
010 000	010 001	010 010	010 011	010 100	010 101	010 110	010 111
011 000	011 001	011 010	011 011	011 100	011 101	011 110	011 111
100 000	100 001	100 010	100 011	100 100	100 101	100 110	100 111
101 000	101 001	101 010	101 011	101 100	101 101	101 110	101 111
110 000	110 001	110 010	110 011	110 100	110 101	110 110	110 111
111 000	111 001	111 010	111 011	111 100	111 101	111 110	111 111

Figure 4.1. The super-row, in binary notation

³ The seventh hole is not included in the system in the same way as the other six. The key covers this hole and it is treated separately, as a randomly introduced element.

000 000	000 001	000 010	000 011	000 100	000 101	000 110	000 111
0	1	2	3	4	5	6	7

Figure 4.2. Comparative Notations

Following the binary system, the hole closest to the key is designated as *one*, the next *two*, followed by *four*, *eight*, *sixteen*, and *thirty-two*. (See Figure 4.3.) Figure 4.4 shows the conventional numbering system used in many 18th-century tutors. Permutations of these numbers may be used to describe each fingering; therefore at *zero*, all finger holes are open; the next fingering in the row will be *one*, signifying that the bottom-most hole on the flute is closed; this hole and corresponding fingering designation are referred to as *one*. The second hole from the bottom of the flute is *two*. Depressing both of these fingers gives the fingering *three*, designating the fingering of *one* and *two* simultaneously, and not a single finger hole.



Figure 4.3. Ecosonic numbers corresponding to finger holes



Figure 4.4. Conventional numbering of finger holes

It is possible to describe fingerings in two ways. The first is as stated in the paragraph above, by actually naming each specific finger hole that is closed (for example, 16 and 32, as in Figure 4.5); the other is by adding these numbers together, in this case giving the number 48. This particular fingering exemplifies a fundamental aspect of the ecosonic system. Figure 4.5, which shows the finger combination 48, shows that this is identical to the conventional fingering for A₄. All conventional fingerings appear in the ecosonic system. It is important to note, however, that although all conventional fingerings on the baroque flute exist in the ecosonic system, their tonal implications are no longer present.

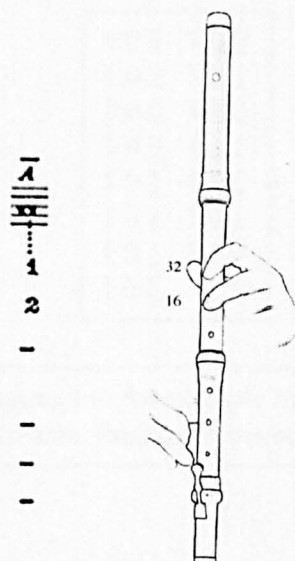


Figure 4.5. Comparison of conventional and ecosonic fingerings

For the performance of ecosonic improvisations, a so-called finger-row sequence is chosen.⁴ First, a 'fixed fingering' is selected, in which three fingers are held in a static position, and may consist of any combination of open or closed holes, but once chosen, these fingers do not move during the improvisation. This fixed fingering produces a group of pitches in up to three registers, called the 'key-sound'; after a fixed fingering is decided, three 'moving fingers' are then selected from amongst any of those that are not already engaged in the fixed fingering. The moving fingers produce multiple different pitches within the finger-row, each register generating a unique set of sounds and colours, called 'microtonal vocabularies'. It is necessary to have three fingers free to act as moving fingers in order to play a complete finger-row, as an ecosonic finger-row consists of eight fingerings. Figure 4.6 shows an example of a sequence, with a fixed fingering of 32 and 4 (36); moving fingers of 1, 2 and 8 are underlined.

⁴ Preston, 'Birdsong as a basis for new techniques', p. 75.

1 0 0	1 0 0
1 0 0	1 0 1
1 0 0	1 1 0
1 0 0	1 1 1
1 0 1	1 0 0
1 0 1	1 0 1
1 0 1	1 1 0
1 0 1	1 1 1

Figure 4.6. An example of an ecosonic finger row sequence

The ecosonic system provides the means for improvisation, defining the possibilities for performance by contextualising it within a chosen sequence, while allowing a great amount of potential flexibility with regard to both fingering and sonic range.

Adapting the ecosonic system for performance in *Less - for baroque flute and electroacoustic sound*, by Jo Thomas

The electroacoustic composer Jo Thomas has specified the use of ecosonic improvisation technique in her composition, *Less – for baroque flute and electroacoustic sound*. In the sections requiring ecosonics, she designates, using conventional notation, the note on which to begin and the note on which to end at each instance. Within each indication is a graphic directional marking. (See Figure 4.7.)



Figure 4.7. An example of notation from *Less*

First attempts at adapting the ecosonic system to these shaped indications were found to be very difficult, as all previous work toward improvising with ecosonic technique involved, at least partially, a non-determined element that is inherent in the system. The unknown factor is that the performer cannot always predict which pitch a particular

fingering will produce, as the ecosonic system is based on physical fingering patterns as opposed to a pitch-based model. The indeterminate element desirable in improvisation modelled on birdsong was not useful in the case of *Less*. Indeed, the challenge became one of shaping indeterminacy to the effective realisation of graphically-indicated directional shapes. To achieve this it was necessary to combine practical knowledge of how the flute works both conventionally and predictably, with how it works ecosonically, in order to produce the improvisational results implied in the score.

In this case, 'indeterminate' means that ecosonic improvisations make use of fingerings, most of which can produce two or more different and often harmonically unrelated pitches; this is unlike conventional fingerings in most cases. The production of the correct fingering for the note 'A', for example, determines that two possibilities will be produced, either an A₄ or A₅. Playing in those two registers is straightforward and a performer will know exactly which of the two notes will sound. With many ecosonic fingerings, because the basis of the system is physical, the expectation and the results are very different from a tonal system with determinate fingerings and pitches. Often fingerings will produce more than one note, sometimes simultaneously,⁵ especially in the third register, and it is not consistently possible to predict which of the repertoire of sounds for a fingering will be produced. This is particularly true at speed.

To be able to achieve what Thomas asks for in her piece, one must combine conventional, determinate technique with ecosonic technique. The following questions must be addressed:

1. What is the tonal direction indicated in the score?
2. How is it possible to produce the indicated result?
3. Is there more than one possibility for producing this result?

The problems revolve around what kinds of intervals may be produced with each combination of fixed and moving fingers; one must become more aware of the way a microtonal vocabulary of sounds can be made to work directionally. Previous work on improvisation based on birdsong made it clear that ecosonic microtonal vocabularies were easier to categorise by dividing them into groups of sounds, each group lying within its own register, and differing from those in other registers. The application of a register change is still useful, but only as a rough way to begin shaping the improvisational

⁵ See Appendices B-C, Multiphonics, pp. 122-203.

passages indicated in *Less*. More detail is required to produce an accurate result designed by the directions and shapes given in the score.

Because sequences can be chosen from any combination of fixed fingers, the first challenge is, perhaps surprisingly, that the performer is left with *too many* choices for moving between point X and point Y. Through experimentation it was found that choosing a sequence at random that may fit the indicated shape, but which has no pitch relationship to the passage, was not useful. For example, if an improvisational indication begins on A-flat₄, a sequence based on the fixed fingering of 8 will not provide a satisfactory musical result, because of the lack of a physical and sonic link between the two fingerings. Figure 4.8 illustrates how these fingerings are physically unrelated; the numbers marked indicate which finger holes are to be closed.

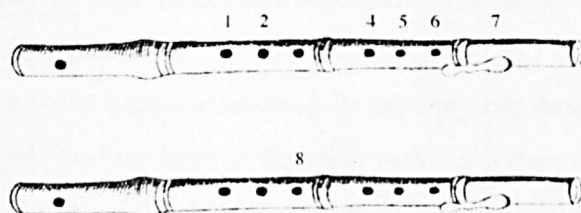


Figure 4.8. The conventional fingering for A-flat₄ compared to the ecosonic fingering, 8

Such a choice, where neither the ecosonic nor the conventional fingering has any physical relationship to the other, creates more difficulty in changing from the conventional to the ecosonic system and returning both quickly and without mental or technical effort.⁶ The change becomes easier and more effective when the leap between languages is made smaller. Musically speaking, it is easier to make this leap when one creates something akin to a pivot chord, but in this case a physical fingering, rather than a chord that exists in both systems. The challenge is to find a matching fixed fingering or one as similar as possible to the conventionally notated pitch given at the start of an improvisational passage, which therefore works as a pivot-fingering, and also has the possibility to produce the desired shape or directionality indicated in the score.

In many cases it is possible to choose a fixed fingering that is either identical, or nearly identical, to the conventionally-notated starting note. Additionally, because this

⁶ There is no physical relationship between these two fingerings because ecosonic fingering '8' and the conventional fingering for A-flat₄ have no fingers in common; every finger must move in changing from '8' to A-flat₄.

related fingering is either the same, or quite near to the starting note sonically, it is likely to possess the possibility of creating a shape that suits what is indicated, matching the register of the note and retaining the sonic starting point. Whenever it is possible, it is also helpful to choose a fingering combination that will allow one to 'land' on the ending note without having to struggle back into the original language of conventional notation. This is most possible when the fingering for the indicated arrival note occurs naturally within the selected finger-row sequence. It is this relationship that is missing when a sequence is chosen purely on the basis that it can produce an appropriate shape without regarding its relationship to the notated beginning and ending of the passage. This latter case maintains the separation between the two systems, defeating the purpose of this sort of improvisation; if the chosen sequence is physically unrelated and as a result, causes difficulty in transitions, the expression of the passage may be lost. The result is an audible struggle, narrowing the performer's focus to address the technical difficulty rather than achieving a musical expression.

The above is the basis for successfully selecting sequences. However, it still remains necessary to find patterns of direction within a system that was created with unavoidable indeterminate elements. The issue to be addressed here is, how does one improvise directionally within an unpredictable system without making that system predictable, thus destroying the improvisational quality by constraining its indeterminacy? That is, how does one avoid constructing a passage that is so predictable that it is no longer improvisatory, but a planned section that chances to be utilising unconventional fingerings? It is at this point that knowledge of the acoustic behaviour of the flute is necessary.

The next step is the process of reviewing the most basic workings of the flute in as simple a form as possible. To begin with, it cannot automatically be assumed that the more holes one closes, the lower the pitch becomes. The flute is still only partially predictable when a majority of holes is closed, depending on their configuration. Sounds are only completely predictable when all finger holes covered are adjacent, beginning with the hole closest to the embouchure. If a gap is left between closed holes, depending on how widely separated they are, the pitch changes only slightly when additional finger holes are closed. When there is only a single hole remaining open between closed finger holes, there is a medium change to the pitch.

Through a great deal of experimentation with the basic workings of the flute in conjunction with ecosonic explorations, it is possible to find sequences that effectively produce the shapes indicated in the score, while maintaining a working relationship with the conventionally notated specifications for each passage.

Choice versus Spontaneity

An important aspect of the selection of these finger-row sequences is that to qualify as being improvisatory, there should be more than one combination of finger movements that will produce the desired shape. If only a singular pattern of finger movements is successful in producing the indicated shape, it should not be regarded as an appropriate choice; there ought to be a minimum of two possibilities of finger movement to create the shape indicated in the score.

It is possible that because of the unconventional sound of the ecosonic system, a listener may be unable to detect the difference between a planned sequence of fingerings and an improvised one. Still, the fact remains that musically, the expression and spontaneity of an improvisatory passage (to produce direct musical expression existing in a particular moment in time in a way that cannot be duplicated) is defeated by using a pre-selected sequence of fingerings. If a planned passage had been desired, it is entirely feasible for the composer to confer with any accomplished baroque flautist and designate in the score a shaped passage employing written-out unconventional fingerings. However, in the case of *Less*, the composer has stressed the importance of the spontaneous quality and unique sound of ecosonic improvisation.

Examples of Ecosonic Improvisational Passages in *Less*⁷

Figure 4.9 makes use of the possibility of choosing a fixed fingering which is identical to the indicated, conventionally fingered starting note: in this case, B₄ and the ecosonic designation 32, share the same fingering. This provides both an anchor and a starting advantage for the improvisatory indication that appears in the second half of the example, written out as two slightly descending lines with dots above them. The lines indicate the directionality, and the dots indicate that the improvised notes are to be articulated with the tongue. The numbers appearing above the indications show the duration in seconds. The other graphic indications preceding the improvisational indication relate to tonal qualities and pitch bending. (More specific explanations can be found in the introduction to the score.)

⁷ Examples appearing in this chapter have been transcribed for the sake of clarity. The graphic indications have been extracted and input exactly as they appear in the score. However, conventional text has been translated from its original hand-written version into typeface.

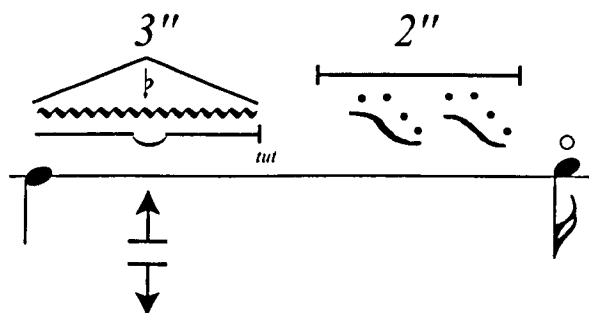


Figure 4.9 From *Less*, audio time index: 8:07

Because the graphic indication shows only a slight pitch change, it is possible to use any number of moving finger combinations to produce the desired result. The single horizontal line indicates the middle line of a staff in treble clef, (B₄ or ecosonic fingering, 32). For the example in Figure 4.9,⁸ the sequence chosen uses a fixed fingering of 32 with moving fingers of 16, 4, and 2 or 8, 4, and 2.⁹

For the extract shown in Figure 4.10 it is impossible to use a fixed fingering that is identical to the starting note because A-flat₄ is fingered with all holes closed excepting only one.¹⁰ This of course, does not provide for the three moving fingers necessary for an ecosonic sequence. Instead, as much of the starting fingering as possible is preserved in selecting the fixed fingering. The chosen sequence uses fixed fingering 16, 2, and 1 with moving fingers: 32, 8, and 4. (Explanation of the chosen sequence follows.) Three of the five finger holes in common with the A-flat fingering remain closed. The moving fingers also make it possible to return easily to the original A-flat at the end of the indication.

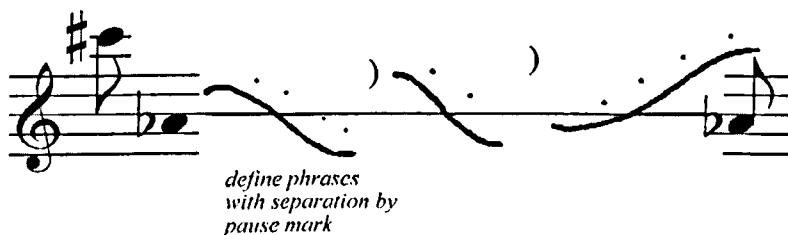


Figure 4.10 From *Less*, audio time index: 11:13

⁸ J. Thomas, 'Electroacoustic Composition Indicative of Human Agency' (PhD Dissertation, City University School of Arts, Department of Music, 2005), PhD scores, *Less*, p. 6, 1st system.

⁹ All time indices supplied with the Figures in this section refer to the live recording of *Less* which accompanies this chapter, Audio Disc 4, Track 7.

¹⁰ Fig. 4.10 is taken from Thomas, *Less*, p. 8, 1st system, time marking 0:00-0:06.

Explanation of sequence chosen for Figure 4.10:

The beginning note is A-flat in binary notation:

110 111 to:

010 011

Fixed fingering of 16, 2, and 1, with moving fingers 32, 8, and 4 underlined.

It can be seen that only two fingers must move to change to the ecosonic fixed fingering.

This provides the following finger row; moving fingers are underlined:

010 011

010 111

011 011

011 111

110 011

110 111 – Within the sequence, the original A-flat₄ fingering appears here.

111 011

111 111

For Figure 4.11, the beginning note is G₅ and ending note is D₅.¹¹ Here the improvisation is very short, and must take place within approximately 1.5 seconds. It is also helpful to make use of a 'bridge fingering'. Because the duration of the improvisation is very short, and the graphic indication shows a decidedly marked change of direction, it becomes necessary to plan the first change of fingering at the beginning of the passage. The chosen sequence uses fixed fingering 16 and 8, with moving-fingers 32, 2, and 1 *or* 32, 4 and 1. The bridge fingering works well when the finger hole closest to the embouchure (32) is moved first. This hole works much like an octave key and the change of pitch is marked easily with the register change caused by moving the first finger. The fixed fingering selected for this improvisation causes this bridge fingering to occur naturally, and there is no sense of having exacted a fingering order; the improvisational quality is not tampered with by the necessity of using a bridge fingering.



Figure 4.11 From *Less*, audio time index: 5:11

¹¹ Fig. 4.11 is taken from Thomas, *Less*, p. 3, 2nd system, time marking: 1:01-1:02.

Explanation of sequence chosen for Figure 4.11:

The starting note in binary notation:

111 000 to

011 000

Fixed fingering on 16 and 8, with moving fingers 32, 4, and 1 are underlined. Here only one finger must move from the starting note to the fixed fingering. The bridge fingering uncovers 32 and occurs naturally within the finger row; it is marked in bold. This provides the following finger-row; moving fingers are underlined:

011 000 – The bridge fingering appears first naturally in finger-row.

011 001

011 100

011 101

111 000

111 001

111 100

111 101

Changing registers within a sequence is especially effective when there is a particularly short allotment of time for an improvisational passage. Varying the register can make changes in direction more apparent in a shorter amount of time and with fewer finger movements, as in Figure 4.12.

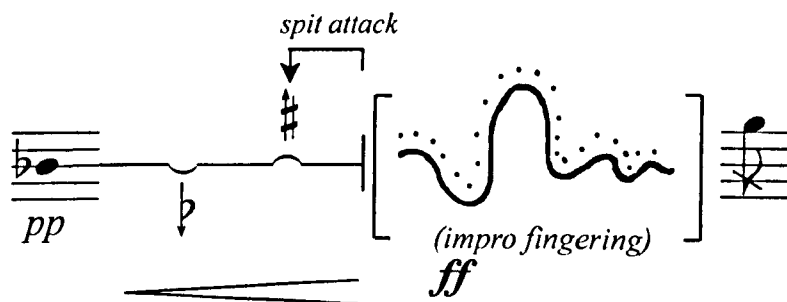


Figure 4.12. From *Less*, audio time index: 5:00

In Figure 4.12, the starting note is B-flat₄, and the ending note is G₅.¹² The chosen sequence uses fixed fingering 32, with moving-fingers 8, 4, and 2; the conventional starting fingering is identical to the fixed fingering for the improvisational passage. Because there is a brief moment allowed for silence before the next conventionally notated pitch, it is somewhat less important for the sequence to allow one to arrive on G₅ within the chosen fingering sequence. Instead, a change of register provides well for the quick, distinct changes of direction in this example. Without the change of register, the moving fingers in the chosen sequence make a range of pitch change that is too small, though this is helpful for the last part of the improvisation, where the graphic markings show only much smaller directional changes. The use of register change in conjunction with a sequence that also produces minute pitch changes within the finger-row allows for ease of production of the several qualities of motion and direction present in this example.

Section Two: Integration of new ‘extended techniques’

New Sounds: Articulation

Many of the ideas for new possibilities in the expansion of the repertoire of sound production and articulation on the baroque flute have been integrated into *Less*. In some cases, historical articulations have formed a foundation for the new shapes and ideas for the extended articulation techniques used. In other cases new techniques were developed over time in collaboration with the composer.

The first technique to be integrated is well known from its common use on the modern flute, and is often heard in contemporary composition, Latin music and jazz. Thomas uses spit tonguing in several instances in *Less*, including a passage of repeated attacks, as well as pitchless spit tonguing with the lips as plosive.¹³ Rapid spit tonguing such as that in Figure 4.13 is also well suited to the baroque flute’s relatively diminutive nature, owing to the fact that only a small amount of air need be released for a spit tongue articulation to speak, allowing the player to produce several attacks in succession with less effort than that which would be required on the Boehm flute.¹⁴

¹² Fig. 4.12 is taken from Thomas, *Less*, p. 3, 2nd system, time marking: 0:50-0:55.

¹³ Full discussion of the spit tongue is given in Chapter 3, Section 2.

¹⁴ Fig. 4.13 is taken from Thomas, *Less*, p. 5, 2nd system, time marking: 3:25-3:31.

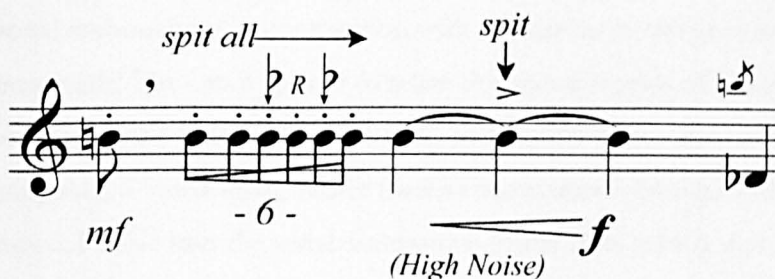


Figure 4.13. From *Less*, audio time index: 7:37

In *Less*, the flute often uses the technique of stop-tonguing to relate the sound worlds of the flute to that of the electronics, as in Figure 4.14.¹⁵ Here, the vertical line at the end of the first C-sharp₆ sustaining line denotes where a stop-tongue is to be used, in contrast to the second C-sharp₆, where there is an additional articulation at the end of the note. Indeed, the effect produced is markedly similar to that created by the electronics.



Figure 4.14. From *Less*, audio time index: 13:37

New Sounds: Tonal Alteration

In the context of this research, the variations of tonal content were developed in ratios of noise to pure tone. As opinions on tone production can be subjective and because there are many ideas of what constitutes a 'good sound', for present purposes the noise content of a tone will be described in relation to alterations to the traditional tone of the baroque flute, i.e. a colourful, yet soft-edged tone. It is from this traditional notion of desired clarity and quality of sound that this research seeks to add new dimension.

¹⁵ Fig. 4.14 is taken from Thomas, *Less*, p. 10, 1st system, time marking: 2:43-2:54.

It is possible to increase the amount of noise within one's tone while using a conventional embouchure in conjunction with alterations in the positioning of the tongue within the mouth.¹⁶ In *Less* it is used to relate the sound worlds of electronics and the live flute by increasing the noise within the tone, making the flute's tone become, as described by the composer, a 'noise shaft' rather than a conventional, baroque flute tone. This introduction of noise into the tonal dimensions of the flute greatly increases the scope of the instrument's sound world. In addition, there is the possibility of employing a non-conventional embouchure. Although this technique is not specifically indicated in *Less*, it is highly effective both in producing a roar-like effect for high noise-to-sound ratio used in Figure 4.15, and in more effectively producing whistle tones, exemplified in Figure 4.16.¹⁷

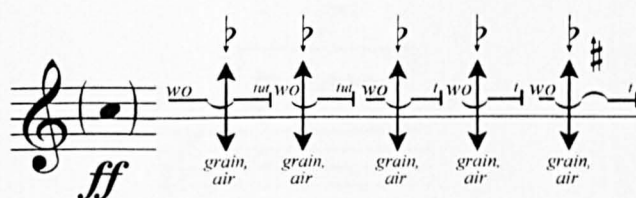


Figure 4.15. From *Less*, audio time index: 8:22

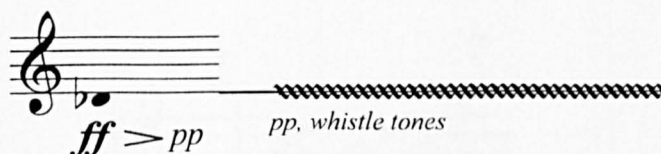


Figure 4.16. From *Less*, audio time index: 3:26

These changes to the shape of the mouth and position of the tongue are often imperceptible, even to the player; but as slight as they are, they can mean the difference between producing a whistle tone, nothing, or a true tone. Even a dynamic marking of *pianissimo* is actually a rather high level of dynamic for whistle tones on the baroque flute.

The use of the non-embouchure technique makes it possible to play lower-pitched, louder whistle tones while maintaining a greater degree of stability. Given that whistle

¹⁶ See Chapter 2, Section Two.

¹⁷ Figure 4.15 is taken from Thomas, *Less*, p. 6, 2nd system; Fig. 4.16 is taken from Thomas, *Less*, p. 2, 3rd system, time marking: 1:20-1:24.

tones are naturally extremely soft in volume, this is especially useful and effective, providing both greater volume of sound and the stability required to sustain them for several seconds, as called for in the score.

