

Cultivating the Contemporary Clarinetist:
Pedagogical Materials for Extended Clarinet Techniques

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Abstract

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The exploration and implementation of new timbral possibilities and techniques over the past century have redefined approaches to clarinet performance and pedagogy. As the body of repertoire involving nontraditional, or “extended,” clarinet techniques has grown, so too has the pedagogical literature on contemporary clarinet performance, yielding method books, dissertations, articles, and online resources. Despite the wealth of resources on extended clarinet techniques, however, few authors offer accessible pedagogical materials that function as a gateway to learning contemporary clarinet techniques and literature. Consequently, many clarinetists may be deterred from learning a significant portion of the repertoire from the past six decades, impeding their musical development.

The purpose of this dissertation is to contribute to the pedagogical literature pertaining to extended clarinet techniques. The document consists of two main sections followed by two appendices. The first section (chapters 1-2) contains an introduction and a literature review of

extant resources on extended clarinet techniques published between 1965–2020. This literature review forms the basis of the compendium of materials, found in Appendix A of this document, which aims to assist performers and teachers in searching for and selecting pedagogical materials involving extended clarinet techniques. The second section (chapters 3-5) discusses my original materials that will prepare clarinetists, especially those with little experience with contemporary music, to perform music involving extended techniques, and aid teachers who are working with students on extended techniques. These original materials—comprising preparatory exercises, studies, and sketches—are presented in their entirety in Appendix B. Techniques covered are multiphonics, microtones, and air sounds. My intent is that the information and materials in this dissertation will help to make resources on contemporary music more accessible to clarinetists and part of a well-rounded musical education.

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CHAPTER 1: INTRODUCTION

“The number of sounds obtainable from a modern clarinet is incredible. It will be greater still in the future.”

—Jack Brymer, *The Clarinet* (1976)

The diversification of compositional styles in music over the last century has placed unprecedented demands on clarinetists, leading to the emergence of the term “extended techniques” to denote techniques that extend beyond the standard physical requirements of instrumental performance. As the body of repertoire involving extended techniques for the clarinet has grown, so too has the pedagogical literature on contemporary clarinet performance, yielding dozens of étude books, dissertations, articles, and online resources. However, the extent to which authors address how to learn and teach these techniques varies, and many existing resources are not widely known among pedagogues and performers. Without accessible materials for developing clarinetists and a compendium of existing resources on extended techniques to guide pedagogy, many clarinetists will miss out on the opportunity to perform music by living and diverse composers. To fill this need, I have created a compendium of fifty existing pedagogical resources for extended clarinet techniques and composed eighty original exercises that are intended to prepare developing clarinetists to perform three prominent extended techniques.

Three main challenges exist for clarinetists new to contemporary music. First, most extant pedagogical resources on extended clarinet techniques assume a basic level of proficiency with extended techniques and their corresponding notation methods, creating barriers for the performer who has never encountered such techniques and notation. Relatedly, many pedagogical materials do not provide simple exercises for isolated techniques but instead implement multiple extended techniques in a single exercise or étude, which may be further

complicated by rhythmic and notation complexities. Finally, the rationale for many of these materials often frames extended clarinet techniques as ancillary to traditional methods of playing. This approach promotes the idea that pedagogical materials for extended clarinet techniques should be subjugated to pedagogical materials in the canon. As a result, many teachers use *étude* and method books that understate or entirely overlook extended techniques, even if those books focus on other aspects of contemporary compositional styles.¹

Extended clarinet techniques should be integrated into clarinet pedagogy first and foremost because they are integral to a well-rounded musical education and cultivate the skills necessary for the twenty-first century clarinetist. As contemporary composers often incorporate techniques that are scarcely addressed or omitted by most popular instructional materials, it is the teacher's responsibility to cover such techniques in lessons by giving students appropriate resources—both preparatory studies and repertoire—and equipping students with a working knowledge of how to successfully perform extended techniques. In addition, introducing extended techniques in earlier stages of musical development may help to normalize nontraditional approaches to performance and prepare performers for more advanced studies.

Accessibility to appropriate materials is a key component of a well-rounded musical education. As many compositions for clarinet written in the last sixty years require a high degree of technical and artistic proficiency and an understanding of nonstandard methods of notation, developing clarinetists have few options for entry points into this literature. By undertaking this project, I sought to create resources that would help equip other clarinetists—particularly students with little experience performing extended clarinet techniques—with the necessary skills to tackle many contemporary compositions confidently and successfully.

1. For further reading on college teachers' use of instructional materials, see Kelly Anne Johnson, "Survey of Major Clarinet Etude Books for the College Undergraduate" (DMA diss., Arizona State University, 1999).

Purpose

The purpose of this dissertation project is to 1) review extant resources on extended clarinet techniques, 2) create a compendium based on the review of extant resources, and 3) compose original materials that will prepare clarinetists to perform music involving extended techniques and aid teachers who are working with students on extended techniques. My original materials are not intended to replace extant resources on extended clarinet techniques; rather, they are designed to supplement what is already available and offer frameworks that can be modified according to each performer's abilities and objectives.