In addition to the techniques mentioned above, multiphonics should be touched upon. Multiphonics have received considerable attention in the fairly recent history of the modern flute, but they have been relatively little written about or experimented with on the baroque flute. However, Jo Thomas has used them to great expressive effect in *Less*. In Figure 4.17, the multiphonic is denoted by the diamond mark above the note, with a simultaneous trill.¹⁸ In Figure 4.18, a slow, controlled simultaneous trill is added to the multiphonic.¹⁹



Figure 4.17. From *Less*, audio time index: 9:43

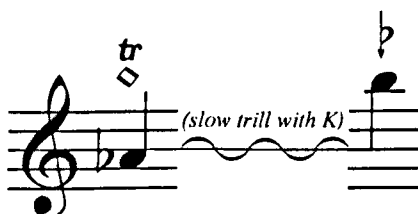


Figure 4.18. From *Less*, audio time index: 11:34

With its conical bore, six finger holes and single key, the baroque flute, unlike its modern counterpart, has a less predictable harmonic series, and therefore produces sometimes unpredictable results when one is using multiphonics. Equally, it is important to note that, unlike the modern flute, baroque flutes may in some cases vary markedly from one to another with regard to which multiphonics are possible on a particular

¹⁸ Fig. 4.17 is taken from Thomas, *Less*, p. 7, 1st system.

¹⁹ Fig. 4.18 is taken from Thomas, *Less*, p. 8, 1st system, time marking: 0:20-0:23.

instrument.²⁰ One flute may have an extraordinary ability to split a note into two or three pitches simultaneously, while another flute may be completely stable when played identically. Thomas avoids this problem of inconsistency between instruments by notating only that a particular note is to be split as a multiphonic, while leaving any specification as to the pitches to be produced un-notated. In this way the expressive quality of a notated multiphonic and its strength as an expressive vehicle are both maintained, but without the difficulty of precisely controlling the pitch(es) produced.

Conclusion

Although the use of ecosonic technique in this piece has required adaptation (as can be seen from Figure 4.10, for instance), it is through this kind of collaboration between performer and composer that a new technique is not only further tested, but also pushed to expand in otherwise unexplored directions. By using the ecosonic system in a way in which it had never been used before, the accompanying thought processes have opened an additional pathway for the performer that can also complement ecosonic improvisation outside of the piece, *Less*. In many ways, this piece begins to bridge the gap between fully improvisational ecosonic music and composed music. Any obstacles present in the adjustment of ecosonic technique are minor and far outweighed by the evolution of thought-processes on the part of the performer.

The baroque flute might be seen as an instrument providing a somewhat limited expressive medium because of its relatively small tessitura and difficult cross-fingerings. Ecosonic technique removes many technical boundaries for this instrument, resulting in a sense of fluency and direct expression from the player. It is this direct flow that is an integral part of the work *Less* and is a major part of this research. The music of *Less* does not limit itself to conventional baroque flute playing, but goes beyond this, integrating the performer, the notated score, electronics, new techniques, and the instrument itself into a single expressive force. Ecosonic improvisation proves its capacity for adaptation and scope for new applications in contemporary music. Both the research necessary to perform *Less* and the work itself extend the boundaries of baroque flute playing and ecosonic improvisation, redefining the baroque flute as a fresh contemporary voice ideally

²⁰ See Appendices B-C, Multiphonics, for detailed exploration of multiphonics on two very different baroque flutes.

suited to the idioms of 21st-century composition.²¹ This research seeks to integrate fully the techniques developed through exploration and experimentation into personal musical work, to have them available for their fullest musical potential. In the future, it is hoped that these techniques may continue to be employed to their fullest capacity within new compositions and improvisations, as they have been during their inception and growth within Jo Thomas's work.

Section Three: Musical Integration of Extended Techniques through Ecosonic Improvisation

The challenge of new instrumental techniques is not the obvious need for their mastery by the player, but for their convincing incorporation, by composers and improvisers, into the music created. Used solely for special effects, they are likely only to serve as empty displays of novel skill; the openness and direct expression of ecosonic improvisation perhaps offers them a greater ease of inclusion here. Further, avoiding the necessity for accurate reading of notated music allows the performer to be concerned with a single line drawn from him/herself.

In addition to improvisation's being an ideal medium for experimentation, the techniques themselves are effective in enriching ecosonic structures. Stephen Preston, Thomas Gardner and I collaboratively developed these structures; I have also researched new techniques through personal experimentation.

Extended techniques can be used to several different ends within all structures of ecosonic improvisation. Perhaps the most obvious is to enrich the sonic repertoire of the flute. This relates closely to another possible use, that of drawing attention either to a particular moment or a specific player when there is overlapping of sounds amongst the performers. These techniques can signal other elements, such as a structural or emotive change. They can also identify a performer individually or in relation to a group.

Forms and structures for improvising using ecosonic technique continue to evolve, and, at least at the current stage of development, seem to present nearly limitless possibilities. There are however, several forms that have taken distinct shape over time, and have been established through extensive experimentation, both through exercises used as practice and within live performance.

²¹ New works composed for the baroque flute using ecosonic technique include John Thow, *Il Prestone* and *L'Amara*, from *Five Pieces for Two Baroque Flutes* (unpublished 2006); Sergio Roberto de Oliveira, *About Birds and Humans* (unpublished 2006); Edward Cowie, *The Soft Complaining Flute* (Essex: United Music Publishers, 2004).

Integration of New Techniques within Ecosonic Forms of Improvisation

Antiphonal

The first successful form began as an exercise for developing increased rapidity of reaction time for one player's response to another;²² but as it is both simple and appealing, it has been adapted for use in performance. This improvisation, first conceived by Stephen Preston, and later developed practically through collaboration with the author, is called *antiphonal*. The antiphonal structure was originally based on the idea of birds that sing in duets and are often so closely coordinated in their exchange of individual sounds or phrases that it is nearly impossible for the listener to discern when one or the other bird is singing at any particular time. In antiphonal ecosonic improvisation, two or more performers take turns in playing single notes (or small, quick groups of notes) at varying speeds. Although the players are limited to a single note at each turn of exchange, that note may be articulated several times, and/or change register as long as the fingering remains unchanged. Although this is by far the simplest in comparison to other developed structures, its possibilities for variation and interest are neither simple nor limited. A key objective in its performance is that of eliciting surprise or delight in the audience, making best use of the unexpected, the unusual, and the virtuosic.

With regard to fingering and sound vocabulary, antiphonal improvisation on the flute most commonly functions in a way unlike other structures, as it generally does not use a typical sequence combining a set of fixed and moving fingers. However, it is possible to use such a sequence, but the qualities of this structure generally make this an exception rather than the rule. The player moves one finger at a time, as with all other ecosonic improvisational technique, but with an unusual sequence of fingerings as there are no fixed, only moving fingers. Strictly speaking the technique could be regarded as not fully ecosonic, but the fundamental philosophy of single-finger, simple movement remains consistent. The sequence of fingering proceeds with each hole being covered one at a time in succession from the bottom of the flute, i.e. the end farthest from the embouchure hole, to the top. It is allowable to use a particular fingering repeatedly on several turns of exchange before proceeding to the next, but the sequence continues in order either repeating from the bottom to top of the flute, or top to bottom, resuming from the starting point each time a sequence has been completed. Figure 4.19 shows the two

²² See Preston, 'Birdsong as a basis for new techniques', Chapter 4.

possibilities for fingering sequences most commonly used for antiphonal ecosonic improvisation, the first beginning at the bottom of the flute at fingering 0, and the other beginning at fingering 32.

000 000	100 000
000 001	010 000
000 010	001 000
000 100	000 100
001 000	000 010
010 000	000 001
100 000	000 000
000 000	100 000
etc.	etc.

Figure 4.19. Fingering sequences for antiphonal improvisation

The pitches produced by these fingering sequences in the first two registers are limited in range. In the first register, the range is from B₄ to C-sharp₅. In the second register, the range is from B₄ to C-sharp₆. There is somewhat more variety possible in the third register which generates pitches ranging from C-sharp₆ to G-sharp₆. (See Figure 4.20.)

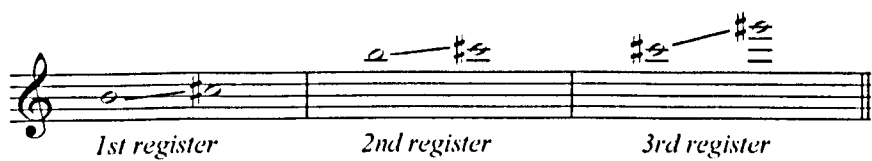


Figure 4.20. Ranges of the three registers generally produced during antiphonal improvisation

Because of this limitation, it is imperative that interest is sustained by other means, or one is dependent solely on the novelty of the performers’ ability to exchange notes in rapid succession. Factors that can maintain and/or increase interest include the variety of articulations, variance of tonal integrity, rhythmic variety, velocity of exchange, pitch bending, dynamic contrast, and register change. Of these factors, extended techniques can be used to maximise the impact of the variety in articulation, tonal integrity, velocity of

exchange and dynamic contrast. The remaining factors are left to the more typical, basic technique of the performer.

When limited to conventional means only, combined with the exchange of, exclusively, one note or small groups of notes on a single pitch at a time, the musical impact can be somewhat limited, causing an increased dependence on other factors such as velocity of exchange and dynamic contrast for maintaining intensity and interest in a given improvisation. However, articulation provides perhaps the greatest opportunity for the integration of extended techniques to increase the variety and scope of antiphonal improvisation. Contemporary techniques that are useful in broadening the diversity of articulation include:

- spit tongue
- spit tongue with lips as the plosive
- contained-air tonguing
- ricochet tonguing
- rapid tongue strokes
- rapid, repeated spit tongue
- tonguing with non-conventional syllables
- multiphonics

These techniques have been selected for use within antiphonal improvisation because they differ markedly in sound from conventional articulation and tone production. They can be used in many gradations. For example, spit tonguing can be very gentle and low in dynamic or quite explosive. A majority of the techniques included here are concerned with the beginning of the note, this is important because antiphonal improvisations are generally quick exchanges of either single or short bursts of notes, often making it difficult to discern the endings and/or the middle of notes.

It is unnecessary to include all of these techniques within a single improvisation, and because they are easily recognised by their difference in sound through their departure from conventional technique, they can also be given an intensity-heightening function to attract attention at particular points in time. Audio Disc 4, Track 1 is a live recording of an antiphonal improvisation. Spit tongue is used at the opening, progressing to breath-based attacks and adding ricochets to these attacks at time index 0:14. A rough breath attack is also used at 0:49 to help split the beginning of the note and produce a very quick multiphonic. All of these variations help to maintain variety and interest in this improvisation.

Using attack-based extended techniques expands the scope of dynamic contrast. For example, explosive attacks can provide a greater volume of sound than those with a more conventional attack. Similarly, when used in conjunction with a tone that includes a larger content of noise, consonant-based articulations such as the spit tongue are effective at an extremely low dynamic level, as they do not sacrifice clarity. Thus, they resemble the exaggeration of consonants when speaking with a projected whisper. These techniques not only enlarge the sound vocabulary and contrast with conventional technique, they make it possible to imbue the improvisation with greater emotional content. Harsher attacks such as these can be interpreted as aggressive, confrontational, or imply a challenge. Alternatively, using the same high-impact attack in a different way can lend an almost comic sound, particularly if used in conjunction with a change in pitch. Using spit tongue with the lips as a plosive can effect a rougher sound, and another kind of confrontational effect, or possibly an indifferent expression, one that is mocking the other player's cleanness of execution.

Because this form of improvisation often uses responses that overlap between the players, the ends of notes or groups of notes are often blurred, or less noticeable. Therefore, attention is usually focussed on the beginnings of notes or groups of notes. To prevent this simplicity from becoming tiresome, the variety of articulations and particularly non-conventional syllables can greatly change the shape of the beginning of an exchange. Slowing the onset of a note can affect both a tempo change (without losing momentum if effected with immediacy) and a change of expression, for example, the change from a conventional tipping of a note in contrast with the syllable *ch*, *f*, or *s*. The extension of the attack has a different effect from quick, percussive attacks such as the spit tongue; it changes the flow of exchange and provides additional variety to the progression of the performance between players.

The use of rapid tongue strokes also affects the development of the improvisation, firstly because they require a lower level of dynamic and ideally a lower register to maintain audibility, but also because there must be a longer duration to the note in order for it to be discerned. Their use will slow the rate of exchange between the players, changing the emphasis from the beginnings of notes to the continuing phase, and can drastically change the prevailing tempo (and potentially the dynamic level) of the improvisation.

Contained-air tonguing affects the sound at the beginning of the note, and the onset of notes is of particular importance in antiphonal improvisation, as it identifies the point of exchange between the players, which can become blurred if too rapid. Contained-air tonguing greatly reduces the dynamic level, drawing attention to the player if it contrasts with what has come previously. This attack is only possible at very low levels of

dynamic, whether made with a conventional embouchure or whilst blowing into the instrument for greater resonance. In addition, contained-air tonguing cannot be maintained at a very quick tempo, and will affect the momentum of the improvisation.

Ricochet tonguing can be made to change the focus from the beginning of the note to the second attack (the ricochet), as the first attack can be made without being tipped by the tongue, so it is softer in impact. Even when the first attack is tongued, this differentiates its shape from all of the attack-based techniques concerned exclusively with the beginning of the primary note.

Audio Disc 4, Track 2 is a studio recording of an antiphonal improvisation. The opening makes use of both spit tonguing and tonal alteration, using noise within the sound. At 0:19, quick bursts of spit tonguing lengthens the time each player is allotted for each exchange. From 0:42, stop-tongue is used, followed at 1:24 by ricochet tonguing and later by stop-tonguing (1:35). This improvisation is aimed slightly more towards demonstration, and may perhaps use more variation in shorter spans of time than would occur in the immediacy of a live performance, and where the audience's presence may also affect the reactions of the performers.

The use of multiphonics within antiphonal improvisation is challenging, given the small span of time that is generally involved in such rapid exchange. But this does not preclude their use. Of particular note is the instability inherent in the fingering '8', or with conventional notation, covering only the 3rd finger hole. Many different possibilities exist simply by tonguing, controlling the pitch through breath control, and by manipulation of the embouchure. This fingering is markedly unstable on many flutes, and as it occurs naturally within the most generally used sequence for antiphonal improvisation, it is a logical choice in making use of the rich and varied sounds that can be generated through the use of multiphonics. There are other possibilities for the production of quick multiphonics, and because of the nature of quick exchanges, many attempts can be made without the appearance of difficulty or error if an unexpected sound is produced, given that such instability is considered well within the scope of useful colour and diversity of sounds most desirable in this form of improvisation. Of course the use of multiphonics need not be limited to quick exchange, and can also be used to shift the focus from the beginnings of notes onto the continuing phase by lengthening the amount of time spent on each note, slowing the prevailing tempo and allowing for more duration in which to develop a multiphonic.

Attack-based articulations in particular may be utilised in conjunction with little to no tonal integrity, focusing all attention on the shape of the sound during the onset of the attack; this is especially true with the varying qualities of onset that are possible when using

non-conventional syllables. In addition, there are many possible degrees of tonal integrity, from very pure tone with virtually no noise at all, to a complete lack of perceivable tone using noise only. Tonal integrity can be used as a variable factor within the body of the note, regardless of the articulation used for the beginning or ending of that note; the content of noise can focus more attention on the middle of a note, particularly if a gentle attack, or no attack is used at the onset. Changes in the noise content of tone can also be used to differentiate players, if one player consistently utilises a higher ratio of noise to pure tone, it can aid in the identification of that player, as the perception of which player is playing which note can become indiscernible during the rapid exchanges common to this type of improvisation.

All of these techniques provide the opportunity to add richness to a very simple form of improvisation. They serve to extend further the effects of dynamics, change the flow of tempo and enable the use of varying tone qualities, particularly those with high noise content. This uncomplicated form of improvising provides an ideal environment for integrating these techniques, as they are very effective in providing and maintaining attention and interest in the exchange between the performers.

Other Ecosonic Improvisational Structures

Countersinging is an idea developed by Stephen Preston and has been further developed practically through collaboration with the author. In this improvisation, interaction is based on a form of birdsong in which two individuals appear to engage in competition, each trying to outdo the other in order to demonstrate superiority. For improvisation, there are two types of countersinging, matched and un-matched. In the former, the objective is to copy the 'lead' player exactly. But there must be a measure of sensitivity when engaging in this kind of duel, as to lose the challenger can cause the improvisation to fall apart. At best it may finish prematurely or awkwardly and can cause the ending to appear unexpectedly and as a result it will sound ragged. One must be pragmatic about the use of difficult techniques, and be assured of the abilities of the other musician, or risk increasing the likelihood of losing the answering player. For improvisations based on un-matched countersinging the field of play for both performers is considerably more open, in so much as there is no concern for 'losing' the answering player; both protagonists are generally free as to whether or not to use or disregard the other player's material.

However, there are other tendencies to be avoided, such as that of progressing towards complexity too quickly, leaving nowhere to go, thus making for an abbreviated improvisation. It can be advantageous to build both complexity and intensity relatively

slowly, adding virtuosity gradually, unless one wishes to end the improvisation with a decisive sweep, in which case a sudden burst of virtuosity may win the contest. But the idea of defeating one's opponent quickly does not necessarily provide a desirable shape for improvising, although it does present an additional element of possibility and unpredictability. This form undoubtedly depends heavily on how matched in ability the performers are, and to a great extent on the mood of the players as to how an individual improvisation will play out. New techniques presented in this research provide a formidable arsenal for potential use in participating and ultimately winning the duels created in countersinging improvisations.

Within the context of the countersinging structure, all of the techniques presented in this research can be utilised. Generally speaking they can best be used to change the progression of complexity by adding different elements to the sonic palette. If only relying upon conventional technique, the shape of countersinging improvisation can be somewhat predictable, proceeding in a linear manner from relative simplicity, or a lower level of complexity and moving towards faster, more virtuosic quality of technique. Extended techniques provide an additional playing field on which to demonstrate technical and expressive prowess.

These techniques can also create contrast by drawing attention to, or back to, a specific player. Related to contrast are the perceived mood or identity of an individual player. In this way, individual techniques or groups of techniques and sounds can be tied to the expressive and/or technical identity of the player. For example, percussive attacks including the spit tongue can be used to imply an advanced level of aggression between the performers; this also potentially changes the course of typical virtuosic display (generally using quick finger movement) to a slower quality of motion in which focus is drawn to single notes rather than longer lines of quick movement. Whistle tones can suddenly affect a very soft dynamic and generally require a certain amount of duration to develop. This possible change in both dynamic and tempo, rather than the use of brash, loud, or fast progressions of sound, may be used to maintain the focus of the listener. Techniques such as these proffer a different kind of virtuosity from that of lightning-fast finger technique, offering the potential for considerable expressive range. In addition, sound-altering techniques such as whistle tones and multiphonics work well within the countersinging structure because players take turns, allowing an indeterminate amount of time (unless interrupted) for the preparation and execution of techniques that may not be produced with immediate predictability. In this structure there is ample time given for the development and integration of such sounds.

Audio Disc 4, Track 3 (live recording) shows that although the opening begins with a great deal of activity, some sense of simplicity is maintained by the limitation of a narrow tessitura. At 0:35, tonal alteration is employed, followed by the use of multiphonics at 1:35. When tonal alteration changes to whistle tones at 2:48, the other player negates this move by using tongue ram (2:57), covering completely the more delicate whistle tones and causing a change to percussive attacks in order to compete. This progresses to a maximum volume of sound by using roar at 4:00, and the improvisation ends soon after.

Audio Disc 4, Track 4 is a studio recording of countersinging, and again, it is to an extent intended as a demonstration. This form, in particular, benefits from interaction between the players and the audience, as the sense of competition is heightened. The opening uses spit tonguing, followed by some tonal alteration, using enough noise within the tone to almost create a multiphonic. This is followed by flutter tonguing, and exchanges of percussive attacks and quick flourishes of notes. At 0:32, more noise is added to the sound after spit tonguing, increasing the 'roughness'. The use of tongue strokes at 0:56 changes the flow of the improvisation, lowering the level of tension slightly, only to be raised again by the answer of the other player with rapid-fire conventional tonguing and a gradually rising pitch level. At 1:36, the flow is again slowed by the use of multiphonics, which require more duration for their development. But this change of flow is not maintained or answered by the other flautist, who instead replies with rapid, slurred notes. After this (2:04), spit tonguing, followed by tone with a high noise content, is used in answering, and the remainder of the improvisation is an exchange of much shorter alternation using percussive attacks and noise within the tone.

The form of improvisation called *omnia* is the least rigid of those discussed thus far. It more closely resembles solo improvisation than any other form, as any number of players can be used. Performers do not play simultaneously, but instead take turns playing in succession. The interaction comes from listening and possibly responding to the player who is performing at any given time, as well as listening to the surrounding environment, including the audience, any sounds of the venue (e.g. air conditioning, fluorescent lights buzzing, etc.) and any noise bleeding through from the outside, such as traffic noise. The listening focus is that of inclusive awareness, taking in all the sounds, not just those of the other musicians. The room and its occupants become tacit participants through their own movements that elicit sound; the performers have the choice of answering or being influenced by all sounds, those experienced before one plays and during each turn taken as the solo player.

This form of improvising is extremely open, particularly because there is no expectation of interaction of material between the players (although response-type

interaction between performers is possible and is not uncommon), and as there is no competition for audibility between the performers. One can choose to be influenced or not by the performance of the preceding player or any other sounds that have been perceived. As there is no struggle to be heard, techniques that may otherwise be lost because of a lack of potential volume can be used without prejudice, and consequently there can be a greater flexibility in their usage. Whistle tones and rapid tongue strokes especially can be heard without competing with other sounds, removing the possibility of being overpowered. Tone consisting entirely of noise or air sound can also be used, and at very low dynamic levels. This security of knowing that volume can be reduced to near silence (or indeed to complete silence) allows the performer to develop ideas using these very quiet techniques, and in doing so, also encourages an inclusiveness of perception, as other environmental sounds are more easily heard.

In addition to the advantage of clear audibility, there is also the advantage of the lack of predetermined duration for each player's contribution. Multiphonics in particular benefit from having no expectation of duration, and they can be very effective when allowed time to develop. Many multiphonics have an inherent instability which can be used to advantage when the player is able to allow instability and/or lack of predictability to be used as desired, without the pressures of timing constraints.

Audio Disc 4, Track 5 is a live performance of an *omniana* improvisation. The opening makes use of varied multiphonics, and is followed by short, soft, percussive *col legno*, cello sounds. At 2:14 the flute answers with equally soft whistle tones, carrying on the quietness initiated by the cello, but also alternating with spit tonguing (2:24), responding to the attacks which have preceded, then going on to alternate between conventional tone and stop-tonguing (2:36) or contained-air tonguing (2:40). Whistle tones then return (2:44) and gradually change to tones with a high noise content and then to conventional tone, ultimately leading to multiphonics at 3:06 and tongue strokes at 3:26. The cello responds by gradually increasing the level of activity, playing *sul ponticello*, and repeating the same note in succession on different strings, increasing the level of tension with *sul ponticello* double stopping. The flute responds with less tension, but responds to the cello's double stopping with the use of multiphonics at 5:36.

Other improvisational structures allow for similar integration of extended techniques. *Argument and Introspect* provide for the designation of mood based on sonic changes which can be identified or altered by the use of percussive attacks in alternation with calm, longer durations needed by tone-altering techniques, including multiphonics, each serving to clarify both the respective mood – either of argument or of introspect – and maintain the possibility of designating a particular sound to signal the change from

one to the other. These techniques may also embody the identity and individuality of players during the simultaneity of sounds, separating the sonic personifications of the performers.

Audio Disc 4, Track 6 is a live performance of an improvisation based on Argument and Introspect, showing how techniques such as roar and spit tongue, both attacking impulses, can link to comparable sounds used by the cello, through exchanges which can express a desired emotive idea. The different degrees of spit tongue approach many aspects of the sounds of the cello using *col legno*, *spiccato*, and *pizzicato* through the first section of the improvisation. At 2:19, the use of a multiphonic changes the mood once again back to introspection, signalling a turn away from the percussive attacks of the argumentative section, which are mirrored by cello double stopping.

Conclusion

Ecosonic improvisation not only provides an ideal opportunity for experimentation with, and the integration of, new techniques, but it allows them to be explored for their potential enrichment of improvisational structures. Additionally, it provides musicians with possibilities for finding a fertile musical outlet, allowing the use of these new techniques as well as enabling greater comfort with risk-taking. One of the principal tenets of ecosonic improvisation is that of communication, between the performers as well as with the audience. Ecosonic technique removes many of the technical limitations imposed by conventional fingering within a tonal system on the baroque flute. Cross-fingerings are no longer a concern, and there is no perceived expectation of 'right or wrong' with regard to sound, tone production or articulation, except with regard to appropriateness for supporting and sustaining the desired form and expressive content of a specific improvisation. The only limiting factors are those that are determined and implemented by the performers themselves. Thus there is a mutually beneficial relationship between extended techniques and ecosonic improvisation. Improvisations gain in diversity and range of expression by utilising new techniques; new techniques gain concrete and immediate expressive meaning within the context of ecosonic improvisations.

In Conclusion

As historical instruments have become assimilated into the modern performance world, audiences have gradually become accustomed to the differences in sound between 'old' instruments and their modern counterparts. The baroque flute is an ever more fully explored instrument, with modern copies being produced with increasing precision; through this process, it has arguably become a slightly different species from the original instruments of the past. The performance circumstances from previous centuries can never be fully and faithfully duplicated; our social structures and the fibre of everyday life have become far removed from earlier conceptions. It is the ideal time for the baroque flute to become fully fledged as a 'new, old' instrument. It possesses the rich history and resources of several centuries, and can in most cases, adapt not only to the rediscovery of historical ideas, but may also influence and utilise contemporary ideas.

The knowledge of historical precedent surrounding both tone and articulation (as well as general attitudes towards performance) are invaluable in providing a basis from which to proceed into new territory. It is advantageous to take into account the manner of playing for which the instrument was originally designed, the differences in attitude towards its perceived strengths and weakness, as revealing to us perceptions that may differ either in small or large degree from attitudes that are common today. These resources provide a foundation on which to build.

The practice of using extended techniques in conjunction with the conventional has a markedly positive affect on flute performance in general. The combined palette and added flexibility gleaned through the incorporation of both new and conventional techniques means that ultimately the two concepts are not held separate, but evolve into a single and fuller sonic resource. Further, it is the integration of new techniques into actual performance that shares and most fully realises their musical potential. The inclusion of these techniques into ecosonic improvisation and into newly composed works, such as *Less*, provides concrete illustration of this fulfilment.

By maintaining an open-minded attitude towards all facets of performance, a musician's understanding and potential are constantly evolving, just as musicians continually change in areas outside their musical life. The baroque flute continues to develop as a modern voice, and can be pushed further through inclusion within contemporary composition and improvisation. The situations described in this research are only the beginning of integration. Not all the techniques presented are included in *Less*, and greater use of multiphonics, varied articulation and tonal alteration are all still to be explored in depth through composed works. Amplification could also be explored,

allowing for increasingly subtle variations of sound and attacks that would otherwise be imperceptible. Ecosonic improvisation need not be the only improvisational circumstance in which these techniques are utilised, though it provides considerable possibility for further development. The addition of live electronic improvisation would also further expand the possibility for the integration of new techniques.

It is hoped that music-making in general can become ever more inclusive, that there will not be the discounting of any idea because it is considered anachronistic for a given instrument, and that our trend towards specialisation, which has been consistent through the last half century, might be changed to the opposite, so that the historical and contemporary performance worlds can coexist, complementing each other and creating a new whole, greater than its previously divided parts.

Appendix A

Quoted References in Original Languages

Page number in Thesis:

Page 26:

In general the most pleasing tone quality (*sonus*) on the flute is that which more nearly resembles a contralto than a soprano, or which imitates the chest tones of the human voice. You must strive as much as possible to acquire the tone quality of those flute players who know how to produce a clear, penetrating, thick, round, masculine, and withal pleasing sound from the instrument.

J. J. Quantz, *On Playing the Flute*, trans. E. R. Riley, 2nd edn (London: Faber & Faber Limited, 1985), p. 50.

Ueberhaupt ist auf der Flöte der Ton (sonus) der allergesälligste, welcher mehr einem Contralt als Sopran; oder welcher denen Tönen, die man ben dem Menschen die Bruststimme nennet, ähnlich ist. Man muß sich, so viel als möglich ist, bemühen, den Ton derjenigen Flötenspieler zu erreichen, welche einen hellen, schneidenden, dicken, runden, männlichen, doch dabem angenehmen Ton, aus der Flöte zu ziehen wissen.

J. J. Quantz, *Versuch einer Anweisung die Flöte traversière zu spielen* (Berlin, 1752; repr. with an introduction by Hans-Peter Schmitz, ed. Horst Augsbach, Kassel: Barenreiter, 2004), p. 41.

Page 27:

Because not all persons are fond of the same kind of tone, but differ amongst themselves in this matter; since one individual likes a strong, full sound, but at the same time not bright and ringing; another likes a strong and shrieking one; still another a thin, biting and sharp one, a fourth a thin and feeble sound, etc., it is therefore impossible to establish a tone-quality that can be recognised as beautiful in general. If the tone is clear, resonant and pleasing, it will indeed please the majority, but there will certainly be some who find something to censure about it here and there. This goes to show that tone is a matter of taste. I have often found that one person can think a tone beautiful while another cannot stand it. So it is difficult, if not quite impossible, exactly to define a sound which everyone considers beautiful. I say: the only model on which an instrumentalist should form his tone is a beautiful human voice; and as far as I am concerned a human voice that is beautiful is one that is bright, full and resonant, of masculine strength, but not shrieking; soft, but not hollow; in short, for me a beautiful voice is full of timbre, rounded, singing, soft and flexible.

J. G. Tromlitz, *The Virtuoso Flute Player*, trans. and ed. A. Powell (Cambridge: Cambridge University Press, 1991), p. 111.

Da nicht alle Menschen einerley Tonart lieben, sondern immer darinnen verschieden sind; denn einer liebet einen starken vollen, aber eben nicht hellen und klingenden; ein anderer einen starken und schreynenden; ein anderer einen dünnen, spikigen und scharfen; ein vierter einen dünnen und matten Ton, u.s.u., so kann man auch keine Tonart, die für allgemein schön anerkannt werden könnte, festsetzen. Wenn der Ton helle, klingend und gefällig ist, wird er zwar den meisten, aber doch gewiß nicht allen so gefallen, daß nicht hier und da etwas daran auszusehen senn sollte. Dieses beweiset, daß der Ton Geschmacks-Sache sen. Ich habe gar oft erfahren daß der eine einen Ton für schön hielt, den der andere nicht ausstehen könnte. Dabero ist es schwer, wo nicht gar unmöglich, den schönen Ton für einen jeden genau zu bestimmen. Ich sage: das einzige Muster, wornach der Instrumentist seinen Ton bilden müsse, ist eine schöne Menschenstimme; und nach meinem Gefühl, ist eine schöne Menschenstimme die, welche hell, voll und klingend, von männlicher

Stärke aber nicht kreischend; sanft, aber nicht dumpfig ist; kurz! Diejenige Menschenstimme ist für mich schön, die viel Metall hat, voll, singend und biegsam ist.

J. G. Tromlitz, *Ausführlicher und gründlicher Unterricht die Flöte zu spielen* (Leipzig, 1791), p. 109.

...On the flute too [as with the voice], a firm, healthy, full and masculine sound, neither too strong nor too weak, can be shaded at pleasure as to tone colour; one only has to know how to handle the instrument properly.

J. G. Tromlitz, *The Virtuoso Flute Player*, trans. and ed. A. Powell (Cambridge: Cambridge University Press, 1991), p. 114.

...Ein sester gesunder, voller und männlicher Ton der weder zu stark noch zu schwach ist, wird sich auch auf der Flöte nach Belieben schattiren lassen; wenn man nur mit dem Instrumente gehörig umzugehen weiß.

J. G. Tromlitz, *Ausführlicher und gründlicher Unterricht die Flöte zu spielen* (Leipzig, 1791), p. 112

Pages 30-31:

The tender (*dolce*), heartfelt, caressing character requires the absence of any roughness in sound, the greatest purity in tone production without any secondary noises.

J. R. Bailey, 'Maximilian Schwedler's "Flute and Flute-playing": Translation and study of late nineteenth-century German performance practice' DM diss., Northwestern University, 1987, p. 424.

Das Sanfte (dolce) Innige, Schmeichelnde verlangt abwesenheit jeder rauheit im Klange, größte Keinheit in der Tongebung ohne alle Nebengaräusche.

M. Schwedler, *Die Flöte und das Flötenspiel* (Leipzig: J. J. Weber, 1923; Frankfurt/Main: Zimmermann, 1982), p. 116.

The comic, ridiculous, even devilish (*infernale*) character can be given by conscious, abrupt and unexpected contrasts in register, tone color and tempo. Usually these are already written out in the piece. Making the lower notes rough and crude, the highest notes easy, and requires virtuosity and effort if technical insecurities are not to appear...

J. R. Bailey, 'Maximilian Schwedler's "Flute and Flute-playing": Translation and study of late nineteenth-century German performance practice' DM diss., Northwestern University, 1987, p. 424.

Das Komische, Lächerliche, auch Teufliche (infernale) kann durch absichtliche, schroffe und unerwartete Gegensätze in Tonhöhe, Klangfarbe und Tempo gegeben werden. Meist sind sie in dem Tonstücke schon vorgesehen. Die tiefen Töne rau und grob, die höchsten Töne scharf und gellend zu bekommen, ohne das Schönheitsmaß zu überschreiten, ist nicht leicht und erfordert, wenn nicht technische Unsicherheiten verkommen sollen, Virtuosität und Unstrengung...

M. Schwedler, *Die Flöte und das Flötenspiel* (Leipzig: J. J. Weber, 1923; Frankfurt/Main: Zimmermann, 1982), p. 116.

However, clarity alone will not suffice for an interpretive artist, who must above all cultivate a sympathetic understanding of the work to be performed. He will then realise that to avoid monotony, the quality of sound must not remain uniform, but must be in turn: energetic, moving, full, mellow, velvety or suave.

J. H. Altès, *Méthode complète de flûte* (Paris; Leduc, 1956). Vol. 2, p. 219.

Cependant, la netteté dans le jeu n'est pas suffisante à un artiste désireux de faire œuvre d'interprète, il faudra avant tout qu'il cherche dans son intelligence et dans sa sensibilité le caractère de l'œuvre à exécuter, et c'est alors qu'il s'apercevra, pour éviter la monotonie, que le timbre de sa sonorité devra pas rester uniforme, mais qu'il devra être tour à tour: énergique, pathétique, plein d'ampleur, mâle, velouté ou suave.

J. H. Altès, *Méthode complète de flûte* (Paris; Leduc, 1956). Vol. 2, p. 219.

The art of using different tone-colours as a means to express various moods and feelings (just as Impressionist painters used their palettes) is fast disappearing. It will soon belong to what is now referred to (with some degree of nostalgia, it seems), as the 'Golden Age'...

...Also, the admirable job done nowadays by flute manufacturers, who 'build in' tone colour, doesn't induce the modern flutist to make much effort in that direction.

The following exercises are excellent for developing a different sort of tone-colour, quite the opposite of what flutists normally try to achieve, i.e. a dark and penetrating sound-quality.

I don't propose to start a debate on which sound is *the* best!

Firstly, there isn't such a thing as the best...

Secondly, it is a combination (among other things) of three fundamental factors: the player's personal ability (both natural and acquired), his own taste, and the choice of an instrument with an *adequate mouthpiece*.

I would just like to point out that to have several means of expression at one's disposal is useful, and to study various aspects of flute tone will help to add infinite variety to the expression of feelings; human emotions as expressed in music are limitless!

L. Moyse, *Tone Quality on the Flute* (Paris: Leduc, 1991), p. 28.

L'art d'employer différentes colorations sonores comme moyen d'expression d'ambiances et de sentiments divers (à la manière dont les peintres impressionnistes utilisaient leur palette) est en train de disparaître rapidement et appartiendra bientôt à ce que l'on appelle désormais << l'Âge d'or >> (avec quel que nostalgie semble-t-il).

...Il est vrai que le travail admirable effectué par les facteurs de flûte actuels, qui << intègrent >> un timbre à l'instrument, n'incite guère le flûtiste moderne à faire d'efforts dans cette direction.

Les exercices qui suivent sont excellents pour développer différentes sortes de colorations, ce qui est à l'opposé de ce que les flûtistes essaient normalement d'acquérir, à savoir une qualité sonore sombre et pénétrante.

Je ne me propose pas d'ouvrir le débat sur le meilleur son!

Tout d'abord, il n'y a pas de meilleur son...

Ensuite, le beau son provient du mélange (entre autres choses) de trois éléments fondamentaux: les aptitudes personnelles (innées ou acquises) de l'interprète, son goût et le choix d'un instrument muni d'une embouchure adéquate.

Je voudrais simplement insister sur l'utilité de disposer de plusieurs moyens d'expression. L'étude des divers aspects de la sonorité de la flûte permet de varier à l'infini la manifestation des sentiments. Il n'y a pas de limites à l'expression des émotions humaines par la musique!

L. Moyse, *Tone Quality on the Flute* (Paris: Leduc, 1991), p. 28.

Pages 51-52:

The tongue is the means by which we give animation to the execution of the notes upon the flute. It is indispensable for musical articulation, and serves the same purpose as the bow-stroke upon the violin. Its use so distinguishes one flute player from another that if a single piece is played in turn by several persons, the differences in their execution frequently make the work almost unrecognizable. The majority of these differences rest upon the correct or incorrect use of the tongue. It is true that much also depends upon the fingers. They are necessary not only to fix the height or depth of each note and to distinguish intervals, but also to give each note its proper duration. The liveliness of the execution, however, depends less upon the fingers than upon the tongue. It is the latter which must animate the expression of the passions in piece of every sort, whatever they may be: sublime, gay or pleasing.

J. J. Quantz, *On Playing the Flute*, trans. E. R. Riley, 2nd edn (London: Faber & Faber Limited, 1985), p. 71.

Die Zunge ist eigentlich das Mittel, wodurch die Töne auf der Flöte lebhaft vorgetragen werden können. Sie ist zur musikalischen Aussprache höchst nöthig; und verrichtet eben das, was der Bogenstrich bei der Violine thut. Es unterscheidet sich da durch ein Flötenspieler von dem andern: so daß, wenn ihrer etliche ein Stück wechselsweise spielen, man dasselbe, wegen des unterschiedenen Vortrages, öfters kaum mehr kennen kann. Dieses rühret nun mehrentheils vom rechten oder unrechten Gebrauche der Zunge her. Es ist wahr, daß auch an den Fingern viel gelegen ist. Sie sind nicht nur nöthig, um die Höhe oder Tiefe jedes Tones zu bestimmen, und die Intervalle von einander zu unterscheiden; sondern auch, um jeder Note ihre gehörige Zeit zu geben. Sie können aber doch der Lebhaftigkeit des Vortrages nicht so behülslich seyn, als es die Zunge ist. Den diese muß den Ausdruck der Leidenschaften, in allen Stücken, er mag prächtig oder traurig, lustig oder annehmlich, oder wie er sonst wolle, seyn, beleben.

J. J. Quantz, *Versuch einer Anweisung die Flöte traversière zu spielen* (Berlin, 1752; repr. with an introduction by Hans-Peter Schmitz, ed. Horst Augsbach, Kassel: Barenreiter, 2004), p. 61.

Page 52:

...On close scrutiny you will notice that the tongue's movements when producing the notes form a species of syllables, and when they are combined, words, and finally a vocabulary*, [**eine Sprache*] which it is possible to apply universally according to a suitable system. Quantz has already dealt with this in his treatise on flute-playing. But since his whole essay about tonguing is based only on isolated bars, and not on whole [pieces], and so are just demonstrations for the pupil to be led through by a teacher who understands the subject, as he says himself, I will therefore try to provide here a written lesson which the pupil can use without the assistance of a teacher, for what is the point of a written instruction if a teacher is first needed to explain it? In that case it is better to take the teacher and put the book away...

J. G. Tromlitz, *The Virtuoso Flute Player*, trans. and ed. A. Powell (Cambridge: Cambridge University Press, 1991), p. 153.

...Ben genauer Untersuchung wird man bemerken, daß die Zunge durch ihre Beiriegungen ben Hervorbringung der Töne, eine Art von Selben und nach deren Zusammensezung, Wörter, und endlich einer Sprache bildet, die sich nach gehöriger Einrichtung überall anwenden läßt. Quanz hat davon schon in seiner Unweisung zum Flötenspielen gehandelt. Da aber sein ganzer Unterricht von der Zunge nur auf einzelne Sätze, und nicht aufs Ganze eingerichtet ist, also nur bloße Verfuche sind, die dem Schüler durch einen Lehrmeister der es versteht, bergebracht werden follen, wie er selbst sagt; so will ich hier verfachen, ob es nicht möglich sen einen schriftlichen Unterrricht zu liesem, welchen der Schüler ohne Berhülse eines Lehrmeisters nützen kann, denn wozu der schriftliche Unterrricht, wenn man erstlich einer Lehrmeister zu dessen Erklärung nötigg hat? also nimmt man lieber den Lehrmeister, und lästet Buch weg...

J. G. Tromlitz, *Ausfürlicher und gründlicher Unterricht die Flöte zu spielen* (Leipzig, 1791), p. 112.

Pages 59-60:

This tonguing should sound as softly as the second syllable 'de' for example, in speaking the word 'Beide', which serves very satisfactorily for the making of separate syllables. In many cases the expression can be further increased, as is indicated in the following example.

The correct articulation follows here of itself from the declamation of the words.

By means of the soft tonguing of the four notes Eb, D, C, and Bb of the first bar, as well as the notes D, C, Bb, and Ab of the third bar, there is given to the words 'ist bezaubernd schön', and 'kein Auge je gesehn', considerably more expression than if they were entirely slurred together.

T. Boehm, *The Flute and Flute Playing*, trans. D. C. Miller (New York: Dover 1964), 148-9.

Dieser Zungerstoss muss gerade so weich lauten, wie z.B. beim Ansprechen des Wortes "Beide", dei zweite Sylbe, "de" lautet, wodurch er sich ganz vorzüglich zur Bezeichnung einzelner Syllben eignet, und in vielen Fällen der Ausdruck gesteigert werden kann, wie aus folgendem Beispiel ersichtlich ist.

Es ergibt sich hier aus der Declamation der Worte die richtige Articulation von selbst.

Durch das weiche Anstossen der vier Noten eF, d, c, bF des ersten Tctes, erlangen die Worte: "ist bezaubernd schön", und "kein Auge je gesehn" gewiss mehr Ausdruck, als wenn sie sämtlich zusammen geschliffen werden.

T. Boehm, *Die Flöte und das Flötenspiel in akustischen, technischen und artistischer Beziehung* (Leipzig, 1881; Frankfurt/Main: Zimmermann, 1980), p. 21-22.

Page 60:

Further, it is evident that it is not allowable to slur any note over to the first note of the next measure, since it almost always happens that the note falling in the so-called strong part of the measure must be tongued, in order that the word depending upon it may receive its proper accent.

T. Boehm, *The Flute and Flute Playing*, trans. D. C. Miller (New York: Dover 1964), 149.

Ferner ist ersichtlich, dass keine Aufstreichs-Note auf die erste Note des nächstfolgenden Tactes hinübergeschliffen werden darf, sondern dass sie wie fast jede, auf einen sogenannten guten Tactheil fallende Note, angestossen werdenmuss, damit das zu Grunde liegende Wort seine erforderliche Betonung erhält.

T. Boehm, *Die Flöte und das Flötenspiel in akustischen, technischen und artistischer Beziehung* (Leipzig, 1881; Frankfurt/Main: Zimmermann, 1980), p. 22

Appendix B

Multiphonics

Introductory Information

The term ‘multiphonic’ is used to describe the production of two or more pitches simultaneously. Unlike the Boehm flute, which has been standardised so that all modern flutes are nearly identical with regard to the placement and tuning of the tone holes and mechanism (with only small variations thereof, none of which affect the overall temperament of the instrument), baroque flutes vary widely as to model and make. Each flute therefore behaves differently. This means that the following research should be regarded as a baseline of information; and in particular, pitch is likely to vary within gradations of a quarter-tone or less depending on the instrument and the individual player.

The research is based on two very different flute models. The main instrument is a four-joint Carlo Palanca flute in boxwood, *circa* 1750 by Martin Wenner. The other flute, used for comparison, is based on an earlier 18th-century instrument, a four-joint Thomas Lot flute in boxwood, *circa* 1730s by Folkers & Powell. The vast majority of multiphonics on the two flutes are identical to within a gradation of a quarter-tone or less. The most common difference between these two flutes is the viability of multiphonics in the top of the third register. The Lot flute, because it is of earlier make, has a considerably weaker and more difficult third octave. This means that a significant number of third octave multiphonics cannot be considered viable, or may simply be non-existent on flutes copied from earlier instruments.¹ When this is the case, an italicised comment is included stating that a particular entry differs in its characteristics, or indeed, does not exist on the Lot flute.

¹ The flute used here, a Thomas Lot copy is based on an instrument from approximately the 1730s. ‘Earlier’ instruments may be considered those copied from flutes made before 1750. This is a generalisation, as each flute is individual. Some early flutes may possess qualities more prevalent in later instruments and vice versa.

Classification

Multiphonics are classified according to several factors. The fingering is given first, accompanied by the resulting pitches and a brief description. The level of difficulty follows, and is quantified by the use of a number on a scale from one to five, where:

- 1 = Very stable, easy to produce, reliable
- 2 = Stable, generally easy to produce, relatively reliable
- 3 = Possible to produce stability with some difficulty, not consistently reliable
- 4 = Difficult to produce, low level of stability, unreliable
- 5 = Extremely difficult to produce, never immediately available or reliable

The second variable concerning the production of a multiphonic is whether it is possible to produce immediately at the outset of the attack. The immediacy of production is rated in the following way:

- 1 = Reliable immediate production at the onset of attack
- 2 = Greater than 50% chance of production at the onset of the attack
- 3 = At least a 50% chance of production at the onset of the attack
- 4 = Less than 50% chance of production at the onset of the attack
- 5 = Immediate production at the onset of attack is impossible and/or unpredictable

The third variable is the dynamic range. It is common for a multiphonic to be limited to narrow dynamic range, particularly in the second and third registers. The system of rating is described on a scale from *pp* to *ff*. Reference is sometimes made to 'ghost tones', which means that this tone is particularly weak, and most often so unstable that it cannot be produced at a louder level of dynamic.

All multiphonics are organised into two separate catalogues. The first covers all possible fingerings on the flute, and follows the ecosonic super-row.² The second catalogue is based on conventional fingerings shown in the tutor by Mahaut;³ both

² The ecosonic system is explained in Chapter 4, Section One, pp. 87-91.

³ Mahaut, *Nouvelle méthode*, p. 7.

catalogues are illustrated graphically, showing finger holes as a series of open or closed circles, as well as in textual form (eg. A-flat, second octave).

Notation

All multiphonics are notated with discretion as regards their enharmonic notation. Notes are shown as being sharp or flat according to their proximity in pitch to a given note using a conventional fingering. That is, if the sound of a given note that is a quarter-tone or smaller gradation is closer to the fully sharp rather than the fully flat note, then the appropriately similar designated notation will be related. The order of notation from sharpness to flatness is shown in Figures B.1 and B.2. Very small gradations of pitch are indicated with parentheses around the arrow indication of pitch tendency. Small vertical arrows in place of or beside a sharp or flat sign signify that the level of pitch is particularly flexible and the note can be placed higher or lower according to the desire of the player.

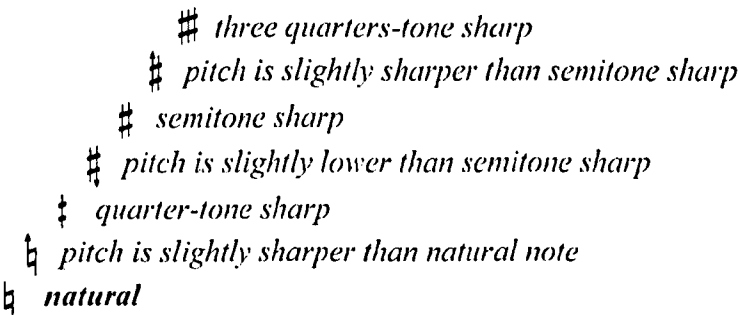


Figure B.1. Notation from natural to highest gradation sharp

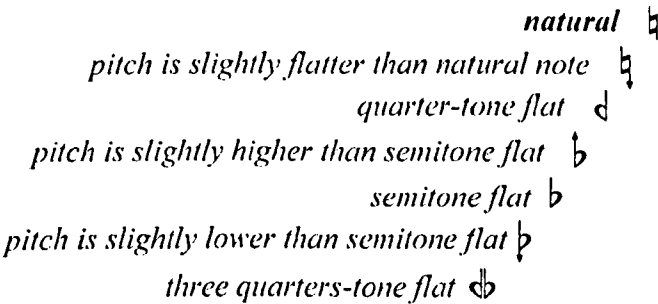


Figure B.2. Notation from natural to highest gradation flat

Contextual Usage

Specific discussion with regard to the integration of multiphonics and their contextual usage is discussed in Chapter 4, Section 2 within the piece *Less* and in Chapter 4, Section 3 within ecosonic improvisation. This research is meant to guide those wishing to compose for the instrument and shows, through conventional notation, the pitches that may be produced simultaneously by the use of a specific fingering. It still must be taken into account that there is a great deal of variation, generally within the breadth of a quarter-tone. Further, because of the nature of the instrument itself, the performer has, in most cases, a significant influence on the intonation of one or both pitches, based on embouchure placement and breath control. The free usage of multiphonics within ecosonic improvisation does not necessarily require a direct knowledge of specific pitches that may be produced, but can be informed by the location of the most flexible and reliable combinations of fingerings.

Ecosonic Catalogue

Multiphonics in this section are not organised by pitch, as the ecosonic system is not based on any tonal template. All fingerings are shown first without using the key, followed by the same fingering, with addition of the key.

Entries unique to the Thomas Lot flute are given in italics; if no italics are present within an entry (as is the case for the majority), this signifies that the results of both flutes are identical to within a gradation of a quarter-tone or less. Those entries that do not exist or are not viable because of extreme range (the upper third register) on the Lot flute are marked at the beginning of the comment with the following sign: §.

0 0 0 0 0 0 ● Zero without key, Audio Disc 2, Track 1

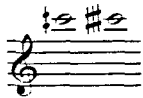


The upper tone can be more effectively produced by first playing the lower pitch, then pushing the lips forward very slightly; alternately one may roll the flute inward. At dynamics levels below mF, instability is greater.