Methodology

Three principal sources have informed the design of the exercises in this project. Andrew Charles Gentsch's dissertation "Technique Builders with a Pedagogical Approach to New Music Proficiency" (2019) features targeted exercises for common techniques found in contemporary violin music.² Gentsch contextualizes the techniques by providing examples of their use in the repertoire. In his book *Bassoon Reimagined* (2019), Ryan Romine catalogs over fifty extended techniques for bassoon and offers suggestions for both performers and composers.³ Romine also composed thirty-two original character studies for solo bassoon that cover nearly all of the techniques discussed. This work provides valuable and up-to-date insight into how extended techniques can be approached pedagogically and utilized musically. Similarly, in her dissertation "An Approach to Contemporary Music Pedagogy for Beginning and Intermediate Level Bassoonists, Including Sixty-Four Original Etudes" (2013) Stephanie

2. Andrew Charles Gentsch, "Technique Builders with a Pedagogical Approach to New Music Proficiency" (DMA diss., The University of Iowa, 2019).

3. Ryan D. Romine, *Bassoon Reimagined: An Extended Technique Sourcebook for Performers and Composers* (N.p., 2019).

Patterson presents original études for bassoon, written to teach concepts such as scales, rhythm, meter, style, and extended techniques to pre-college level bassoonists.⁴ Patterson provides suggestions for teaching and learning the études, as well as thoughts on the concepts at hand. These three texts are only a few of the recent sources that deal with the pedagogy of contemporary music as it relates to woodwind playing; all have been practical references for both my own compositions and this dissertation in general.

Combining my performance experience with research on existing pedagogical materials for extended techniques, I composed eighty exercises covering multiphonics, microtones, and air sounds, with each section isolating one technique and its subcategories. The exercises are further sectionalized by pedagogical function: preparatory exercises are designed to introduce the basic skills needed for each technique, studies introduce the different notation methods for and (when applicable) subcategories of each technique, and sketches present each technique in a musical context. Table 1 below exhibits all materials composed for this dissertation project:

Table 1. Materials composed for this dissertation project.

Multiphonics	Microtones	Air Sounds
Section I: Preparatory Voicing Exercises	Section I: Preparatory Exercises	Section I: Air Sound Studies
Section II: Multiphonic Studies	Section II: Microtonal Studies	Section II: Air Sound Sketches
Section III: Multiphonic Sketches	Section III: Microtonal Sketches	n/a

Definition of Terms

The terms “contemporary music” and “extended techniques” are open to a range of interpretations. Therefore, it is necessary to establish the definitions that will be used throughout

4. Stephanie Willow Patterson, “An Approach to Contemporary Music Pedagogy for Beginning and Intermediate Level Bassoonists, Including Sixty-Four Original Etudes” (DMA diss., The University of Iowa, 2013).

this dissertation, keeping in mind that this nomenclature will likely continue to evolve. The term “contemporary music” is a vague and often unsuitable label, but because many texts rely on this term, it will be used throughout this dissertation to denote the body of literature written between approximately 1960 and the present, coinciding with the rise of extended clarinet techniques.

“Extended techniques” encompasses a multitude of definitions that differ between instruments and instrument groups. Violist Sarah Wei-Yan Kwok points out that microtones are not considered extended techniques on string instruments: “The process of playing a microtone is the same process required to play any note, as the adjustments necessary to play a microtone are identical to those necessary to play with good intonation.”⁵ However, on woodwind instruments, microtones are considered extended techniques, as they frequently require using fingerings outside of the standard diatonic and chromatic fingerings and/or manipulating pitch with the embouchure.

In addition to unconventional technical demands, the classification of an extended technique should be based on its prevalence in the literature. “Once a technique spreads into a significant number of other works and across multiple genres of music,” writes Cameron Ghahremani, “it should then be considered a standard requirement for the professional musician.”⁶ To give one example, flutter-tongue is occasionally still considered an extended technique, but as it was introduced in 1892 in works by Richard Strauss and Pyotr Ilyich Tchaikovsky and is now regularly encountered in the clarinet literature, it should not be considered new or extended. For the purpose of this dissertation, I define an extended technique

5. Sarah Wei-Yan Kwok, “Breaking the Sound Barriers: Extended Techniques and New Timbres for the Developing Violist” (DMA diss., University of British Columbia, 2018), 2.

6. Cameron Lee Ghahremani, “Contemporary Strategies for Fundamental Development: Utilizing Extended Techniques to Advance Foundational Trumpet Methodology” (DMA diss., University of Miami, 2016), 2.

as “an instrumental technique that is not part of the traditional manner of playing an instrument...executed by physical action on the instrument with the purpose of creating a specific timbre”⁷ and whose prevalence is currently contained to a minor portion of the literature.