Difficulty – 2

Immediacy – 3

Dynamic range – PP-FF



Simultaneity is very difficult; however, slurring slowly from one pitch to the other, particularly from the higher pitch to the lower is easier. This produces a sort of 'purring' effect from the closeness of pitch. At higher dynamic levels simultaneity becomes extremely difficult, though a tremolo may still be possible.

Difficulty – 2

Immediacy – 3

Dynamic range – PP-F



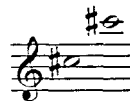
It is very difficult to maintain simultaneity. The most effective results are possible when air flow is minimal and the embouchure is as small as possible. This benefits from the introduction of noise into the tone. Lower dynamic levels produce more equality of the pitches; at higher levels, the upper pitch becomes more dominant making the lower apt to become a 'ghost' tone.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-F

0 0 0 0 0 0 0 Zero with key, Track 2



This can produce a perfect octave or can be made to create 'beats' by using different dynamic levels and through embouchure control. This becomes unstable at the extremes of dynamic.

Difficulty – 1

Immediacy – 2

Dynamic range – PP-FF



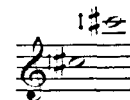
This is very unstable, particularly at extremes of dynamic; stability is only possible between P and F.

Difficulty – 3; *Lot* – 4

Immediacy – 3-4

Dynamic range – P-F

0 0 0 0 0 0 ● ● One without key, Track 3



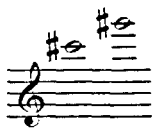
This is very stable and has good dynamic flexibility. There is a slight difference in the pitches of the two C#s, and one can produce 'beats' based on embouchure manipulation, more beats are produced at a low dynamic level unless special care is taken with the embouchure to maintain pitch.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF

One without key, cont'



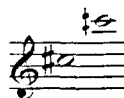
This is very difficult and unstable making simultaneity unpredictable; stability is easier to maintain at lower dynamic levels.

Difficulty – 3-4

Immediacy – 4

Dynamic range – PP-FF

One with key, Track 4



This is very unstable, best results are possible by beginning from the higher pitch and allowing the lower to bleed through. This can produce 'beats'.

Difficulty – 3; *Lot* – 1

Immediacy – 3; *Lot* – 1

Dynamic range – PP-FF



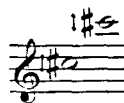
This is very difficult and benefits by beginning with the higher pitch and allowing the lower to bleed through. Stability is considerably more difficult to maintain at higher dynamic levels.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-F

Two without key, Track 5

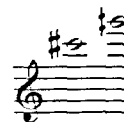


This is stable, and flexible. It generally produces a slightly imperfect octave, with prominent 'beats' of varying frequency depending on dynamic level and embouchure control.

Difficulty – 1

Immediacy – 3

Dynamic range – PP-FF



This is difficult and best results are possible by beginning with one pitch and allowing one or other of the pitches to bleed through at a very low dynamic level.

Difficulty – 3-4

Immediacy – 4

Dynamic range – PP-mF

Two with key, Track 6



The upper pitch is extremely weak and difficult to maintain. This is only viable at very low levels of dynamic, and requires duration to develop the upper pitch.

Difficulty – 3

Immediacy – 4-5

Dynamic range – PP-P

Two with key, cont'



This is very stable, with good dynamic flexibility. At very low levels of dynamic, it may revert to the upper pitch given above.
 Difficulty – 1
 Immediacy – 1-2
 Dynamic range – P-FF



The multiphonic can be immediate at the onset of attack, but is very difficult to maintain thereafter.
 Difficulty – 4
 Immediacy – 1-3
 Dynamic range – PP-F

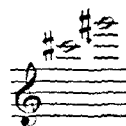


§ It is difficult to maintain simultaneity, but instability is manageable with very fine embouchure control. Equality of pitches is best at a dynamic level of mF or below.
 Difficulty – 3
 Immediacy – 2
 Dynamic range – PP-F

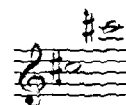
Three without key, Track 7



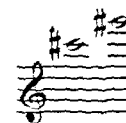
This is very stable and can produce 'beats' or a perfect octave depending on the dynamic level and by manipulation of the embouchure.
 Difficulty – 1
 Immediacy – 1-2
 Dynamic range – PP-FF



Three with key, Track 8

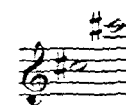


This is very stable, and can produce 'beats' or a perfect octave depending on the dynamic level and by manipulation of the embouchure.
 Difficulty – 1
 Immediacy – 1-2
 Dynamic range – PP-FF



This is quite difficult because both pitches tend to stabilise, making the simultaneity very difficult to maintain. Best results are attained at low levels of dynamic, using noise within the tone.
 Difficulty – 3; *Lot* – 4
 Immediacy – 2-3; *Lot* – 5
 Dynamic range – PP-F; *Lot* – F-FF

Four without key, Track 9



This is very stable, with good dynamic flexibility.
 Difficulty – 1
 Immediacy – 1
 Dynamic range – PP-FF

Four without key, cont'



The upper pitch is more stable and will tend to be stronger than the lower. It is difficult to maintain stability, particularly at higher levels of dynamic.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-F

○ ○ ○ ● ○ ○ ○ Four with key, Track 10

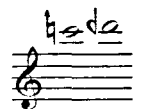


This is very stable and has good dynamic flexibility. It can produce 'beats' depending on dynamic level, or a perfect octave.

Difficulty – 1

Immediacy – 1; *Lot* – 2-3

Dynamic range – PP-FF; *Lot* – PP - *mf*

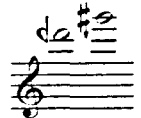


This is quite unstable, but both notes have good equality of strength; it is however, difficult to maintain simultaneity.

Difficulty: 1

Immediacy: 1-2

Dynamic range: PP-F



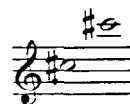
This is very unstable and it is extremely difficult to maintain simultaneity; best results are possible at a low level of dynamic and with an amount of noise within the tone.

Difficulty – 3-4

Immediacy – 3

Dynamic range – PP-F

○ ○ ○ ● ○ ● ● Five without key, Track 11

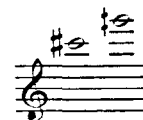


This is very stable, with excellent dynamic flexibility; 'beats' are possible depending on dynamic level and by manipulation of the embouchure.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



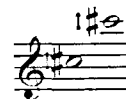
This is very unstable and it is difficult to maintain simultaneity, particularly at dynamic levels above *mf*.

Difficulty – 3-4

Immediacy – 3

Dynamic range – PP-F

○ ○ ○ ● ○ ● ○ Five with key, Track 12

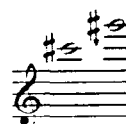


This is very stable and generally produces a perfect octave, though pitch level is flexible and it is possible to produce 'beats'.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



This is extremely difficult and unstable, requiring very fine embouchure control to achieve simultaneity. Instability is markedly increased above *mf*.

Difficulty – 4-5; *Lot* – 3

Immediacy – 4-5; *Lot* – 3

Dynamic range – PP-*mf*

0 0 0 ● ● 0 ● Six without key, Track 13



This is very stable and generally produces a perfect octave, though pitch level is flexible making it possible to produce 'beats'.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



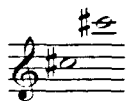
This is very unstable making it difficult to maintain simultaneity. Best results are possible at levels of dynamic of mP or below. Stability can also be increased by utilising significant noise within the tone.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-F

0 0 0 ● ● 0 0 Six with key, Track 14



This is very stable, with excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



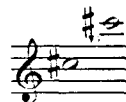
§ This is very difficult and unstable; best results are possible at a level of dynamic of mF or below, allowing the lower note to develop gradually.

Difficulty – 4-5

Immediacy – 4-5

Dynamic range – PP-F

0 0 0 ● ● ● ● Seven without key, Track 15



This is very stable, with good dynamic flexibility; it can produce 'beats' of varying speeds depending on dynamic level and embouchure control.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



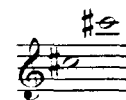
The upper pitch tends to be stronger. Stability is best at a dynamic level of mF or below; above this, the lower pitch is much weaker and maintaining simultaneity is considerably more difficult.

Difficulty – 2-3

Immediacy – 3-4

Dynamic range – PP-F

0 0 0 ● ● ● 0 Seven with key, Track 16

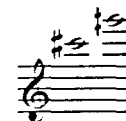


This is very stable, with excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



This is extremely unstable. Best results are possible either by using a low level of dynamic with noise within the tone, or by playing at a high dynamic and 'ghosting' the lower pitch, allowing for the greater duration necessary for the pitch to develop.

Difficulty – 3-4; *Lot* – 2-3

Immediacy – 3-4; *Lot* – 2-3

Dynamic range – PP-FF

○ ○ ● ○ ○ ○ ● Eight without key, Track 17



This is very weak and the upper note is unpredictable as this fingering presents extreme instability in the second register.

Difficulty – 3-4

Immediacy – 4-5

Dynamic range – PP-mP

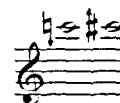


This is a difficult combination to 'find', a tight embouchure is best for maintaining simultaneity.

Difficulty – 3

Immediacy – 3

Dynamic range – mF-F

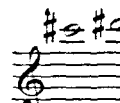


This is most effectively produced at low dynamic levels; at higher levels of dynamic, simultaneity is very difficult.

Difficulty – 2-3

Immediacy – 2-4

Dynamic range – PP-mP



This is best produced at low levels of dynamic with a very gentle air stream, but is generally very unstable and it is difficult to maintain simultaneity.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-mP



This is difficult as the high G# is always the strongest, most stable pitch, and other pitches are not always predictable, they are most easily produced by 'ghosting', either singularly or simultaneously.

Difficulty – 2-3

Immediacy – 2-3

Dynamic range – PP-FF

○ ○ ● ○ ○ ○ ○ Eight with key, Track 18



This is very difficult and extremely unstable. Stability is best at lower levels of dynamic.

Difficulty – 4

Immediacy – 3-5

Dynamic range – PP-mF



Stability is best at low levels of dynamic, maintaining simultaneity at higher dynamic levels is considerably more difficult.

Difficulty – 2-3

Immediacy – 1-4

Dynamic range – PP-mF



Stability is best at a dynamic level of mP or below; at higher levels, it becomes extremely difficult to maintain simultaneity.

Difficulty – 2-3

Immediacy – 3

Dynamic range – PP-mP

○ ○ ● ○ ○ ● ● Nine without key, Track 19



Stability is generally good, though control is slightly more difficult at high levels of dynamic.
 Difficulty – 2
 Immediacy – 2-3
 Dynamic range – PP-FF



This is very difficult, best results are possible at lower levels of dynamic.
 Difficulty – 4
 Immediacy – 5
 Dynamic range – PP-P



This is only viable at low levels of dynamic. It is difficult to predict which of the lower two pitches will be produced at the outset.
 Difficulty – 4
 Immediacy – 4
 Dynamic range – PP-P

○ ○ ● ○ ○ ● ○ Nine with key, Track 20



This has good stability and dynamic flexibility; produces strong 'beats'. *Lot: The upper pitch tends to be considerably flatter than that produced on the Palanca; and instability is also greater.*
 Difficulty – 2
 Immediacy – 2-3
 Dynamic range – PP-FF



This is generally easily sounded at the outset of the attack, but it is difficult to maintain simultaneity thereafter.
 Difficulty – 1
 Immediacy – 2
 Dynamic range – PP - F



This is extremely unstable and it is very difficult to maintain simultaneity; best results are possible at lower levels of dynamic.
 Difficulty – 3-4; *Lot* – 2
 Immediacy – 3
 Dynamic range – PP-mF

○ ○ ● ○ ○ ○ ● Ten without key, Track 21

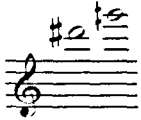


This can produce potentially prominent 'beats'. Strongest results are possible when employing 'edgy' tone with a tight, pulled-back embouchure.
 Difficulty – 1-2
 Immediacy – 3
 Dynamic range – PP-FF



It is very difficult to maintain simultaneity and sufficient duration is required to 'find' the D-sharp.
 Difficulty – 4
 Immediacy – 5
 Dynamic range – PP-mP

Ten without key, cont'



It is very difficult to maintain simultaneity and sufficient duration is required to 'find' the D-sharp.

Difficulty – 4

Immediacy – 5

Dynamic range – PP-mP



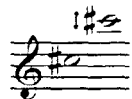
§ This is very difficult and unstable and can only be maintained at levels of dynamic between mF and F.

Difficulty – 4

Immediacy – 3

Dynamic range – mF-F

○ ○ ● ○ ● ○ ○ Ten with key, Track 22

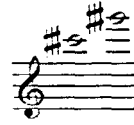


This can produce a perfect octave or can be made to produce 'beats' by either rolling the flute in or out, thus narrowing or widening the octave. Narrowing the octave is considerably less demanding, to widen the octave it is necessary to use a much higher dynamic level to produce a perceptible pitch alteration.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



This is very difficult to maintain; bleeding through from the higher pitch is easier than attempting to reach upwards from the lower note. Instability is increased at high levels of dynamic.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-FF

○ ○ ● ○ ● ● ● Eleven without key, Track 23



This produces strong beats, and either note can be made more or less dominant. Beats can only be partially controlled in frequency by manipulating the embouchure.

Difficulty – 1-2

Immediacy – 1-2

Dynamic range – P-F



This is very unstable and it is difficult to maintain simultaneity. Best results are possible at lower levels of dynamic. Above mP, one of the pitches will stabilise, making it necessary to 'ghost' the other pitch.

Difficulty – 3-4; *Lot* – 4-5

Immediacy – 4

Dynamic range – PP-F

Eleven without key, cont'



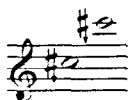
§ This is particularly unstable and it is difficult to maintain simultaneity. Best results are possible at a dynamic level between mP and mF; at higher levels, instability is greatly increased.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-F

○ ○ ● ○ ● ● ○ Eleven with key, Track 24



This easily produces a perfect octave and can be made to 'bear' very slowly if the flute is rolled in at higher levels of dynamic (F-FF).

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



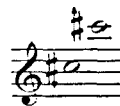
At levels of dynamic above *forte*, one of the two pitches will become ghostlike as the other will become prohibitively dominant and stable.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-F

○ ○ ● ● ○ ○ ● Twelve without key, Track 25

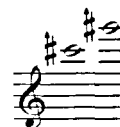


This is very stable and has good dynamic flexibility.

Difficulty – 1-2

Immediacy – 2-3

Dynamic range – mP-F



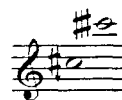
This is easiest to produce at lower levels of dynamic (mP – PP), but it can be maintained at up to *forte*, though it becomes less stable as the dynamic level is raised.

Difficulty – 2

Immediacy – 3

Dynamic range – PP-F

○ ○ ● ● ○ ○ ○ Twelve with key, Track 26



Quite stable, this can be made to produce faster or slower 'beats' depending on the position of the embouchure.

Difficulty – 2

Immediacy – 1-2

Dynamic range – P-F



This is very unstable and difficult; best results are possible at low levels of dynamic, with a very small embouchure. It is easier to produce if the upper pitch is allowed to be more prominent.

Difficulty – 3-4

Immediacy – 3

Dynamic range – PP-mP

○ ○ ● ● ○ ● ● Thirteen without key, Track 27



This is a slightly narrow octave and produces strong beats. It is generally quite difficult to maintain stability.
 Difficulty: 1
 Immediacy: 2
 Dynamic range: PP-FF



This is quite stable at lower levels of dynamic. It is easier to begin with upper note and 'bleed' downward rather than vice versa. Instability is markedly increased at higher levels of dynamic.
 Difficulty – 2-3
 Immediacy – 3
 Dynamic range – P-F

○ ○ ● ● ○ ● ○ Thirteen with key, Track 28

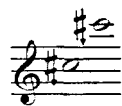


This is quite stable with good dynamic flexibility. It is possible to produce varying speeds of 'beats' or a perfect octave at higher dynamic levels.
 Difficulty – 2
 Immediacy – 2
 Dynamic range – P-FF

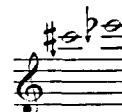


Particularly unstable, it is very difficult to maintain simultaneity.
 Difficulty – 4-5; *Lot* – 3
 Immediacy – 5
 Dynamic range – mP- FF

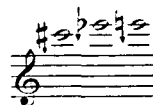
○ ○ ● ● ● ○ ● Fourteen without key, Track 29



A perfect octave is possible, or this can produce varying speeds of 'beats' depending on the position of the embouchure. It is very difficult to maintain stability, particularly at higher levels of dynamic.
 Difficulty – 2
 Immediacy – 2
 Dynamic range – PP-F

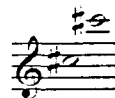


This is extremely difficult to 'find', and requires sufficient duration for both pitches to develop simultaneity.
 Difficulty – 4
 Immediacy – 5
 Dynamic range – P-mF



Best results are possible at low levels of dynamic. It is not possible to maintain simultaneity at a dynamic level above mF.
 Difficulty – 4
 Immediacy – 2
 Dynamic range – PP-mF

○ ○ ● ● ● ○ ○ Fourteen with key, Track 30



This is very stable and it is quite easy to maintain a perfect octave.
 Difficulty – 1
 Immediacy – 1
 Dynamic range – PP-FF

Fourteen with key, cont'



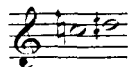
This is very unstable and difficult to maintain, especially when the lower note is made more prominent. Allowing 'bleed through' from the upper note is most effective in attaining simultaneity. Instability is markedly increased at dynamic levels above mP.

Difficulty – 3

Immediacy – 4

Dynamic range – P-F

○ ○ ● ● ● ● Fifteen without key, Track 31



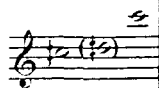
Best results are possible at lower levels of dynamic.

Simultaneity is very difficult to maintain at levels above mP.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-mF



The middle pitch tends to appear unpredictably as a 'ghost' and may be made slightly more prominent if given sufficient duration. At very low levels of dynamic (below mP) the lowest pitch may become the 'ghost' in favour of the middle.

Difficulty – 1

Immediacy – 2

Dynamic range – PP-FF

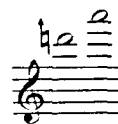


This is most stable at lower levels of dynamic, but it is possible to extend the dynamic range up to mF, though instability is greatly increased and simultaneity becomes difficult to maintain.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-mF



This is very unstable, and it is difficult to maintain simultaneity.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-mF

○ ○ ● ● ● ● ○ Fifteen with key, Track 32



It is quite easy to produce a perfect octave with excellent stability and dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



This is unstable and will tend to shift from one note to the other, as both pitches are particularly stable and strong. Best results are possible at dynamic levels of mF or below; at higher levels, instability is greatly increased.

Difficulty – 3

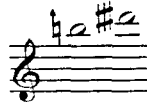
Immediacy – 3-4

Dynamic range – PP-F

○ ● ○ ○ ○ ○ ● Sixteen without key, Track 33



This is very unstable and difficult to maintain, simultaneity is only stable at low levels of dynamic.
Difficulty – 3; *Lot* – 2
Immediacy – 3-4
Dynamic range – P-mF; *Lot* – P - F

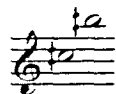


This is very unstable and one of the pitches will tend become dominant and prevent simultaneity at dynamic levels above mF.
Difficulty – 3
Immediacy – 2
Dynamic range – PP-mF; *Lot* – PP - F



§ This is very unstable and it is difficult to maintain simultaneity, particularly at higher levels of dynamic.
Difficulty – 3
Immediacy – 3
Dynamic range – PP-mF

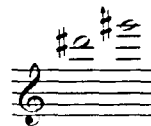
○ ● ○ ○ ○ ○ ○ Sixteen with key, Track 34



This is somewhat unstable at lower levels of dynamic, there is good stability and flexibility between mP and F; above this level, instability is greatly increased.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-F



Very unstable, best results are possible at lower levels of dynamic. Instability is markedly increased above mP.
Difficulty – 3
Immediacy – 4
Dynamic range – PP-mF

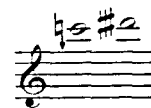


§ Stability is attainable between PP – mP only; at higher levels of dynamic, simultaneity is not possible.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-mP

○ ● ○ ○ ○ ○ ● Seventeen without key, Track 35

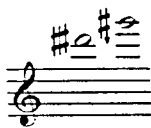


This is unstable and it is difficult to achieve and maintain simultaneity; requiring extremely fine embouchure control.
Difficulty – 3-4
Immediacy – 3-4
Dynamic range – PP-F



Both pitches have good equality of strength, though there is moderate instability. This becomes too unstable at higher dynamic levels.
Difficulty – 2-3
Immediacy – 2
Dynamic range – PP-mP

Seventeen without key, cont'



§
This is very difficult and stability is best at lower levels of dynamic while using some noise content within the tone.
Difficulty – 3
Immediacy – 3
Dynamic range – PP-F

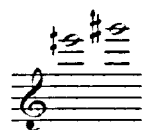
○ ● ○ ○ ○ ● ○ Seventeen with key, Track 36



This is unstable and benefits from using noise within the tone, particularly at dynamic levels above mP.
Difficulty – 1
Immediacy – 2
Dynamic range – PP-F



Higher levels of dynamic are not viable because the upper note will become completely dominant, preventing simultaneity.
Difficulty – 3
Immediacy – 2
Dynamic range – PP – mF



It is very difficult to achieve equality of strength between the two pitches; the lower pitch is considerably weaker, especially at higher levels of dynamic.
Difficulty – 3
Immediacy – 2
Dynamic range – PP-mF

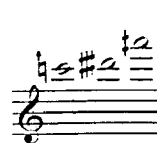
○ ● ○ ○ ● ○ ● Eighteen without key, Track 37



Generally very unstable, this can be made to produce slower or faster 'beats' depending on embouchure placement. At a very low dynamic level, a perfect octave can be produced.
Difficulty – 3
Immediacy – 3-4
Dynamic range – PP-F

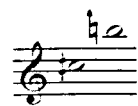


Stability is best at lower levels of dynamic, and very fine embouchure control is required. Instability is increased at higher levels of dynamic.
Difficulty – 2-3
Immediacy – 2
Dynamic range – PP-mF



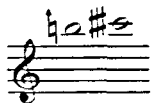
This is particularly difficult and unstable. Best results are possible at lower levels of dynamic and with some noise content within the tone.
Difficulty – 3
Immediacy – 3-4
Dynamic range – PP-mP

○ ● ○ ○ ● ○ ○ Eighteen with key, Track 38

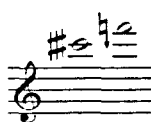


It is difficult to maintain simultaneity except at low levels of dynamic.
Difficulty – 1-3
Immediacy – 1-2
Dynamic range – PP-mP

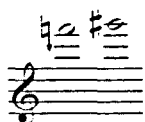
Eighteen with key, cont'



This is very difficult to maintain, and is only stable at very low levels of dynamic.
Difficulty – 3
Immediacy – 2-3
Dynamic range – PP-mP

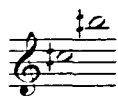


It is difficult to maintain simultaneity and is only viable at lower levels of dynamic.
Difficulty – 3
Immediacy – 2
Dynamic range – PP-mP

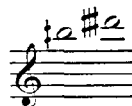


§ This is extremely weak and only possible when using a great deal of noise in the sound at a very low level of dynamic.
Difficulty – 3-5
Immediacy – 4-5
Dynamic range – PP-mP

● ● ● ● ● Nineteen without key, Track 39



This can be quite unstable, particularly at lower levels of dynamic.
Difficulty – 1-3
Immediacy – 1-3
Dynamic range – PP-F

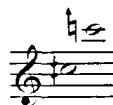


Stability is best at lower levels of dynamic; above mP, instability is markedly increased, but manageable.
Difficulty – 3
Immediacy – 2-3
Dynamic range – PP-F

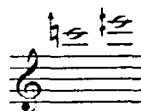


Stability is increased when there is a greater content of noise within the tone, especially at lower levels of dynamic.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-mF

● ● ● ● ● Nineteen with key, Track 40



Stability is extremely difficult to achieve in any measure. The rate of 'beats' produced can be affected by the placement of the embouchure. A perfect octave can also be produced.
Difficulty – 1-2
Immediacy – 1-2
Dynamic range – PP-FF



Very unstable, but stability increases at the lowest levels of dynamic. Stability is also increased when the lower note is 'ghosted' rather than given even strength.
Difficulty – 3
Immediacy – 3
Dynamic range – PP-F

Nineteen with key, cont'



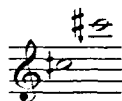
§
Very unstable, it is best when one note or the other is 'ghosted' within a low level of dynamic, particularly with noise within the tone.

Difficulty – 3

Immediacy – 4

Dynamic range – PP-F

○ ● ○ ● ○ ○ ● Twenty without key, Track 41

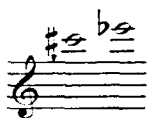


This is somewhat unstable, particularly at lower levels of dynamic. When the upper note is made flatter, a perfect octave is possible. 'Beats' are much more prevalent at higher levels of dynamic.

Difficulty – 1

Immediacy – 2

Dynamic range – PP-FF

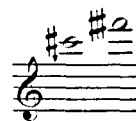


This is stable at the onset of the attack and directly after the attack. Maintaining stability is very difficult, and is increasingly difficult at higher levels of dynamic.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP - F

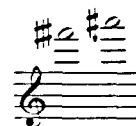


Best results are achieved at lower levels of dynamic, particularly when some noise is introduced into the tone. Instability increases at higher levels of dynamic, though stability can be improved somewhat by 'ghosting' the lower pitch.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP-F



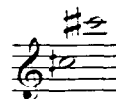
§
Very difficult and unstable, this becomes even less viable at higher levels of dynamic. Stability can be improved by introducing noise into the tone.

Difficulty – 3

Immediacy – 3

Dynamic range – P-FF

○ ● ○ ● ○ ○ ○ Twenty with key, Track 42



This easily produces strong 'beats', and does so particularly well at mid-level dynamics.

Difficulty – 1

Immediacy – 2

Dynamic range – PP-FF

Twenty with key, cont'



§
Difficult, due to the extreme range of the upper note, and requires a great deal of air. This benefits from the introduction of noise into the tone. Instability is markedly increased at higher levels of dynamic.
Difficulty – 3
Immediacy – 3
Dynamic range – PP-F

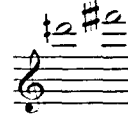
○ ● ○ ● ○ ● ● Twenty-one without key, Track 43



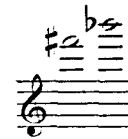
Either pitch can be made dominant. It is relatively stable once established and produces fast 'beats'.
Difficulty – 2
Immediacy – 3
Dynamic range – PP-FF



Both pitches tend to stabilise making simultaneity difficult. Compensation is possible by maintaining a lower level of dynamic, or by using a large embouchure in conjunction with greater air volume and much higher dynamic (up to F).
Difficulty – 2
Immediacy – 3
Dynamic range – PP-F



This is relatively stable once established, particularly at lower levels of dynamic. It is aided by the introduction of noise into the tone. Higher levels of dynamic require 'ghosting' of the lower note to maintain simultaneity.
Difficulty – 2
Immediacy – 3
Dynamic range – PP-F



§
This is very difficult and unstable; it is only possible to maintain simultaneity at lower levels of dynamic.
Difficulty – 3
Immediacy – 2-3
Dynamic range – PP-mF

○ ● ○ ● ○ ● ○ Twenty-one with key, Track 44



This generally produces a perfect octave or can be made to produce 'beats' by changing the embouchure, particularly at higher levels of dynamic.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF



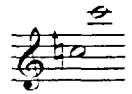
Difficult, this requires very fine control and extreme stability of the embouchure to achieve stability.
Difficulty – 3-4
Immediacy – 4
Dynamic range – P-F

Twenty-one with key, cont'



§
This is very difficult and requires an extremely small embouchure. Stability is best achieved when some noise is introduced into the tone.
Difficulty – 3
Immediacy – 3-4
Dynamic range – mP-F

○ ● ○ ● ● ○ ● Twenty-two without key, Track 45



This is quite stable and produces 'beats' of varying frequency based on the placement of the embouchure and by changing the level of dynamic.
Difficulty – 1
Immediacy – 2
Dynamic range – PP-FF



It is difficult to maintain stability, especially at extremes of dynamic. This requires extremely fine control and stability of the embouchure.
Difficulty – 4
Immediacy – 4
Dynamic range – P-F

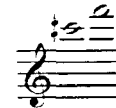


Though relatively stable, this is apt to produce a very high 'whistle' sound at lower levels of dynamic. The upper pitch tends to become dominant at higher levels of dynamic.
Difficulty – 2; *Lot* – 5
Immediacy – 1-2; *Lot* – 4
Dynamic range – P-F

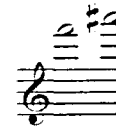
○ ● ○ ● ● ○ ○ Twenty-two with key, Track 46



This produces a perfect octave that is both stable and balanced. The lower pitch is easier to maintain as the dominant of the two.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF



This is difficult to establish and is very unstable, particularly at higher levels of dynamic.
Difficulty – 4
Immediacy – 4
Dynamic range – PP-mF



§
This is very difficult and unstable, best results are possible at lower levels of dynamic.
Difficulty – 3
Immediacy – 3-4
Dynamic range – P-mF

○ ● ○ ● ● ● ● Twenty-three without key, Track 47

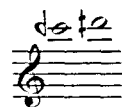


This produces 'beats' of varying frequency. Instability increases at higher levels of dynamic.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-F



There is very even strength between the two pitches, particularly at lower levels of dynamic. Instability becomes unmanageable at high levels of dynamic.

Difficulty – 1-2

Immediacy – 2

Dynamic range – PP-mF

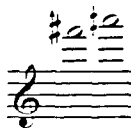


It is generally difficult to keep both pitches equal in strength; the higher pitch will tend to be stronger. This is only viable at low levels of dynamic.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-mP



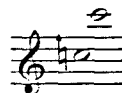
The higher pitch is stronger and at higher levels of dynamic, it will generally become too stabile, making simultaneity impossible.

Difficulty – 2-3; *Lot* – 5

Immediacy – 3; *Lot* – 4

Dynamic range – PP-mP; *Lot* – mP - mF

○ ● ○ ● ● ● ○ Twenty-three with key, Track 48

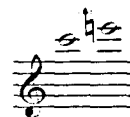


This is very stable and flexible, can be made to produce a perfect octave at high levels of dynamic.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



This can produce a strong difference tone. Immediacy can be improved when a breath attack is used instead of tonguing. Instability becomes unmanageable at high levels of dynamic.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-mF



Difficult, this requires extremely fine embouchure control and benefits from using some noise within the tone, particularly at high levels of dynamic. This can produce a very strong difference tone.

Difficulty – 4; *Lot* – 5

Immediacy – 3

Dynamic range – PP-FF; *Lot* – mF - F

Twenty-three with key, cont'



§
Barely viable, a very tight embouchure is required in conjunction with a high volume of air. Best results are possible at lower levels of dynamic. Instability increases at higher levels and benefits from using a marked amount of noise within the tone.
Difficulty – 4
Immediacy – 3
Dynamic range – mP-FF

○ ● ● ○ ○ ○ ○ Twenty-four without key, Track 49



This is very stable and can benefit from a less controlled, particularly wide embouchure.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF

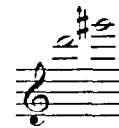


This is extremely unstable. The lower note is very stable and tends to dominate, making simultaneity markedly difficult. Particularly fine embouchure control is required at all levels of dynamic.
Difficulty – 4-5
Immediacy – 4
Dynamic range – PP-FF

○ ● ● ○ ○ ○ ○ Twenty-four with key, Track 50

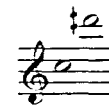


This is very stable and it is easy to maintain equality of pitches.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF

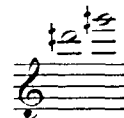


This is difficult because each pitch tends to stabilise; it is more predictable when the upper note is played first, introducing the lower pitch through 'ghosting'. Instability increases at higher levels of dynamic.
Difficulty – 2-3
Immediacy – 3
Dynamic range – PP-FF

○ ● ● ○ ○ ● ● Twenty-five without key, Track 51

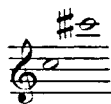


This is a very stable and good dynamic flexibility.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF



This is extremely unstable and requires significant duration to develop simultaneity and any measure of stability. It is aided by allowing a great deal of noise within the tone.
Difficulty – 5
Immediacy – 5
Dynamic range – PP-mP

● ● ● ● ● Twenty-five with key, Track 52



This is stable and has good dynamic flexibility. Instability is increased at lower levels of dynamic.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



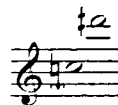
Very difficult, this benefits from some noise content within the tone; without the addition of some noise, one of the pitches will tend to stabilise making simultaneity impossible. Instability is increased at higher levels of dynamic.

Difficulty – 2-3

Immediacy – 2

Dynamic range – PP-FF

● ● ● ● ● Twenty-six without key, Track 53



This has good dynamic flexibility, but it is quite unstable making it difficult to maintain simultaneity.

Difficulty – 1-2

Immediacy – 1-2

Dynamic range – PP-FF



This is barely viable because of extreme instability. One or other of the pitches must be 'ghosted' to achieve simultaneity. Instability is unmanageable at levels of dynamic above mP.

Difficulty – 5

Immediacy – 5

Dynamic range – PP-mF

● ● ● ● ● Twenty-six with key, Track 54

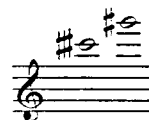


This is very stable and has good dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



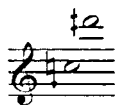
This is quite difficult and benefits from the introduction of noise into the tone; but it can be attained without the aid of noise given sufficient duration. Instability is greatly increased at high levels of dynamic.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-F

● ● ● ● ● Twenty-seven without key, Track 55



This is very stable and has good dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



This requires extremely fine embouchure control to maintain simultaneity.

Difficulty – 4

Immediacy – 4

Dynamic range – PP-FF

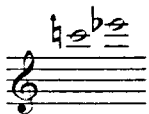
○ ● ● ○ ● ● ○ Twenty-seven with key, Track 56



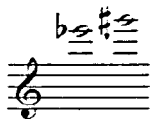
This is quite unstable. Stability in this register is only possible at lower levels of dynamic.
 Difficulty – 2
 Immediacy – 3
 Dynamic range – PP-mP



This is generally unstable, though stability can be increased at higher levels of dynamic.
 Difficulty – 2
 Immediacy – 3
 Dynamic range – mP-FF



This is quite unstable as one pitch or the other will tend to dominate, making simultaneity difficult. This is particularly true at higher levels of dynamic.
 Difficulty – 2
 Immediacy – 1-2
 Dynamic range – PP-mF

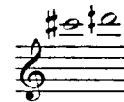


Very unstable, though stability is slightly improved when some noise is introduced into the sound. Instability increases at higher levels of dynamic.
 Difficulty – 3
 Immediacy – 4
 Dynamic range – PP-F

○ ● ● ● ○ ○ ● Twenty-eight without key, Track 57



This is quite stable, with good dynamic flexibility.
 Difficulty – 1
 Immediacy – 1
 Dynamic range – PP-FF



This is very unstable and simultaneity is particularly difficult to achieve. This is not viable at higher levels of dynamic.
 Difficulty – 4
 Immediacy – 4
 Dynamic range – PP-P



It can be difficult to 'find' this combination, as a higher partial can also be evident. Therefore it can require some duration to develop simultaneity.
 Difficulty – 3
 Immediacy – 3
 Dynamic Range – PP-mF



This is quite unstable and difficult to control. At higher levels of dynamic, simultaneity becomes impossible.
 Difficulty – 2
 Immediacy – 2
 Dynamic range – PP-mP

O ● ● ● O O O Twenty-eight with key, Track 58



This is stable, with good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF



§ This is very unstable, causing immediacy to be very unpredictable. Instability is increased at high levels of dynamic.
Difficulty – 5
Immediacy – 5
Dynamic range – P-mF

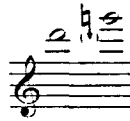


§ This is very difficult and unstable. Best results are possible at low levels of dynamic.
Difficulty – 3
Immediacy – 2
Dynamic range – PP-F

O ● ● ● O ● ● Twenty-nine without key, Track 59



This is very stable, with good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF

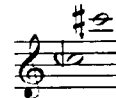


This is very difficult and unstable, though stability can be increased at very low levels of dynamic with some amount of noise within the tone. At higher levels of dynamic, the lower pitch will stabilise, making simultaneity impossible.
Difficulty – 4-5
Immediacy – 5
Dynamic range – PP-mP



§ This is very difficult and particularly unstable.
Difficulty – 4
Immediacy – 4-5
Dynamic range – PP-F

O ● ● ● O ● O Twenty-nine with key, Track 60

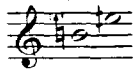


This is very stable with good dynamic flexibility.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF



Very unstable, this requires fine embouchure control to maintain simultaneity. At higher levels of dynamic, instability is greatly increased.
Difficulty – 3
Immediacy – 3
Dynamic range – PP-F

○ ● ● ● ● ○ ● Thirty without key, Track 61

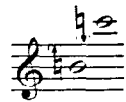


This is very unstable and best results are achieved when using a wide stream of air and a very relaxed embouchure. Simultaneity is not possible at higher levels of dynamic.

Difficulty – 2-3

Immediacy – 3-4

Dynamic range – PP-P

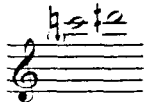


This is very stable once established and can produce strong 'beats'.

Difficulty – 2

Immediacy – 2

Dynamic range – P-FF



It is very difficult to maintain stability, and requires extremely fine embouchure control. At higher levels of dynamic, simultaneity becomes impossible to maintain.

Difficulty – 4

Immediacy – 4

Dynamic range – PP-mF



This is very difficult. Stability is best at lower levels of dynamic.

Difficulty – 4

Immediacy – 4

Dynamic range – PP-mF

○ ● ● ● ● ○ ○ Thirty with key, Track 62



This can be difficult to 'find' and may require significant duration to develop; it is only viable at low levels of dynamic.

Difficulty – 3; *Lot* – 4

Immediacy – 3-4; *Lot* – 5

Dynamic range – PP-P



This is very stable and flexible.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF

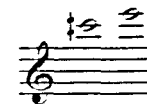


§ This is very unstable and is only viable at low levels of dynamic.

Difficulty – 5

Immediacy – 5

Dynamic range – PP-P



Barely viable, this is extremely unstable and difficult to maintain simultaneity for longer than a moment.

Difficulty – 4; *Lot* – 3

Immediacy – 4; *Lot* – 3

Dynamic range – PP-F

Thirty with key, cont'



§

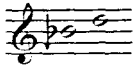
This is only viable when using a low dynamic level in conjunction with high air speed and a significant amount of noise within the tone.

Difficulty – 4

Immediacy – 4

Dynamic range – PP-mP

● ● ● ● ● ● Thirty-one without key, Track 63



A very gentle air stream is required. This is most easily maintained with some noise within the tone. At higher levels of dynamic, the lower pitch cannot be maintained.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-mP



This produces a stable, perfect octave; stability is considerably more difficult at the lowest range of dynamic.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



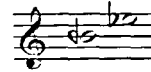
This is very unstable and requires extremely fine embouchure control to maintain simultaneity.

Difficulty – 3

Immediacy – 2

Dynamic range – PP-FF

○ ● ● ● ● ● ○ Thirty-one with key, Track 64



A very gentle air stream is required. At higher levels of dynamic, the lower pitch cannot be maintained.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-mP

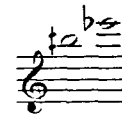


This is quite unstable and it is very difficult to control and maintain simultaneity. Instability increases at higher levels of dynamic.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-F

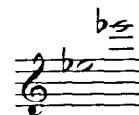


This is very unstable and it is difficult to maintain simultaneity. It is only viable at low levels of dynamic.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP-mP



Simultaneity at the exact moment of attack is unreliable. One must begin with a very brief moment on either note alone, then move to simultaneity.

Difficulty – 2

Immediacy – 4

Dynamic range – mF-FF

Thirty-one with key, cont'



This is very unstable and it is difficult to make the upper pitch speak. It can be produced given duration for development with a low dynamic level using noise within the tone.

Difficulty – 4

Immediacy – 4

Dynamic range – P-mP

● ○ ○ ○ ○ ○ ● Thirty-two without key, Track 65

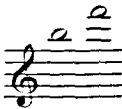


This can produce very prominent 'beats', the speed of which can be controlled to some degree with the embouchure. A perfect octave is also possible.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-FF



This is generally stable after some duration, which is required for the upper pitch to develop; this needs the introduction of noise to the tone for stability.

Difficulty – 3

Immediacy – 2

Dynamic range – PP-F



One of the two notes will tend to stabilise so some duration is required for the establishment of stability. Best results are possible at low levels of dynamic and with substantial noise within the tone.

Difficulty – 3

Immediacy – 2

Dynamic range – PP-mF



This is extremely unstable and immediacy is particularly difficult to predict.

Difficulty – 4

Immediacy – 5

Dynamic range – PP-FF

● ○ ○ ○ ○ ○ ○ Thirty-two with key, Track 66

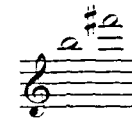


This produces very prominent 'beats', the speed of which can be controlled to some degree with the embouchure. A perfect octave is possible at low levels of dynamic.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-FF



Extremely difficult and unstable, it is only possible to produce this combination at a low level of dynamic, using a substantial amount of noise within the tone.

Difficulty – 4

Immediacy – 4-5

Dynamic range – PP-mP

Thirty-two with key, cont'



§

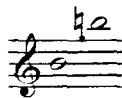
Extremely difficult and very unstable, this is most achievable at lower levels of dynamic using a considerable amount of noise within the tone.

Difficulty – 4-5

Immediacy – 4-5

Dynamic range – PP-mF

● ○ ○ ○ ○ ● ● Thirty-three without key, Track 67

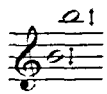


This is generally unstable and creates 'beats' unless specifically aiming not to.

Difficulty: 2

Immediacy: 2

Dynamic range: mP - F

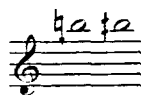


This can be made to produce 'beats' or a perfect octave at lower levels of dynamic. Instability is increased at higher levels of dynamic.

Difficulty – 1

Immediacy – 2

Dynamic range – PP-FF

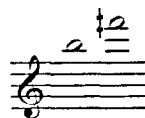


It is very difficult to maintain simultaneity for more than a moment, and is best produced at lower levels of dynamic.

Difficulty – 1

Immediacy – 2

Dynamic range - PP-mF



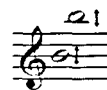
This can be quite unstable; best results are possible at low to medium levels of dynamic, as instability increases at higher levels.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-FF

● ○ ○ ○ ○ ● ○ Thirty-three with key, Track 68

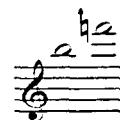


This can be made to produce prominent 'beats' or a perfect octave and is quite stable and flexible.

Difficulty – 1

Immediacy – 2

Dynamic range – PP-FF



Very unstable, best results for maintaining simultaneity are attained at low levels of dynamic with a considerable amount of noise within the tone.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-mP



§

This is very unstable and it is difficult to maintain simultaneity.

Difficulty – 3

Immediacy – 1-2

Dynamic range – PP-F

● ○ ○ ○ ● ○ ● Thirty-four without key, Track 69



Maintaining simultaneity is extremely difficult. This is only viable at very low levels of dynamic.
Difficulty – 3
Immediacy – 4
Dynamic range – PP-P

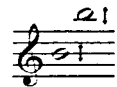


Maintaining simultaneity for more than a moment is extremely difficult. This is only viable at very low levels of dynamic.
Difficulty – 2
Immediacy – 1
Dynamic range – PP-mP



This is difficult and quite unstable, best results are possible at low to medium levels of dynamic.
Difficulty – 3
Immediacy – 3
Dynamic range – PP-F

● ○ ○ ○ ● ○ ○ Thirty-four with key, Track 70



This generally produces a slightly narrow octave and can produce very strong 'beats'.
Difficulty – 1
Immediacy – 2
Dynamic range – PP-FF

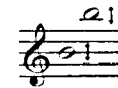


This is very unstable and requires fine embouchure control to maintain simultaneity.
Difficulty – 3
Immediacy – 3
Dynamic range – PP-FF

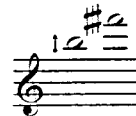


§ This is very unstable and it is extremely difficult to maintain simultaneity for any amount of time.
Difficulty – 3-4
Immediacy – 3
Dynamic range – PP-F

● ○ ○ ○ ● ● ● Thirty-five without key, Track 71



This is very stable and has good dynamic flexibility.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF

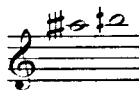


It is extremely difficult to maintain simultaneity. At lower levels of dynamic, stability is improved; at higher levels, the lower of the two pitches is best maintained by 'ghosting'.
Difficulty – 2
Immediacy – 2-3
Dynamic range – PP-F

● ○ ○ ○ ● ● ○ Thirty-five with key, Track 72



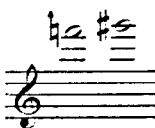
This is very stable and reliable. This generally produces prominent 'beats'.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF



This is only possible at extremely low levels of dynamic and with a very gentle air stream.
Difficulty – 3
Immediacy – 3-5
Dynamic range – PP only



Simultaneity is difficult to maintain at higher levels of dynamic. Stability is most easily achieved by first 'ghosting' the lower pitch, then gradually increasing its strength.
Difficulty – 3
Immediacy – 2-3
Dynamic range – PP-FF



§ This is very unstable and it is difficult to maintain simultaneity. Instability is greatly increased at higher levels of dynamic.
Difficulty – 4
Immediacy – 4-5
Dynamic range – PP-F

● ○ ○ ● ○ ○ ● Thirty-six without key, Track 73

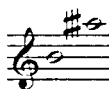


This is very unstable, but stability can be slightly improved by using a less focused air stream with a considerable amount of noise within the tone.
Difficulty – 2
Immediacy – 3-4
Dynamic range – PP-F



This can produce a clear difference tone. Stability becomes considerably more difficult at higher levels of dynamic and requires very fine embouchure control.
Difficulty – 2
Immediacy – 2-3
Dynamic range – PP-FF

● ○ ○ ● ○ ○ ○ Thirty-six with key, Track 74

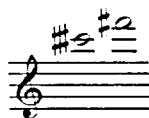


This is moderately unstable but not difficult to produce.
Difficulty – 2
Immediacy – 1-2
Dynamic range – PP-FF



§ Simultaneity is very difficult to maintain, particularly at higher levels of dynamic. It can be difficult to 'find' the upper pitch without considerable duration.
Difficulty – 3
Immediacy – 4-5
Dynamic range – PP-mF

Thirty-six with key, cont'



§
This is difficult to 'find'. The lower of the two pitches is particularly unstable. Best results are possible when a considerable amount of noise is used within the tone.
Difficulty – 3-4
Immediacy – 4-5
Dynamic range – PP-mF

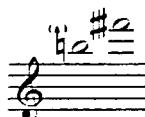


§
It is extremely difficult to maintain simultaneity, best results are possible at low levels of dynamic with a fast, unfocused air stream and a marked noise content within the tone.
Difficulty – 3-4
Immediacy – 4
Dynamic range – PP-mF

● ○ ○ ● ○ ● ● Thirty-seven without key, Track 75

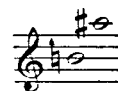


This is very stable with good dynamic flexibility.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF

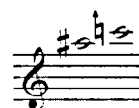


This can produce a clear difference tone. Instability increases at higher levels of dynamic.
Difficulty – 2
Immediacy – 2-3
Dynamic range – PP-FF

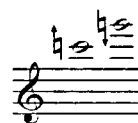
● ○ ○ ● ○ ● ○ Thirty-seven with key, Track 76



This is very unstable and it is extremely difficult to maintain simultaneity.
Difficulty – 3-4
Immediacy – 4-5
Dynamic range – PP-mF

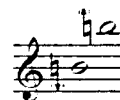


This can only be produced at low levels of dynamic.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-mP



It is extremely difficult to produce equal strength in both pitches, the higher will tend to be stronger. Stability is very difficult to maintain.
Difficulty – 2-3
Immediacy – 4
Dynamic range – PP-mF

● ○ ○ ● ● ○ ● Thirty-eight without key, Track 77



Stable and flexible, this can be made to produce 'beats' of varying frequency. A perfect octave is possible at higher levels of dynamic.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF

Thirty-eight without key, cont'



Stability is best maintained at lower levels of dynamic. In addition, the higher of the two pitches is much more stable than the lower, making it effective to allow the lower pitch to be a 'ghost' tone.

Difficulty – 2-3

Immediacy – 2

Dynamic range – PP-FF

● ○ ○ ● ● ○ ○ Thirty-eight with key, Track 78



This is quite stable and produces very fast 'beats'.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



The lower of the two pitches will tend to be softer due to its greater instability, except at the lowest levels of dynamic.

Difficulty – 2

Immediacy – 3-4

Dynamic range – PP-F



§

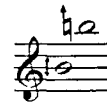
This is extremely difficult and unstable. It is only viable at lower levels of dynamic with considerable noise content within the tone.

Difficulty – 5

Immediacy – 4-5

Dynamic range – PP-mp

● ○ ○ ● ● ● Thirty-nine without key, Track 79

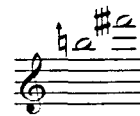


This can produce a perfect octave, or can be made to generate 'beats' by manipulating the embouchure.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



It is difficult to maintain simultaneity, to do so requires very fine embouchure control.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP-FF

● ○ ○ ● ● ● ○ Thirty-nine with key, Track 80

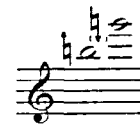


This is stable and can be made to produce 'beats' of varying frequency. A perfect octave is possible at high levels of dynamic.

Difficulty – 1

Immediacy – 2

Dynamic range – PP-FF



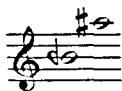
It is very difficult to maintain simultaneity and requires very fine embouchure control, particularly at higher levels of dynamic.

Difficulty – 2-3

Immediacy – 3

Dynamic range – PP-FF

● ○ ● ○ ○ ○ ● Forty without key, Audio Disc 3, Track 1

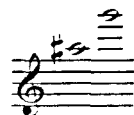


It is very difficult to maintain simultaneity and best results are possible with some noise content in the tone, or by using a low dynamic level.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-mF



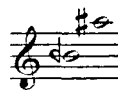
It is very difficult to maintain simultaneity, as both pitches are very stable alone and one will tend to dominate to the detriment of the other.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-FF

● ○ ● ○ ○ ○ ○ Forty with key, Track 2

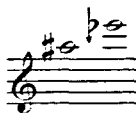


It is very difficult to maintain simultaneity because both pitches tend to stabilise. The introduction of some noise content to the tone is required to maintain viability at high levels of dynamic.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP-FF



This is very unstable and it is difficult to maintain simultaneity; best results are possible at low to medium levels of dynamic.

Difficulty – 2

Immediacy – 2

Dynamic range – PP - F



This is barely viable. A great deal of noise within the tone is necessary, and some duration may be required for both pitches to develop coherence.

Difficulty – 3

Immediacy – 3

Dynamic range – PP - F



It is difficult to maintain simultaneity, but can benefit by using noise within the tone, particularly at higher levels of dynamic.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP-FF

● ○ ● ○ ○ ● ● Forty-one without key, Track 3



This produces strong 'beats' and is quite unstable.

Difficulty – 2

Immediacy – 3-4

Dynamic range – PP-F



It is very difficult to maintain simultaneity and best results are possible at low levels of dynamic. At higher levels, one of the pitches will tend to stabilise making simultaneity impossible.

Difficulty – 3-4

Immediacy – 3-4

Dynamic range – PP-mP

Forty-one without key, cont'



This is generally stable once established. It can require some duration to develop both pitches. At higher levels of dynamic, instability is increased.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-mF



This is relatively stable, but it requires fine embouchure control to maintain simultaneity. At higher levels of dynamic, instability is greatly increased.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-mF

● ○ ● ○ ○ ● ○ Forty-one with key, Track 4

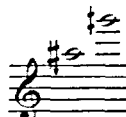


It is difficult to maintain stability because both pitches tend to stabilise alone. At levels of F or above, a great deal of noise must be used within the tone to maintain simultaneity.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-FF



Both pitches are very stable alone. This causes moderate difficulty in maintaining simultaneity.

Difficulty – 1-2

Immediacy – 2

Dynamic range – PP-FF

● ○ ● ○ ● ○ ● Forty-two without key, Track 5



The lower pitch tends to dominate, making simultaneity difficult. An increase in air speed with a relaxed embouchure aids stability. At higher levels of dynamic, instability becomes unmanageable and the upper pitch will change to the next higher pitch (shown below).

Difficulty – 2

Immediacy – 2

Dynamic range – PP-mF

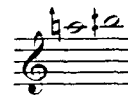


This is relatively stable and produces strong 'beats' and can be made faster or slower through embouchure manipulation. Instability is increased at the extremes of dynamic.

Difficulty – 1-2

Immediacy – 2

Dynamic range – mP-FF



This is very unstable and is only possible to maintain stability at low levels of dynamic.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-mP

Forty-two without key, cont'



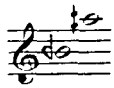
Both pitches are stable singly, making simultaneity very difficult to achieve. Best results are possible when the higher pitch is sounded first, then introducing the lower as a 'ghost' and gradually building strength.

Difficulty – 3; *Lot* – 2

Immediacy – 4-5; *Lot* – 3

Dynamic range – PP-FF

● ○ ● ○ ● ○ ○ Forty-two with key, Track 6



This is very stable, with good dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



The upper pitch tends to be dominant. Best results are possible at lower levels of dynamic. At higher levels, instability becomes unmanageable.

Difficulty – 2

Immediacy – 2 – 3

Dynamic range – PP-F



This is very unstable and it is difficult to achieve simultaneity except at lower levels of dynamic. Using an increased amount of noise and/or additional volume/speed of air is also beneficial.

Difficulty – 4

Immediacy – 2-3

Dynamic range – PP-mF

● ○ ● ○ ● ● ● Forty-three without key, Track 7

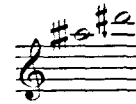


This is stable and has very good dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-F



§

The upper pitch will tend to be more dominant, making it difficult to equalise strength between the pitches.

Difficulty – 4

Immediacy – 3-4

Dynamic range – PP-F



§

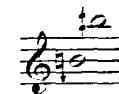
It can be difficult to predict which of the two lower pitches will occur from the outset. Duration is required to 'find' one of the lower pitches. Brief moments of simultaneity of all three pitches are possible.

Difficulty – 2

Immediacy – 3-4

Dynamic range – PP-mF

● ○ ● ○ ● ● ○ Forty-three with key, Track 8



This is relatively stable, although the lower pitch tends to be quite weak. Dynamic range can be extended to F if a substantial amount of noise is added to the tone.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-mF

Forty-three with key, cont'



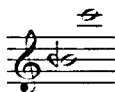
Quite stable, although the lower pitch tends to be the weaker of the two; greater equality can be achieved if a substantial amount of noise is added to the tone.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-FF

● ○ ● ● ○ ○ ● Forty-four without key, Track 9

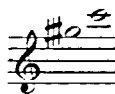


This is very stable and has good dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



This is very unstable and generally requires substantial duration at a low dynamic level to be viable.

Difficulty: 2

Immediacy: 4

Dynamic range: PP-mP



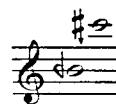
Somewhat unstable, this requires extremely fine embouchure control to maintain simultaneity, particularly at higher levels of dynamic.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP-F

● ○ ● ● ○ ○ ○ Forty-four with key, Track 10



This is very stable and flexible throughout dynamic range. * *The Lot flute also adds a third possible note: A-natural between these two pitches, which can be sounded (though unpredictably) simultaneously with the other two.*

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



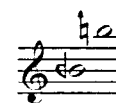
§ Extremely unstable, the embouchure must be very tight and controlled. Stability can be somewhat improved by greater air speed and the addition of noise to the tone.

Difficulty – 3-4

Immediacy – 3-4

Dynamic range – PP-FF

● ○ ● ● ○ ○ ● Forty-five without key, Track 11

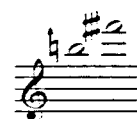


This is quite stable and produces strong 'beats', the frequency of which can be changed by manipulating the embouchure.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



This is somewhat unstable, but it is possible to attain good dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF

● ○ ● ● ○ ● ○ Forty-five with key, Track 12

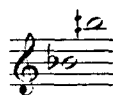


This is very stable with good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF



Achieving simultaneity is usually quite difficult. A very small and highly controlled embouchure is helpful in improving stability.
Difficulty – 3
Immediacy – 2-3
Dynamic range – PP-FF

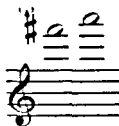
● ○ ● ● ● ○ ● Forty-six without key, Track 13



This is very stable with good dynamic flexibility.
Difficulty – 1
Immediacy – 1
Dynamic range – PP-FF

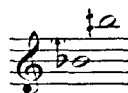


The higher pitch tends to be much stronger and will stabilise without very fine embouchure control, this makes it difficult to maintain simultaneity.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-FF



§ Barely viable, this is only possible with great effort. This is extremely difficult and unreliable.
Difficulty – 5
Immediacy – 5
Dynamic range – mF-FF

● ○ ● ● ● ○ ○ Forty-six with key, Track 14



This is quite stable and has good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF

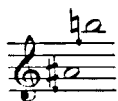


This is very difficult and unstable; it requires substantial duration to develop simultaneity.
Difficulty – 4
Immediacy – 4-5
Dynamic range – P - mF



§ This is very unstable and it is difficult to maintain simultaneity for any amount of time.
Difficulty – 3
Immediacy – 3-4
Dynamic range – PP-F

● ○ ● ● ● ● ● Forty-seven without key, Track 15

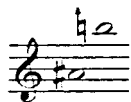


This is very stable and has good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF



This is somewhat unstable, particularly at higher levels of dynamic. The higher pitch tends to be dominant. Improved equality of strength for both pitches is possible only at lower levels of dynamic.
Difficulty – 2
Immediacy – 2-3
Dynamic range – PP-mF

● ○ ● ● ● ● ○ Forty-seven with key, Track 16



This is stable and has good dynamic flexibility. Instability increases at higher levels of dynamic.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-F

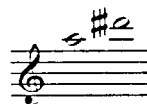


This is very unstable and unpredictable, but stability can be improved somewhat by adding noise to the tone.
Difficulty – 4
Immediacy – 3-4
Dynamic range – PP-FF

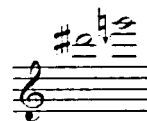
● ● ○ ○ ○ ○ ● Forty-eight without key, Track 17



This is somewhat unstable, but is not difficult to produce. The pitch of both notes is variable based on the shape of the embouchure and the dynamic level. It can also produce strong 'beats' of varying frequency.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-FF

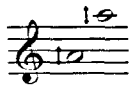


This is markedly unstable except at very low levels of dynamic, when stability is moderate. Stability is further improved when noise is used in the tone. Higher levels of dynamic are possible, but stability is marginal.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-mF



§ This is very unstable and unpredictable; some improvement is possible by using a low dynamic level with the addition of noise to the tone.
Difficulty – 3-4
Immediacy – 4
Dynamic range – PP-mF

● ● ○ ○ ○ ○ ○ Forty-eight with key, Track 18



This is somewhat unstable, but not difficult to produce. The pitch of both notes is variable based on the shape of the embouchure and the dynamic level. It can produce 'beats' of varying frequency.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-FF

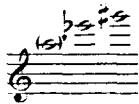


Best results are possible when adding a substantial amount of noise to the tone. Instability is greatest in mid-level dynamics.

Difficulty – 3

Immediacy – 2-4

Dynamic range – PP-FF



§ This is limited to dynamic levels of mF or lower, as the topmost pitch will become dominant, disallowing the others. The A is, at best, a 'ghost' tone which is not always present, and is never equal with the other two in strength except at extremely low dynamic levels and with a high noise content within the tone.

Difficulty – 4

Immediacy – 3

Dynamic range – PP-mF

● ● ○ ○ ○ ● ● Forty-nine without key, Track 19



This is somewhat unstable, but not difficult to produce. The pitch of both notes is variable based on the shape of the embouchure and the dynamic level. It can produce 'beats' of varying frequency.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-FF

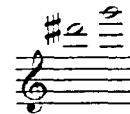


This is very unstable, particularly at higher dynamic levels. Best results are possible at lower levels of dynamic. FF is possible, but it is extremely unstable and difficult to maintain.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-FF



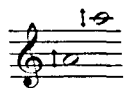
§ This is extremely difficult, unstable, and unpredictable. It is viable only if given significant duration to allow both pitches to develop.

Difficulty – 5

Immediacy – 5

Dynamic range – PP-F

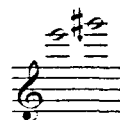
● ● ○ ○ ○ ● ○ Forty-nine with key, Track 20



This is somewhat unstable. The pitch of both notes is variable based on the embouchure and the dynamic level. This produces strong 'beats' of varying frequency.
Difficulty – 2
Immediacy – 2
Dynamic range – PP-FF

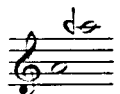


This is particularly unstable and immediacy is markedly unpredictable.
Difficulty – 3
Immediacy – 4-5
Dynamic range – PP-FF



§ This is particularly unstable and it is very difficult to predict immediacy. Using noise within the tone can increase stability.
Difficulty – 4
Immediacy – 4
Dynamic range – PP-FF

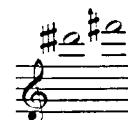
● ● ○ ○ ○ ● Fifty without key, Track 21



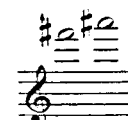
This is quite stable and has good dynamic flexibility. It produces strong 'beats' of varying rapidity, based on the embouchure and dynamic level.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF



Stability is best at a dynamic level of mP or less; above this level of, the higher pitch will be decidedly stronger and instability is increased.
Difficulty – 2
Immediacy – 1-3
Dynamic range – PP-FF

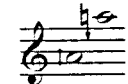


§ Stability is best at mP or less as above this level, the higher pitch will be decidedly stronger and instability is increased.
Difficulty – 2
Immediacy – 1-3
Dynamic range – PP-FF



§ This is very difficult and unpredictable. Best results are possible at low levels of dynamic with considerable noise content within the tone. High levels of dynamic are possible only with a very low level of stability.
Difficulty – 4-5
Immediacy – 3
Dynamic range – PP-FF

● ● ○ ○ ○ ○ Fifty with key, Track 22



This is quite stable at lower levels of dynamic and has good flexibility, though instability is markedly increased at the highest levels of dynamic.
Difficulty – 2
Immediacy – 1-3
Dynamic range – PP-FF

Fifty with key, cont'



This requires very fine embouchure control to maintain simultaneity. Above a dynamic level of F, instability becomes unmanageable.
 Difficulty – 2-5
 Immediacy – 1-3
 Dynamic range – PP-F

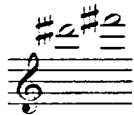
● ● O O ● ● ● Fifty-one without key, Track 23



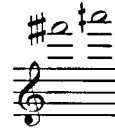
This is very stable and has excellent dynamic flexibility. Above a level of FF it is only marginally viable without over-blowing to the second register.
 Difficulty – 1
 Immediacy – 1-2
 Dynamic range – PP-FF



This is quite difficult to attain and it is extremely difficult to maintain simultaneity, particularly at higher levels of dynamic.
 Difficulty – 3-4
 Immediacy – 3
 Dynamic range – PP-F



§ Very difficult to attain, best results are possible at low levels of dynamic using noise within the tone.
 Difficulty – 4
 Immediacy – 3-4
 Dynamic range – PP-mF

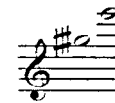


§ This is very difficult and unstable. It benefits from using some noise within the tone.
 Difficulty – 4
 Immediacy – 4
 Dynamic range – PP-mF

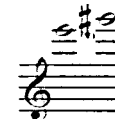
● ● O O ● ● O Fifty-one with key, Track 24



Simultaneity is only possible at mF or less, and a strong difference tone can be present.
 Difficulty – 2
 Immediacy – 2-3
 Dynamic range – PP-mF



This is somewhat unstable and immediacy is unpredictable, particularly at higher levels of dynamic.
 Difficulty – 2
 Immediacy – 1-4
 Dynamic range – PP-F



§ This is barely viable and is usually accompanied by a loud, high-pitched 'whistle' within the sound. Stability is decreased even more at dynamic levels above mF.
 Difficulty – 4-5
 Immediacy – 5
 Dynamic range – P-mF

● ● ○ ● ○ ○ ● Fifty-two without key, Track 25



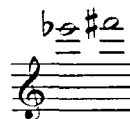
It is difficult to maintain simultaneity. Best results are possible when using noise within the tone at lower levels of dynamic.
Difficulty – 2-3
Immediacy – 2-3
Dynamic range – PP-F



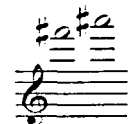
This is very difficult to 'find', but once it is established, it can become relatively stable. This is viable only at low levels of dynamic.
Difficulty – 4
Immediacy – 4-5
Dynamic range – PP-mP



§ This is quite stable as long as the embouchure remains perfectly stable. Altering the embouchure for any reason (e.g. dynamic change) increases instability greatly. This can produce a weak difference tone.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF

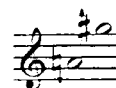


This often requires significant duration to allow the lower pitch to develop. Once established, stability is generally good. A low level of dynamic is required to prevent the higher pitch from becoming dominant, causing the lower pitch to disappear.
Difficulty – 3
Immediacy – 3-4
Dynamic range – PP-mP



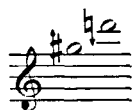
§ Barely viable, this is extremely difficult and unstable.
Difficulty – 4-5
Immediacy – 5
Dynamic range – mP-F

● ● ○ ● ○ ○ ○ Fifty-two with key, Track 26



It is difficult to maintain stability. Best results are possible when using noise within the tone at lower levels of dynamic.
Difficulty – 2-3
Immediacy – 2-3
Dynamic range – PP-F

Fifty-two with key, cont'



This is very unstable and difficult to 'find'; this is viable only at lower levels of dynamic.

Difficulty – 4

Immediacy – 4-5

Dynamic range – PP - mP

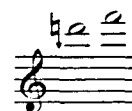


§ Best results are possible at levels of dynamic below F. At F or above, the higher pitch will completely dominate, making simultaneity impossible.

Difficulty – 2-3

Immediacy – 2-3

Dynamic range – PP-mF



This can require significant duration to develop stability and requires a low dynamic level.

Difficulty – 4

Immediacy – 5

Dynamic range – PP - mP



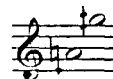
§ This is very difficult and unpredictable; embouchure control must be extremely fine. At low levels of dynamic a degree of noise within the tone is necessary for simultaneity. It is more useful if allowed to 'pulse' between the two pitches at will. Best results are possible at levels of dynamic below F.

Difficulty – 4

Immediacy – 5

Dynamic range – PP-mF

● ● 0 ● 0 ● ● Fifty-three without key, Track 27



This is very stable and has good dynamic flexibility. This generally produces a strong difference tone.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF

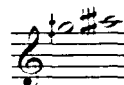


§ This is most reliable and predictable at levels of dynamic at mF or above. At lower levels, immediacy is less predictable, and beginning with the upper pitch alone can become necessary to ensure the desired top pitch is produced.

Difficulty – 2

Immediacy – 1-2

Dynamic range – (PP-mP) best at mF-FF



§ Best results for stability are attained at very low levels of dynamic. Above mP, instability is greatly increased, and one pitch will tend to become much stronger than the other.

Difficulty – 1-3

Immediacy – 1-3

Dynamic range – PP-mF

Fifty-three without key, cont'



Varying combinations of all three pitches are possible. Predicting which will result at any given time is difficult. Stability is best at low levels of dynamic, as above mF, one pitch will become very stable to the detriment of the others. * *Lot* – these are broken into two combinations, the lower two pitches and the higher two pitches, all three do not occur simultaneously.

Difficulty – 2-3

Immediacy – 2-3

Dynamic range – PP-mF

● ● ○ ● ○ ● ○ Fifty-three with key, Track 28



This is very unstable, though stability is improved at very low levels of dynamic with fine embouchure control. Slightly higher levels of dynamic are possible if a substantial amount of noise is used within the tone.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-mF



This is relatively stable, with good dynamic flexibility.

Difficulty – 2; *Lot* – 3

Immediacy – 2-3; *Lot* – 3-4

Dynamic range – PP-FF; *Lot* – mP - mF



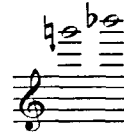
§

Stability is best at lower levels of dynamic. At levels above mF, a higher partial will result.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-F



§

Best results are possible at medium dynamic levels; this tends to be very unstable and difficult to maintain.

Difficulty – 4

Immediacy – 4

Dynamic range – P-F

● ● ○ ● ● ○ ● Fifty-four without key, Track 29



This is generally stable, with excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



This is very unstable and achieving consistent simultaneity is particularly difficult.

Difficulty – 3

Immediacy – 3-4

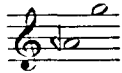
Dynamic range – PP-F

Fifty-four without key, cont'

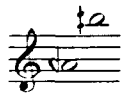


§
This is barely viable. Simultaneity is only possible at a low level of dynamic and with a substantial amount of noise within the tone.
Difficulty – 4
Immediacy – 4
Dynamic range – PP-mP

● ● O ● ● O O Fifty-four with key, Track 30



It can be is difficult to 'find' both pitches as the G tends to be quite weak. This is only viable at mP or less.
Difficulty – 2-3
Immediacy – 3-4
Dynamic range – PP-mP



§
This is very stable once it is established, and has good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – mP-FF



This is very difficult and immediacy is extremely unpredictable. Both pitches must be 'coaxed' out at very low levels of dynamic.
Difficulty – 4-5; *Lot* – 3
Immediacy – 4-5; *Lot* – 3
Dynamic range – PP-P

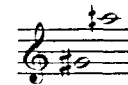


Both pitches are very stable alone, making simultaneity very difficult. Best results are possible if one of the two pitches is allowed to be dominant, while 'ghosting' the other. Equality of strength in both pitches is not possible, but can be improved at very low levels of dynamic with the addition of noise within the tone.
Difficulty – 4
Immediacy – 4
Dynamic range – PP-FF



§
This is barely viable and maintaining simultaneity is extremely difficult. Best results are possible at lower levels of dynamic with substantial noise within the tone.
Difficulty – 4
Immediacy – 4-5
Dynamic range – PP-mF

● ● O ● ● ● ● Fifty-five without key, Track 31



This is very stable and has excellent dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF

Fifty-five without key, cont'



This is moderately unstable and becomes more so at F or above. The higher pitch will generally be stronger and more stable, making simultaneity difficult at higher dynamic levels.

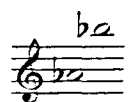
Difficulty – 2; *Lot* – 4
Immediacy – 2-3; *Lot* – 4
Dynamic range – PP-FF



§ This is only marginally viable because of extreme instability; it is only possible achieve moments of simultaneity with a substantial amount of noise within the tone at low levels of dynamic.

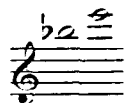
Difficulty – 4
Immediacy – 4-5
Dynamic range – PP-mP

● ● ● ○ ● ● ● ○ Fifty-five with key, Track 32



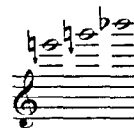
This is very stable and has excellent dynamic flexibility.

Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF



Simultaneity is very unpredictable, maintaining stability is also very challenging. Best results are possible when using a substantial amount of noise within the tone.

Difficulty – 4; *Lot* – 3
Immediacy – 4-5; *Lot* – 3
Dynamic range – PP-F



§ Various combinations of the three pitches are possible, though the middle pitch is weakest. Given enough duration, simultaneity of all three pitches is possible. Higher dynamic levels are not compatible with simultaneity, as one pitch will become dominant, disallowing the others.

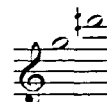
Difficulty – 3
Immediacy – 4
Dynamic range – PP-mF

● ● ● ○ ○ ○ ● Fifty-six without key, Track 33



This produces a stable, balanced octave and has good dynamic flexibility.

Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF



This is most stable at lower levels of dynamic. At higher levels, very fine embouchure control is required and equal strength of both pitches is not possible.

Difficulty – 2
Immediacy – 2
Dynamic range – PP-F

Fifty-six without key, cont'



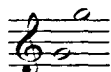
This is moderately unstable and best results are possible at lower levels of dynamic, though higher levels are possible if a substantial amount of noise and greater volume of air are used.

Difficulty – 3

Immediacy – 3

Dynamic range – PP-F

● ● ● ○ ○ ○ ○ Fifty-six with key, Track 34

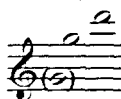


This is relatively stable, though there is some variation of stability at extremes of dynamic. The octave can vary according to dynamic level, and 'beats' may be produced.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-FF



This is very stable, with good dynamic flexibility. The lower octave G appears as a strong difference tone.

Difficulty – 1; *Lot* – 3

Immediacy – 1-2; *Lot* – 2

Dynamic range – PP-FF



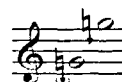
§ It is very difficult to maintain simultaneity; at higher levels of dynamic it is best to 'ghost' the lower pitch.

Difficulty – 3

Immediacy – 2-3

Dynamic range – PP-FF

● ● ● ○ ○ ● ● Fifty-seven without key, Track 35

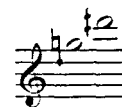


This is very stable, with good dynamic flexibility, though stability decreases markedly at extremely high levels of dynamic. However, this can be controlled with the embouchure.

Difficulty – 1-2

Immediacy – 1-2

Dynamic range – PP-FF

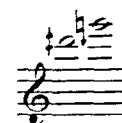


This is very stable and has unusually predictable immediacy. This also has excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



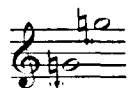
This is very unstable and it is difficult to maintain simultaneity for any length of time regardless of dynamic level. At higher levels of dynamic, it is more effective to 'ghost' the lower pitch.

Difficulty – 3-4

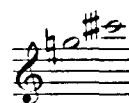
Immediacy – 4-5

Dynamic range – PP-FF

● ● ● ○ ○ ● ○ Fifty-seven with key, Track 36



This is a very stable octave with good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP-FF

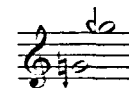


The lower pitch tends to be more dominant. This combination can require some duration to develop stability.
Difficulty – 3
Immediacy – 2-5
Dynamic range – PP-FF



The higher pitch is stronger and more dominant, making simultaneity difficult to maintain. The lower partial (shown above) can also appear, particularly at lower levels of dynamic.
Difficulty – 3
Immediacy – 3-4
Dynamic range – P-F

● ● ● ○ ○ ● Fifty-eight without key, Track 37

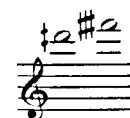


This is very unstable but has good dynamic flexibility. This produces 'beats' of varying frequency.
Difficulty – 2
Immediacy – 2-3
Dynamic range – PP-FF



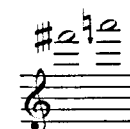
It is difficult to control the equality of strength between both pitches, particularly at higher levels of dynamic. It is most effective to allow the upper pitch to be stronger, then build the lower pitch from 'ghosting' to more prominence.

Difficulty – 3; *Lot* – 2
Immediacy – 2-4; *Lot* – 2
Dynamic range – PP-FF



It is difficult to maintain simultaneity. Some noise within the tone is beneficial to stability.

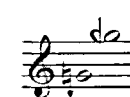
Difficulty – 4-5
Immediacy – 3
Dynamic range – mP-mF



§ Simultaneity is very unpredictable and nearly impossible above mF. A substantial amount of noise within the tone is beneficial.

Difficulty – 4-5
Immediacy – 4-5
Dynamic range – PP-mF

● ● ● ○ ○ ○ Fifty-eight with key, Track 38



This has good dynamic flexibility and stability and can produce strong 'beats' if desired.

Difficulty – 2
Immediacy – 2
Dynamic range – PP-FF

Fifty-eight with key, cont'



Stability is best when the embouchure is kept very stable and dynamic change is not effected. Above mF, stability is more challenging to maintain as the lower pitch becomes weaker and more difficult to control.

Difficulty – 2-3

Immediacy – 1-3

Dynamic range – PP-F



This is only possible at mP or below. Above this level, the higher pitch becomes completely dominant, causing the lower to disappear. At low levels of dynamic, stability is best.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-mP



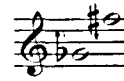
This is only possible at mF or below. Above this level, the higher pitch becomes completely dominant, causing the lower to disappear. At low levels of dynamic, stability is moderate.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-mF

● ● ● 0 ● ● ● Fifty-nine without key, Track 39



The quality and balance of this combination varies according to dynamic and to embouchure manipulation; the lower pitch tends to be the weaker and more difficult to control.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-F



From PP – mP, stability and balance are best; at higher levels of dynamic, the lower pitch becomes considerably weaker. At F or above, the lower note can only be 'ghosted'.

Difficulty – 2-3

Immediacy – 1-3

Dynamic range – PP-FF



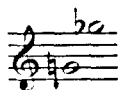
§ This is very difficult and unstable. It is difficult to maintain simultaneity. This is not viable at *forte* or above.

Difficulty – 3-4

Immediacy – 2-4

Dynamic range – PP-F

● ● ● ○ ● ● ○ Fifty-nine with key, Track 40

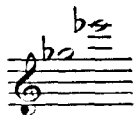


This is relatively stable at lower levels of dynamic. At F or above, it becomes markedly more difficult to control and to maintain simultaneity. This produces 'beats' of varying frequency.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP-FF

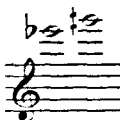


This is quite stable at lower levels of dynamic. It is somewhat more difficult to maintain simultaneity at F or above. This can produce a strong difference tone.

Difficulty – 2

Immediacy – 1-3

Dynamic range – PP-FF



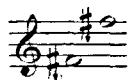
This is unstable and it is difficult to maintain simultaneity. It is not viable above mF.

Difficulty – 3-4

Immediacy – 1-2

Dynamic range – PP-mF

● ● ● ● ○ ○ ● Sixty without key, Track 41

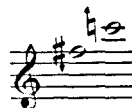


This is very stable with excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF

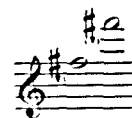


This is very unstable and it is difficult to maintain simultaneity. This is only viable at low levels of dynamic.

Difficulty – 2

Immediacy – 3

Dynamic range – PP - mP

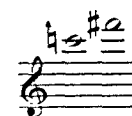


This is moderately stable. The lower pitch is always weaker and more difficult to control.

Difficulty – 2

Immediacy – 2

Dynamic range – PP - F

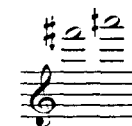


This is very stable, with excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF



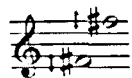
§ This is barely viable due to extreme instability.

Difficulty – 5

Immediacy – 5

Dynamic range – P-FF

● ● ● ● ○ ○ ○ Sixty with key, Track 42

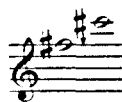


Quite stable with good dynamic flexibility, this can be made to produce 'beats' of varying frequency.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF

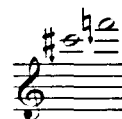


Quite unstable, best results are attained at lower levels of dynamic. Above mF, the lower pitch must be 'ghosted' to maintain simultaneity.

Difficulty – 2-3

Immediacy – 2

Dynamic range – PP-FF

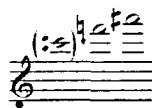


This is very unstable and it is difficult to maintain or predict simultaneity.

Difficulty – 4

Immediacy – 4

Dynamic range – PP-FF



§

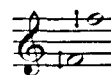
Barely viable, this is extremely difficult and unpredictable. The lowest of the three pitches can sometimes appear as a 'ghost' tone.

Difficulty – 5

Immediacy – 5

Dynamic range – PP-FF

● ● ● ● ○ ● ● Sixty-one without key, Track 43

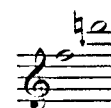


Quite stable, this has good dynamic flexibility and produces strong 'beats' of varying frequency.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-FF

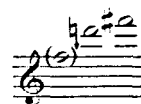


This is generally stable, with excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP-FF



Though relatively stable, the lower of the two pitches is considerably weaker. The F below can sometimes be made to appear as a 'ghost' tone at higher levels of dynamic.

Difficulty – 2-3; *Lot* – 4

Immediacy – 3; *Lot* – 4

Dynamic range – PP-FF

● ● ● ● ○ ● ○ Sixty-one with key, Track 44



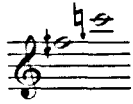
This is quite stable with good dynamic flexibility and produces very strong 'beats' of varying frequency.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-FF

Sixty-one with key, cont'

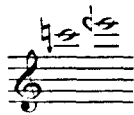


It is very difficult to attain equal strength between both pitches; either one or the other will tend to become more dominant.

Difficulty – 2

Immediacy – 2

Dynamic range – PP-FF



This is only possible at low levels of dynamic, the upper pitch is very weak and can be difficult to 'find'.

Difficulty – 3

Immediacy – 1-2

Dynamic range – PP-mP



This is generally unstable. It is not possible for both pitches to have equal strength simultaneously; the upper pitch tends to be more stable as it is the stronger pitch.

* *The E-quarter-tone flat from above is the lower pitch in this combination on the Lot flute, but it is equally difficult and generally unstable.*

Difficulty – 3

Immediacy – 3

Dynamic range – PP-F



Sixty-two without key, Track 45



This is stable, with good dynamic flexibility, though limited by the general softness of the register, and therefore it cannot produce a dynamic level above F. Produces strong 'beats' of varying frequency.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-F

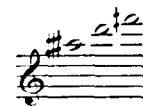


Stability varies according to dynamic level; between PP and mP, it is possible to achieve nearly equal strength between both pitches. At mF and above, instability is greatly increased, and the lower note is only possible as a 'ghost' tone.

Difficulty – 2

Immediacy – 2-4

Dynamic range – PP-mF



The middle pitch, is extremely weak and requires a dynamic level between PP and mP as well as an unpredictable amount of time for it to be developed. The outer two pitches are considerably more stable and predictable. * *For the Lot flute, these are split into two sets of two, the lower two pitches and the higher two, simultaneity amongst all three are not possible on the Lot flute.*

Difficulty – 2-5

Immediacy – 2-5

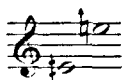
Dynamic range – PP-FF

Sixty-two without key, cont'

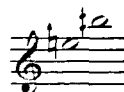


§ This is extremely difficult and unstable, requiring either an amount of noise within the tone at a low level of dynamic (PP – mF) or, at a higher level of dynamic, the lower pitch must be 'ghosted'. Under these circumstances, the predictability of immediacy is greatly improved.
 Difficulty – 3-5
 Immediacy – 3-5
 Dynamic range – PP-FF

● ● ● ● ● ○ ○ Sixty-two with key, Track 46



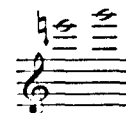
This is very stable, with excellent dynamic flexibility and produces strong 'beats'.
 Difficulty – 1
 Immediacy – 2
 Dynamic range – PP-FF



It is extremely difficult to maintain simultaneity, though it is most viable to do so at a low dynamic level.
 Difficulty – 3-4
 Immediacy – 3-4
 Dynamic range – PP-mF

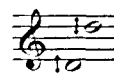


Both pitches tend to be very stable alone, making simultaneity difficult and not practical at a dynamic level above mF.
 Difficulty – 3-4
 Immediacy – 4
 Dynamic range – PP-mF



§ This is barely viable because it is extremely unstable. Immediacy is particularly unpredictable.
 Difficulty – 5
 Immediacy – 5
 Dynamic range – P-F

● ● ● ● ● ● Sixty-three without key, Track 47



This is very stable and has excellent dynamic flexibility. It also produces strong 'beats' of varying frequency.
 Difficulty – 1
 Immediacy – 1
 Dynamic range – PP-FF



It is difficult to maintain simultaneity. Best results are possible at low dynamic levels, at higher levels, instability is increased and the lower pitch will become much weaker, generally only appearing as a 'ghost' tone. The lower octave D is possible as a third simultaneous tone.
 Difficulty – 3
 Immediacy – 3-4
 Dynamic range – PP-F

Sixty-three without key, cont'



Maintaining stability is challenging and best results are possible at a very low dynamic level. At higher levels, instability increases and the lower pitch become weaker and more difficult to control. The lower D octave can appear as a third simultaneous pitch.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP-F



This combination is extremely difficult and unstable, it is only viable at very low dynamic levels. Stability is improved with some noise content within the tone.

Difficulty – 4-5

Immediacy – 4-5

Dynamic range – PP-mP



S

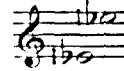
This is very unstable, though it is only moderately difficult to maintain simultaneity at lower levels of dynamic. Above mF, control is considerably more challenging.

Difficulty – 2-4

Immediacy – 2-4

Dynamic range – PP-F

● ● ● ● ● ● O Sixty-three with key, Track 48

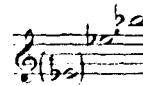


This is very stable, with good dynamic flexibility; it produces strong, variable 'beats'.

Difficulty – 1

Immediacy – 1

Dynamic range – PP-FF

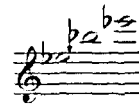


This is generally quite stable, though at higher levels of dynamic, stability is more difficult to maintain. It can produce the lower octave E-flat as a third, simultaneous pitch.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP-FF



It is unpredictable as to which combination of these pitches will result, and it is generally difficult to maintain simultaneity. Best results are possible when a specific desired pitch is played alone first, then adding the second pitch as a 'ghost' tone, allowing it to become stronger, if possible.

Difficulty – 4

Immediacy – 3-5

Dynamic range – PP-F

Sixty-three with key, cont'



This is very unstable and it is extremely difficult to maintain simultaneity. Stability is somewhat improved at lower levels of dynamic with an amount of noise within the tone.

Difficulty – 3-4

Immediacy – 4

Dynamic range – P-F

Appendix C

Multiphonics: Conventional Fingering Catalogue

The following catalogue is organised based on conventional fingerings according to the chart given in Chapter 1 from Mahaut's *Nouvelle méthode*.¹ Fingerings are conventionally represented numerically as follows in Figure C.1:



Figure C.1. The baroque flute, with fingerings designated by numbers

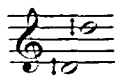
To prevent confusion, fingerings will be given graphically as in Figure C.2. This form of representing fingering is also historically common. It should also be noted, for further clarity, that the seventh circle, which represents the key designates the opening or closing of the hole, which is opposite to the action of the finger.



Figure C.2. Graphic representation of conventional baroque-flute fingering

¹ See Chapter 1, Figure 1.4, p. 21.

● ● ● ● ● ● ● D Natural, 1st octave, Track 49

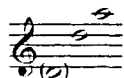


This is very stable and has excellent dynamic flexibility. It also produces strong 'beats' of varying frequency.

Difficulty – 1

Immediacy – 1

Dynamic range – PP – FF

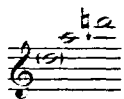


It is difficult to maintain simultaneity. Best results are possible at low dynamic levels, at higher levels, instability is increased and the lower pitch will become much weaker, generally only appearing as a 'ghost' tone. The lower octave D is possible as a third simultaneous tone.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP – F



Maintaining stability is challenging and best results are possible at a very low dynamic level. At higher levels, instability increases and the lower pitch become weaker and more difficult to control. The lower D octave can appear as a third simultaneous pitch.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP – F

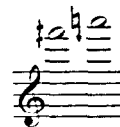


This combination is extremely difficult and unstable; it is only viable at very low dynamic levels.

Difficulty – 4-5

Immediacy – 4-5

Dynamic range – PP – mP



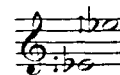
§ This is very unstable, though it is only moderately difficult to maintain simultaneity at lower levels of dynamic. Above mF, control is considerably more challenging.

Difficulty – 2-4

Immediacy – 2-4

Dynamic range – PP – F

● ● ● ● ● ● ● O D sharp/E flat, 1st octave, Track 50



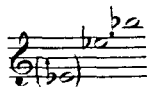
This is very stable, with good dynamic flexibility; it produces strong, variable 'beats'.

Difficulty – 1

Immediacy – 1

Dynamic range – PP – FF

D sharp/E flat, 1st octave, cont'

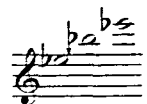


This is generally quite stable, though at higher levels of dynamic, stability is more difficult to maintain. It can produce the lower octave E-flat as a third, simultaneous pitch.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP – FF

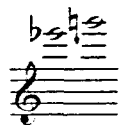


It is unpredictable as to which combination of these pitches will result, and it is generally difficult to maintain simultaneity. Best results are possible when a specific desired pitch is played alone first, then adding the second pitch as a 'ghost' tone, allowing it to become stronger, if possible.

Difficulty – 4

Immediacy – 3-5

Dynamic range – PP – F



This is very unstable and it is extremely difficult to maintain simultaneity. Stability is somewhat improved at lower levels of dynamic with an amount of noise within the tone.

Difficulty – 3-4

Immediacy – 4

Dynamic range – P – F

● ● ● ● ● O ● E natural, 1st octave, Track 51



This is stable, with good dynamic flexibility, though limited by the general softness of the register, and therefore it cannot produce a dynamic level above F. Produces strong 'beats' of varying frequency.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP – F

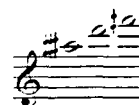


Stability varies according to dynamic level; between PP and mP, it is possible to achieve nearly equal strength between both pitches. At mF and above, instability is greatly increased, and the lower note is only possible as a 'ghost' tone.

Difficulty – 2

Immediacy – 2-4

Dynamic range – PP – mF



The middle pitch is extremely weak and requires a dynamic level between PP and mP as well as an unpredictable amount of time for it to be developed. The outer two pitches are considerably more stable and predictable. * *For the Lot flute, these are split into two sets of two, the lower two pitches and the higher two, simultaneity amongst all three are not possible on the Lot flute.*

Difficulty – 2-5

Immediacy – 2-5

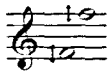
Dynamic range – PP – FF

E natural, 1st octave, cont'



§ This is extremely difficult and unstable, requiring either an amount of noise within the tone at a low level of dynamic (PP – mF) or, at a higher level of dynamic, the lower pitch must be 'ghosted'. Under these circumstances, the predictability of immediacy is greatly improved.
 Difficulty – 3-5
 Immediacy – 3-5
 Dynamic range – PP – FF

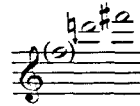
● ● ● ● O ● ● F natural, 1st octave, Track 52



Quite stable, this has good dynamic flexibility and produces strong 'beats' of varying frequency.
 Difficulty – 2
 Immediacy – 1-2
 Dynamic range – PP – FF



This is generally stable, with excellent dynamic flexibility.
 Difficulty – 1
 Immediacy – 1-2
 Dynamic range – PP – FF

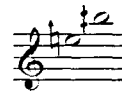


Though relatively stable, the lower of the two pitches is considerably weaker. The F below can sometimes be made to appear as a 'ghost' tone at higher levels of dynamic.
 Difficulty – 2-3; *Lot* – 4
 Immediacy – 3; *Lot* – 4
 Dynamic range – PP – FF

● ● ● ● ● O O F flat, 1st octave, Track 53



This is very stable, with excellent dynamic flexibility and produces strong 'beats'.
 Difficulty – 1
 Immediacy – 2
 Dynamic range – PP – FF

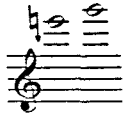


It is extremely difficult to maintain simultaneity, though it is most viable to do so at a low dynamic level.
 Difficulty – 3-4
 Immediacy – 3-4
 Dynamic range – PP – mF



Both pitches tend to be very stable alone, making simultaneity difficult and not practical at a dynamic level above mF.
 Difficulty – 3-4
 Immediacy – 4
 Dynamic range – PP – mF

F flat, 1st octave, cont'



§

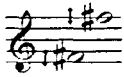
This is barely viable due to an extreme lack of stability. Immediacy is particularly unpredictable.

Difficulty – 5

Immediacy – 5

Dynamic range – P – F

● ● ● ● ○ ○ ○ F sharp, 1st octave, Track 54



Quite stable with good dynamic flexibility, this can be made to produce 'beats' of varying frequency.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP – FF



Quite unstable, best results are attained at lower levels of dynamic. Above mF, the lower pitch must be 'ghosted' to maintain simultaneity.

Difficulty – 2-3

Immediacy – 2

Dynamic range – PP – FF



This is very unstable and it is difficult to maintain or predict simultaneity.

Difficulty – 4

Immediacy – 4

Dynamic range – PP – FF



§

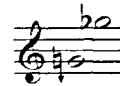
Barely viable, this is extremely difficult and unpredictable. The lowest of the three pitches can sometimes appear as a 'ghost' tone.

Difficulty – 5

Immediacy – 5

Dynamic range – PP – FF

● ● ● ○ ● ● ○ G flat, 1st octave, Track 55

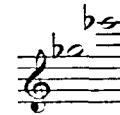


This is relatively stable at lower levels of dynamic. At F or above, it becomes markedly more difficult to control and to maintain simultaneity. This produces 'beats' of varying frequency.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP – FF



This is quite stable at lower levels of dynamic. It is somewhat more difficult to maintain simultaneity at F or above. This can produce a strong difference tone.

Difficulty – 2

Immediacy – 1-3

Dynamic range – PP – FF

G flat, 1st octave, cont'



This is unstable and it is difficult to maintain simultaneity. It is not viable above mP.
Difficulty – 3-4
Immediacy – 1-2
Dynamic range – PP – mP

● ● ● ○ ○ ○ ● G natural, 1st register, without key, Track 56



This produces a stable, balanced octave and has good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP – FF



This is most stable at lower levels of dynamic. At higher levels, very fine embouchure control is required and equal strength of both pitches is not possible.
Difficulty – 2
Immediacy – 2
Dynamic range – PP – F

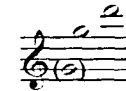


This is moderately unstable and best results are possible at lower levels of dynamic, though higher levels are possible if a substantial amount of noise and greater volume of air are used.
Difficulty – 3
Immediacy – 3
Dynamic range – PP – F

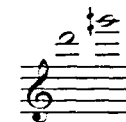
● ● ● ○ ○ ○ ○ G natural, 1st octave, with key, Track 57



This is relatively stable, though there is some variation of stability at extremes of dynamic. The octave can vary according to dynamic level, and 'beats' may be produced.
Difficulty – 2
Immediacy – 1-2
Dynamic range – PP – FF

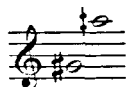


This is very stable, with good dynamic flexibility. The lower octave G appears as a strong difference tone.
Difficulty – 1; Lot – 3
Immediacy – 1-2; Lot – 2
Dynamic range – PP – FF



§
It is very difficult to maintain simultaneity; at higher levels of dynamic it is best to 'ghost' the lower pitch.
Difficulty – 3
Immediacy – 2-3
Dynamic range – PP – FF

● ● ● ● ● G sharp/A flat, 1st octave, Track 58



This is very stable and has excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP – FF



This is moderately unstable and becomes more so at F or above. The higher pitch will generally be stronger and more stable, making simultaneity difficult at higher dynamic levels.

Difficulty – 2; *Lot* – 4

Immediacy – 2-3; *Lot* – 4

Dynamic range – PP – FF



§

This is barely viable and is only possible with a substantial amount of noise within the tone at low levels of dynamic.

Difficulty – 4

Immediacy – 4-5

Dynamic range – PP – mP

● ● ● ● ● A natural, 1st octave, without key, Track 59



This is somewhat unstable, but is not difficult to produce. The pitch of both notes is variable based on the shape of the embouchure and the dynamic level. It can also produce strong 'beats' of varying frequency.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – FF

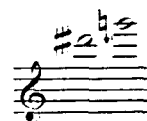


This is markedly unstable except at very low levels of dynamic, when stability is moderate. Stability is further improved when noise is used in the tone. Higher levels of dynamic are possible, but stability is marginal.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – mF



§

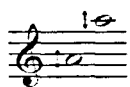
This is very unstable and unpredictable; some improvement is possible by using a low dynamic level with the addition of noise to the tone.

Difficulty – 3-4

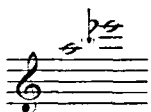
Immediacy – 4

Dynamic range – PP – mF

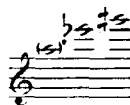
● ● ○ ○ ○ ○ A natural, 1st octave, with key, Track 60



This is somewhat unstable, but not difficult to produce. The pitch of both notes is variable based on the shape of the embouchure and the dynamic level. It can produce 'beats' of varying frequency.
Difficulty – 2
Immediacy –
Dynamic range – PP – FF



Best results are possible when adding a substantial amount of noise to the tone. Instability is greatest in mid-level dynamics.
Difficulty – 3
Immediacy – 2-4
Dynamic range – PP – FF



§
This is limited to dynamic levels of mF or lower, as the topmost pitch will become dominant, disallowing the others. The A is, at best, a 'ghost' tone which is not always present, and is never equal with the other two in strength except at extremely low dynamic levels and with a high noise content within the tone.
Difficulty – 4
Immediacy – 3
Dynamic range – PP – mF

● ○ ● ● ● ○ A sharp/B flat, 1st octave, Track 61



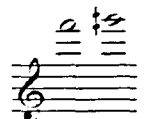
This is quite stable and has good dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP – FF



This is very difficult and unstable; it requires substantial duration to develop simultaneity.
Difficulty – 4
Immediacy – 4-5
Dynamic range – P - mF



§
This is very unstable and it is difficult to maintain simultaneity for any amount of time.
Difficulty – 3
Immediacy – 3-4
Dynamic range – PP – F



It is very difficult to maintain simultaneity, particularly because the higher note is much more stable and will tend to become fully dominant.
Difficulty – 3
Immediacy – 3
Dynamic range – P - F

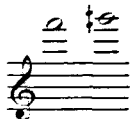
● ○ ○ ○ ○ ○ ● B natural, 1st octave, without key, Track 62



This can produce very prominent 'beats', the speed of which can be controlled to some degree with the embouchure. A perfect octave is also possible.
Difficulty – 2
Immediacy – 2
Dynamic range – PP – FF



This is generally stable after some duration, which is required for the upper pitch to develop; this benefits from the introduction of noise to the tone.
Difficulty – 2
Immediacy – 2
Dynamic range – PP – F

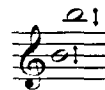


One of the two notes will tend to stabilise so some duration is required for the establishment of stability. Best results are possible at low levels of dynamic and with substantial noise within the tone.
Difficulty – 2
Immediacy – 2
Dynamic range – PP – mF

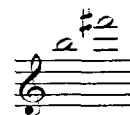


§ This is extremely unstable and immediacy is particularly difficult to predict.
Difficulty – 4
Immediacy – 5
Dynamic range – PP – FF

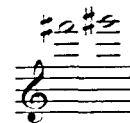
● ○ ○ ○ ○ ○ ○ B natural, 1st octave, with key, Track 63



This produces very prominent 'beats', the speed of which can be controlled to some degree with the embouchure. A perfect octave is possible at low levels of dynamic.
Difficulty – 2
Immediacy – 2
Dynamic range – PP – FF



Extremely difficult and unstable, it is only possible to produce this combination at a low level of dynamic, using a substantial amount of noise within the tone.
Difficulty – 4
Immediacy – 4.5
Dynamic range – PP – mP



§ Extremely difficult and very unstable, this is most achievable at lower levels of dynamic using a considerable amount of noise within the tone.
Difficulty – 4.5
Immediacy – 4.5
Dynamic range – PP – mF

○ ● ● ○ ○ ○ ● C natural, 1st octave, without key, Track 64



This is very stable and can benefit from a less controlled, particularly wide embouchure.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP – FF



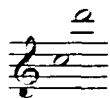
This is extremely unstable. The lower note is very stable and tends to dominate, making simultaneity markedly difficult. Particularly fine embouchure control is required at all levels of dynamic.

Difficulty – 4-5

Immediacy – 4

Dynamic range – PP – FF

○ ● ● ○ ○ ○ ○ C natural, 1st octave, with key, Track 65



This is very stable and it is easy to maintain equality of pitches.

Difficulty – 1

Immediacy – 1

Dynamic range – PP – FF



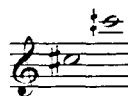
This is difficult because each pitch tends to stabilise; it is more predictable when the upper note is played first, introducing the lower pitch through 'ghosting'. Instability increases at higher levels of dynamic.

Difficulty – 2-3

Immediacy – 3

Dynamic range – PP – FF

○ ○ ○ ○ ○ ○ ● C sharp, 1st octave, Track 66



The upper tone can be more effectively produced by first playing the lower pitch, then pushing the lips forward very slightly; alternately one may roll the flute inward. At dynamics levels below mF, instability is greater.

Difficulty – 2

Immediacy – 3

Dynamic range – PP – FF



Simultaneity is very difficult; however, slurring slowly from one pitch to the other, particularly from the higher pitch to the lower is easier. This produces a sort of 'purring' effect from the closeness of pitch. At higher dynamic levels simultaneity becomes extremely difficult, though a tremolo may still be possible.

Difficulty – 2

Immediacy – 3

Dynamic range – PP – F

C sharp, 1st octave, cont'



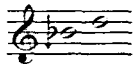
It is very difficult to maintain simultaneity, most effective results are possible when air flow is minimal and the embouchure is as small as possible. This benefits from the introduction of noise into the tone. Lower dynamic levels produce more equality of the pitches; at higher levels, the upper pitch becomes more dominant making the lower apt to become a 'ghost' tone.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – F

● ● ● ● ● ● D natural, 2nd octave, Track 67

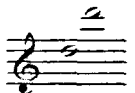


A very gentle air stream is required. This is most easily maintained with some noise within the tone. At higher levels of dynamic, the lower pitch cannot be maintained.

Difficulty – 1

Immediacy – 1

Dynamic range – PP – mP

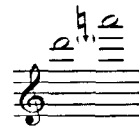


This produces a stable, perfect octave; stability is considerably more difficult at the lowest range of dynamic.

Difficulty – 1

Immediacy – 1

Dynamic range – PP – FF



This is very unstable and requires extremely fine embouchure control to maintain simultaneity.

Difficulty – 3

Immediacy – 2

Dynamic range – PP – FF

● ● ● ● ● ● O D sharp, 2nd octave, Track 68

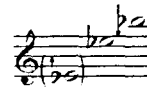


This is very stable, with good dynamic flexibility; it produces strong, variable 'beats'.

Difficulty – 1

Immediacy – 1

Dynamic range – PP – FF



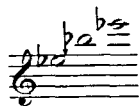
This is generally quite stable, though at higher levels of dynamic, stability is more difficult to maintain. It can produce the lower octave E-flat as a third, simultaneous pitch.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP – FF

D sharp, 2nd octave, cont'

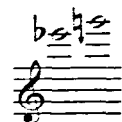


It is unpredictable as to which combination of these pitches will result, and it is generally difficult to maintain simultaneity. Best results are possible when a specific desired pitch is played alone first, then adding the second pitch as a 'ghost' tone, allowing it to become stronger, if possible.

Difficulty – 4

Immediacy – 3-5

Dynamic range – PP – F



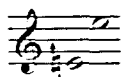
This is very unstable and it is extremely difficult to maintain simultaneity. Stability is somewhat improved at lower levels of dynamic with an amount of noise within the tone.

Difficulty – 3-4

Immediacy – 4

Dynamic range – P – F

● ● ● ● ● ○ ● E natural, 2nd octave, Track 69

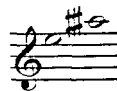


This is stable, with good dynamic flexibility, though limited by the general softness of the register, and therefore it cannot produce a dynamic level above F. Produces strong 'beats' of varying frequency.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP – F

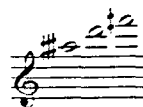


Stability varies according to dynamic level; between PP and mP, it is possible to achieve nearly equal strength between both pitches. At mF and above, instability is greatly increased, and the lower note is only possible as a 'ghost' tone.

Difficulty – 2

Immediacy – 2-4

Dynamic range – PP – mF

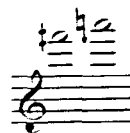


The middle pitch, is extremely weak and requires a dynamic level between PP and mP as well as an unpredictable amount of time for it to be developed. The outer two pitches are considerably more stable and predictable. * *For the Lot flute, these are split into two sets of two, the lower two pitches and the higher two, simultaneity amongst all three are not possible on the Lot flute.*

Difficulty – 2-5

Immediacy – 2-5

Dynamic range – PP – FF



§ This is extremely difficult and unstable, requiring either an amount of noise within the tone at a low level of dynamic (PP – mF) or, at a higher level of dynamic, the lower pitch must be 'ghosted'. Under these circumstances, the predictability of immediacy is greatly improved.

Difficulty – 3-5

Immediacy – 3-5

Dynamic range – PP – FF

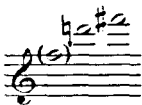
● ● ● ● ○ ● ● F natural, 2nd octave, Track 70



Quite stable, this has good dynamic flexibility and produces strong 'beats' of varying frequency.
Difficulty – 2
Immediacy – 1-2
Dynamic range – PP – FF



This is generally stable, with excellent dynamic flexibility.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP – FF



Though relatively stable, the lower of the two pitches is considerably weaker. The F below can sometimes be made to appear as a 'ghost' tone at higher levels of dynamic.
Difficulty – 2-3; *Lot* – 4
Immediacy – 3; *Lot* – 4
Dynamic range – PP – FF

● ● ● ● ● ○ ○ F flat, 2nd octave, Track 71



This is very stable, with excellent dynamic flexibility and produces strong 'beats'.
Difficulty – 1
Immediacy – 2
Dynamic range – PP – FF



It is extremely difficult to maintain simultaneity, though it is most viable to do so at a low dynamic level.
Difficulty – 3-4
Immediacy – 3-4
Dynamic range – PP – mF

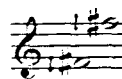


Both pitches tend to be very stable alone, making simultaneity difficult and not practical at a dynamic level above mF.
Difficulty – 3-4
Immediacy – 4
Dynamic range – PP – mF



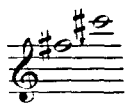
§ This is barely viable because it is extremely unstable. Immediacy is particularly unpredictable.
Difficulty – 5
Immediacy – 5
Dynamic range – P – F

● ● ● ● ○ ○ ○ F sharp, 2nd octave, Track 72



Quite stable with good dynamic flexibility, this can be made to produce 'beats' of varying frequency.
Difficulty – 1
Immediacy – 1-2
Dynamic range – PP – FF

F sharp, 2nd octave, cont'

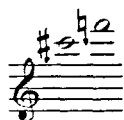


Quite unstable, best results are attained at lower levels of dynamic. Above mF, the lower pitch must be 'ghosted' to maintain simultaneity.

Difficulty – 2-3

Immediacy – 2

Dynamic range – PP – FF

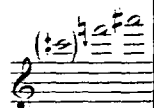


This is very unstable and it is difficult to maintain or predict simultaneity.

Difficulty – 4

Immediacy – 4

Dynamic range – PP – FF



§ Barely viable, this is extremely difficult and unpredictable. The lowest of the three pitches can sometimes appear as a 'ghost' tone.

Difficulty – 5

Immediacy – 5

Dynamic range – PP – FF

● ● ● ○ ● ● ○ G flat, 2nd octave, Track 73

This is relatively stable at lower levels of dynamic. At F or above, it becomes markedly more difficult to control and to maintain simultaneity. This produces 'beats' of varying frequency.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP – FF



This is quite stable at lower levels of dynamic. It is somewhat more difficult to maintain simultaneity at F or above. This can produce a strong difference tone.

Difficulty – 2

Immediacy – 1-3

Dynamic range – PP – FF



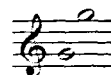
This is unstable and it is difficult to maintain simultaneity. It is not viable above mP.

Difficulty – 3-4

Immediacy – 1-2

Dynamic range – PP – mP

● ● ● ○ ○ ○ ● G natural, 2nd octave, without key, Track 74



This produces a stable, balanced octave and has good dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP – FF



This is most stable at lower levels of dynamic. At higher levels, very fine embouchure control is required and equal strength of both pitches is not possible.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – F

G natural, 2nd octave, without key, cont'



This is moderately unstable and best results are possible at lower levels of dynamic, though higher levels are possible if a substantial amount of noise and greater volume of air are used.

Difficulty – 3

Immediacy – 3

Dynamic range – PP – F

● ● ● ○ ○ ○ ○ G natural, 2nd octave, with key, Track 75

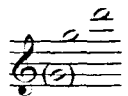


This is relatively stable, though there is some variation of stability at extremes of dynamic. The octave can vary according to dynamic level, and 'beats' may be produced.

Difficulty – 2

Immediacy – 1-2

Dynamic range – PP – FF



This is very stable, with good dynamic flexibility. The lower octave G appears as a strong difference tone.

Difficulty – 1; *Lot* – 3

Immediacy – 1-2; *Lot* – 2

Dynamic range – PP – FF



§

It is very difficult to maintain simultaneity; at higher levels of dynamic it is best to 'ghost' the lower pitch.

Difficulty – 3

Immediacy – 2-3

Dynamic range – PP – FF

● ● ○ ● ○ ● ○ G sharp, 2nd octave, Track 76

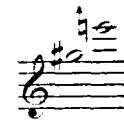


This is very unstable, though stability is improved at very low levels of dynamic with fine embouchure control. Slightly higher levels of dynamic are possible if a substantial amount of noise is used within the tone.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP – mF



This is relatively stable, with good dynamic flexibility.

Difficulty – 2; *Lot* – 3

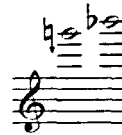
Immediacy – 2-3; *Lot* – 3-4

Dynamic range – PP – FF; *Lot* – mP – mF

G sharp, 2nd octave, cont'



Stability is best at lower levels of dynamic. At levels above mF, a higher partial will result.
 Difficulty – 3
 Immediacy – 3-4
 Dynamic range – PP – F

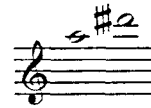


§ Best results are possible at medium dynamic levels, this tends to be very unstable and difficult to maintain.
 Difficulty – 4
 Immediacy – 4
 Dynamic range – PP – F

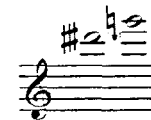
● ● O O O O ● A natural, 2nd octave, without key, Track 77



This is somewhat unstable, but is not difficult to produce. The pitch of both notes is variable based on the shape of the embouchure and the dynamic level. It can also produce strong 'beats' of varying frequency.
 Difficulty – 2
 Immediacy – 2
 Dynamic range – PP – FF

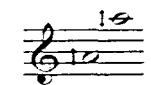


This is markedly unstable except at very low levels of dynamic, when stability is moderate. Stability is further improved when noise is used in the tone. Higher levels of dynamic are possible, but stability is marginal.
 Difficulty – 2
 Immediacy – 2
 Dynamic range – PP – mF



§ This is very unstable and unpredictable; some improvement is possible by using a low dynamic level with the addition of noise to the tone.
 Difficulty – 3-4
 Immediacy – 4
 Dynamic range – PP – mF

● ● O O O O O A natural, 2nd octave, with key, Track 78



This is somewhat unstable, but not difficult to produce. The pitch of both notes is variable based on the shape of the embouchure and the dynamic level. It can produce 'beats' of varying frequency.
 Difficulty – 2
 Immediacy – 2
 Dynamic range – PP – FF

A natural, 2nd octave, with key, cont'

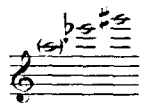


Best results are possible when adding a substantial amount of noise to the tone. Instability is greatest in mid-level dynamics.

Difficulty – 3

Immediacy – 2-4

Dynamic range – PP – FF



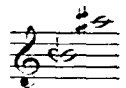
§ This is limited to dynamic levels of mF or lower, as the topmost pitch will become dominant, disallowing the others. The A is, at best, a 'ghost' tone which is not always present, and is never equal with the other two in strength except at extremely low dynamic levels and with a high noise content within the tone.

Difficulty – 4

Immediacy – 3

Dynamic range – PP – mF

● ○ ● ○ ○ ○ ● A sharp, 2nd octave, without key, Track 79



It is very difficult to maintain simultaneity and best results are possible with some noise content in the tone, or by using a low dynamic level.

Difficulty – 3

Immediacy – 3

Dynamic range – PP – mF



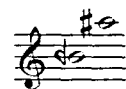
It is very difficult to maintain simultaneity, as both pitches are very stable alone and one will tend to dominate to the detriment of the other.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP – FF

● ○ ● ○ ○ ○ ○ A sharp, 2nd octave, with key, Track 80

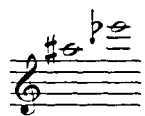


It is very difficult to maintain simultaneity because both pitches tend to stabilise. The introduction of some noise content to the tone is required to maintain viability at high levels of dynamic.

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP – FF

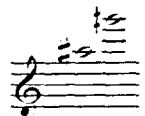


This is very unstable and it is difficult to maintain simultaneity; best results are possible at low to medium levels of dynamic.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – F



It is difficult to maintain simultaneity, but can benefit by using noise within the tone, particularly at higher levels of dynamic.

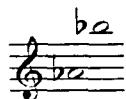
**Lot – the lower pitch is the E-flat from above as opposed to the A-sharp.*

Difficulty – 2

Immediacy – 2-3

Dynamic range – PP – FF

● ● O ● ● ● O B flat, 2nd octave, Track 81

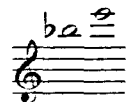


This is very stable and has excellent dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP – FF

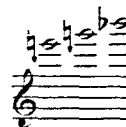


Simultaneity is very unpredictable, maintaining stability is also very challenging. Best results are possible when using a substantial amount of noise within the tone.

Difficulty – 4; *Lot* – 3

Immediacy – 4-5; *Lot* – 3

Dynamic range – PP – F



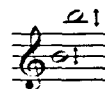
§ Various combinations of the three pitches are possible, though the middle pitch is weakest. Given enough duration, simultaneity of all three pitches is possible. Higher dynamic levels are not compatible with simultaneity, as one pitch will become dominant, disallowing the others.

Difficulty – 3

Immediacy – 4

Dynamic range – PP – mF

● O O O O O ● B natural, 2nd octave, without key, Track 82



This can produce very prominent 'beats', the speed of which can be controlled to some degree with the embouchure. A perfect octave is also possible.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – FF

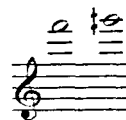


This is generally stable after some duration, which is required for the upper pitch to develop; this benefits from the introduction of noise to the tone.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – F



One of the two notes will tend to stabilise so some duration is required for the establishment of stability. Best results are possible at low levels of dynamic and with substantial noise within the tone.

Difficulty – 2

Immediacy – 2

Dynamic range – PP – mF



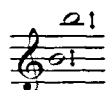
§ This is extremely unstable and immediacy is particularly difficult to predict.

Difficulty – 4

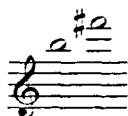
Immediacy – 5

Dynamic range – PP – FF

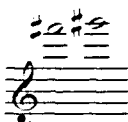
● ○ ○ ○ ○ ○ B natural, 2nd octave, with key, Track 83



This produces very prominent 'beats', the speed of which can be controlled to some degree with the embouchure. A perfect octave is possible at low levels of dynamic.
Difficulty – 2
Immediacy – 2
Dynamic range – PP – FF

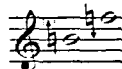


Extremely difficult and unstable, it is only possible to produce this combination at a low level of dynamic, using a substantial amount of noise within the tone.
Difficulty – 4
Immediacy – 4-5
Dynamic range – PP – mP

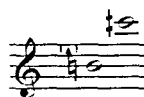


§
Extremely difficult and very unstable, this is most achievable at lower levels of dynamic using a considerable amount of noise within the tone.
Difficulty – 4-5
Immediacy – 4-5
Dynamic range – PP – mF

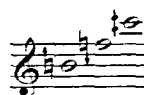
○ ● ● ● ● ○ B sharp, 2nd octave, Track 84



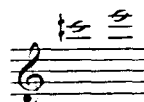
This can be difficult to 'find' and may require significant duration to develop; it is only viable at low levels of dynamic.
Difficulty – 3; *Lot* – 4
Immediacy – 3-4; *Lot* – 5
Dynamic range – PP – P



This is very stable and flexible.
Difficulty – 1
Immediacy – 1
Dynamic range – PP – FF



§
This is very unstable and is only viable at low levels of dynamic.
Difficulty – 5
Immediacy – 5
Dynamic range – PP – P



Barely viable, this is extremely unstable and difficult to maintain simultaneity for longer than a moment.
Difficulty – 4; *Lot* – 3
Immediacy – 4; *Lot* – 3
Dynamic range – PP – F

B sharp, 2nd octave, cont'



§ This is only viable when using a low dynamic level in conjunction with high air speed and a significant amount of noise within the tone.

Difficulty – 4

Immediacy – 4

Dynamic range – PP – mP

○ ● ○ ● ● ● ○ C natural, 2nd octave, Track 85

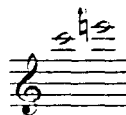


This is very stable and flexible, can be made to produce a perfect octave at high levels of dynamic.

Difficulty – 1

Immediacy – 1

Dynamic range – PP – FF



This can produce a strong difference tone. Immediacy can be improved when a breath attack is used instead of tonguing. Instability becomes unmanageable at high levels of dynamic.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP – mF



Difficult, this requires extremely fine embouchure control and benefits from using some noise within the tone, particularly at high levels of dynamic. This can produce a very strong difference tone.

Difficulty – 4; *Lot* – 5

Immediacy – 3

Dynamic range – PP – FF; *Lot* – mF – F



§ Barely viable, a very tight embouchure is required in conjunction with a high volume of air. Best results are possible at lower levels of dynamic. Instability increases at higher levels and benefits from using a marked amount of noise within the tone.

Difficulty – 4

Immediacy – 3

Dynamic range – mP – F

○ ● ● ● ○ ○ ○ C sharp/D flat, 2nd octave, Track 86



This is stable, with good dynamic flexibility.

Difficulty – 1

Immediacy – 1-2

Dynamic range – PP – FF

C sharp/D flat, 2nd octave, cont'



§
This is very unstable, causing immediacy to be very unpredictable. Instability is increased at high levels of dynamic.
Difficulty – 5
Immediacy – 5
Dynamic range – P – mf



§
This is very difficult and unstable. Best results are possible at low levels of dynamic.
Difficulty – 3
Immediacy – 2
Dynamic range – PP – F

● ● ● ○ ○ ○ ○ D natural, 3rd octave, Track 87

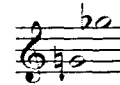


This is very stable and it is easy to maintain equality of pitches.
Difficulty – 1
Immediacy – 1
Dynamic range – PP – FF

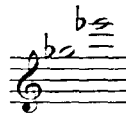


This is difficult because each pitch tends to stabilise; it is more predictable when the upper note is played first, introducing the lower pitch through 'ghosting'. Instability increases at higher levels of dynamic.
Difficulty – 2-3
Immediacy – 3
Dynamic range – PP – FF

● ● ● ○ ● ● ○ D sharp/ E-flat, 3rd octave, Track 88



This is relatively stable at lower levels of dynamic. At F or above, it becomes markedly more difficult to control and to maintain simultaneity. This produces 'beats' of varying frequency.
Difficulty – 2
Immediacy – 2-3
Dynamic range – PP – FF



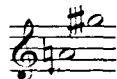
This is quite stable at lower levels of dynamic. It is somewhat more difficult to maintain simultaneity at F or above. This can produce a strong difference tone.
Difficulty – 2
Immediacy – 1-3
Dynamic range – PP – FF

D sharp/ E-flat, 3rd octave, cont'

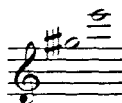


This is unstable and it is difficult to maintain simultaneity. It is not viable above mP.
Difficulty – 3-4
Immediacy – 1-2
Dynamic range – PP – mP

● ● O O ● ● O E natural, 3rd octave, Track 89



Simultaneity is only possible at mF or less, and a strong difference tone can be present.
Difficulty – 2
Immediacy – 2-3
Dynamic range – PP – mF

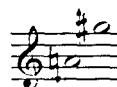


This is somewhat unstable and immediacy is unpredictable, particularly at higher levels of dynamic.
Difficulty – 2
Immediacy – 1-4
Dynamic range – PP – F

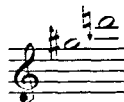


§
This is barely viable and is usually accompanied by a loud, high-pitched 'whistle' within the sound. Stability is decreased even more at dynamic levels above mF.
Difficulty – 4-5
Immediacy – 5
Dynamic range – P – mF

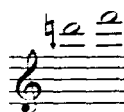
● ● O ● O O O F natural, 3rd octave, Track 90



It is difficult to maintain stability. Best results are possible when using noise within the tone at lower levels of dynamic.
Difficulty – 2-3
Immediacy – 2-3
Dynamic range – PP – F



This is very unstable and difficult to 'find'; this is viable only at lower levels of dynamic.
Difficulty – 4
Immediacy – 4-5
Dynamic range – PP – mP



This can require significant duration to develop stability and requires a low dynamic level.
Difficulty – 4
Immediacy – 5
Dynamic range – PP – mP



§
Best results are possible at levels of dynamic below F. At F or above, the higher pitch will completely dominate, making simultaneity impossible.
Difficulty – 2-3
Immediacy – 2-3
Dynamic range – PP – mF

F natural, 3rd octave, cont'



§ This is very difficult and unpredictable; embouchure control must be extremely fine. At low levels of dynamic a degree of noise within the tone is necessary for simultaneity. It is more useful if allowed to 'pulse' between the two pitches at will. Best results are possible at levels of dynamic below F.
 Difficulty – 4
 Immediacy – 5
 Dynamic range – PP – mF

● ● O ● O O ● F sharp, 3rd octave, Track 91



It is difficult to maintain simultaneity. Best results are possible when using noise within the tone at lower levels of dynamic.
 Difficulty – 2-3
 Immediacy – 2-3
 Dynamic range – PP – F



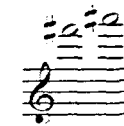
This is very difficult to 'find', but once it is established, it can become relatively stable. This is viable only at low levels of dynamic.
 Difficulty – 4
 Immediacy – 4-5
 Dynamic range – PP – mP



§ This is quite stable as long as the embouchure remains perfectly stable. Altering the embouchure for any reason (e.g. dynamic change) increases instability greatly. This can produce a weak difference tone.
 Difficulty – 1
 Immediacy – 1-2
 Dynamic range – PP – FF

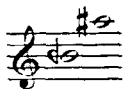


This often requires significant duration to allow the lower pitch to develop. Once established, stability is generally good. A low level of dynamic is required to prevent the higher pitch from becoming dominant, causing the lower pitch to disappear.
 Difficulty – 3
 Immediacy – 3-4
 Dynamic range – PP – mP



§ Barely viable, this is extremely difficult and unstable.
 Difficulty – 4-5
 Immediacy – 5
 Dynamic range – mP – F

● ○ ● ○ ○ ○ ● G natural, 3rd octave, Track 92

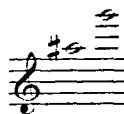


It is very difficult to maintain simultaneity and best results are possible with some noise content in the tone, or by using a low dynamic level.

Difficulty – 3

Immediacy – 3

Dynamic range – PP – mF



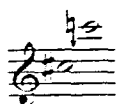
It is very difficult to maintain simultaneity, as both pitches are very stable alone and one will tend to dominate to the detriment of the other.

Difficulty – 3

Immediacy – 3-4

Dynamic range – PP – FF

○ ○ ● ○ ○ ○ ● G sharp/A flat, 3rd octave, Track 93



This is very weak and the upper note is unpredictable as this fingering presents extreme instability in the second register.

Difficulty – 3-4

Immediacy – 4-5

Dynamic range – PP – mP



This is a difficult combination to 'find', a tight embouchure is best for maintaining simultaneity.

Difficulty – 3

Immediacy – 3

Dynamic range – mF – F

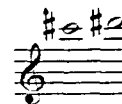


This is most effectively produced at low dynamic levels; at higher levels of dynamic, simultaneity is very difficult.

Difficulty – 2-3

Immediacy – 2-4

Dynamic range – PP – mP

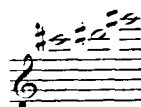


This is best produced at low levels of dynamic with a very gentle air stream, but is generally very unstable and it is difficult to maintain simultaneity.

Difficulty – 3

Immediacy – 3

Dynamic range – PP – mP



This is difficult as the high G# is always the strongest, most stable pitch; other pitches are not always predictable, they are most easily produced by 'ghosting', either singularly or simultaneously.

Difficulty – 2-3

Immediacy – 2-3

Dynamic range – PP – FF

○ ● ● ● ● ○ ● A natural, 3rd octave, Track 94



This is very unstable and best results are achieved when using a wide stream of air and a very relaxed embouchure. Simultaneity is not possible at higher levels of dynamic.

Difficulty – 2-3

Immediacy – 3-4

Dynamic range – PP – P

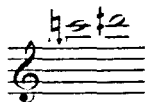


This is very stable once established and can produce strong 'beats'.

Difficulty – 2

Immediacy – 2

Dynamic range – P – FF



It is very difficult to maintain stability, and requires extremely fine embouchure control. At higher levels of dynamic, simultaneity becomes impossible to maintain.

Difficulty – 4

Immediacy – 4

Dynamic range – PP – mF



This is very difficult. Stability is best at lower levels of dynamic.

Difficulty – 4

Immediacy – 4

Dynamic range – PP – mF

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