Scope

Selection of techniques covered was determined by the prevalence of the technique in the repertoire over the past sixty years, as well as my experience with the techniques. Many techniques have been excluded from the original materials. For example, humming and singing while playing, although a relatively new technique, has been covered extensively by Jeremy Ruth in his 2019 dissertation.⁸ As numerous extant resources provide sufficient pedagogical exercises and instruction regarding humming and singing while playing, flutter-tongue, glissando, and portamento, it would be redundant to include materials in this dissertation that target those techniques. Therefore, the original materials presented here are not intended to be comprehensive. Instead, I have selected three common extended techniques that performers are likely to encounter in repertoire and that are accessible to performers of varying levels: multiphonics, microtones, and air sounds. The compendium in Appendix A contains resources covering all documented categories of extended clarinet techniques.

Organization

This dissertation contains six chapters and three appendices. Chapter 1 provides background on the intersection of extended techniques and pedagogy and states the need for this project. Chapter 2 is a literature review of books, dissertations, journal articles, musical materials

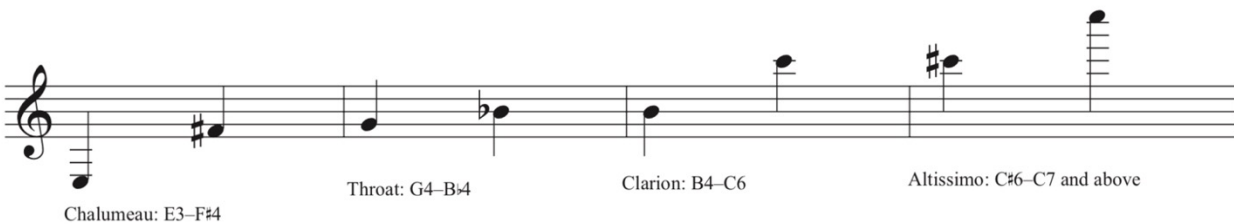
7. Kwok, “Breaking the Sound Barriers,” 2.

8. Jeremy Larkham Ruth, “Humming and Singing while Playing in Clarinet Performance: An Evidence Based Method for Performers and Resource for Composers” (DMA diss., Arizona State University, 2019).

(including treatises and method and étude books), and online sources dealing with pedagogical aspects of contemporary clarinet techniques. Chapters 3-5 discuss select extended clarinet techniques: multiphonics, microtones, and air sounds. Each chapter on a technique includes the following sections: 1) historical background on the technique and its relevance to contemporary clarinet performance; 2) notation and terminology considerations; 3) instructions for executing the technique; 4) the purpose and a description of the original exercises; 5) how to use the materials and examples of possible modifications, and 6) recommended pedagogical materials and repertoire for further study. Chapter 6 summarizes the principal findings and efforts of this dissertation, acknowledges limitations, and offers suggestions for future research. Appendices A and B present a compendium of extant pedagogical materials for extended clarinet techniques, and all materials composed for this dissertation, respectively.

Register Designations

This dissertation focuses on the standard Boehm system soprano clarinet. The following register designations are used throughout this dissertation:



CHAPTER 2: LITERATURE REVIEW

Introduction

The purpose of this chapter is to survey books, dissertations, journal articles, musical materials (including treatises and method and étude books), and online sources dealing with pedagogical aspects of contemporary clarinet techniques. Pedagogical materials that do not target extended clarinet techniques have been omitted from this literature review. Furthermore, the sources in this review are first and foremost pedagogical in nature. With a few exceptions, solo repertoire from the twentieth and twenty-first centuries has largely been excluded, not because of its lack of pedagogical value, but because it was designed for performance.⁹ Resources written primarily for composers, such as Gardner Read's *Contemporary Instrumental Techniques* (1976), have also been excluded. This literature review forms the basis of the compendium of pedagogical materials related to contemporary clarinet techniques, which can be found in Appendix A.

Extant materials covering pedagogical aspects of contemporary clarinet techniques can be placed into one of two “waves.” The earlier wave consists of materials published between 1965 and 1980. Phillip Rehfeldt's *New Directions for Clarinet* (1977), a landmark in the chronology of resources for extended clarinet techniques, was one of the first comprehensive attempts to catalog techniques. Rehfeldt's book became a popular resource for performers and composers, whereas most earlier publications are not as well-known even today. Therefore, ending the first wave soon after the publication of *New Directions* allows for an examination of how subsequent literature has expanded upon or deviated from early scholarship.

9. For a more comprehensive listing of solo repertoire pertaining to extended clarinet techniques, see Gary Wilson Behm, “A Comprehensive Performance Project in Clarinet Literature with an Essay on the use of Extended, Or New, Technique in Selected Unaccompanied Clarinet Solos Published from 1960 through 1987” (DMA diss., The University of Southern Mississippi, 1992).

The second wave consists of materials published between 1981 and 2020. Fewer pedagogical resources emerged in the 1980s and 1990s than in previous decades, despite an increase in clarinet repertoire incorporating extended techniques. Scholarship from the past two decades reflects a surge of interest in various aspects of extended clarinet techniques, such as multiphonic production strategies, use of extended techniques by composers of diverse nationalities, and performance guides for new clarinet repertoire. Notably, a number of clarinet pedagogues have explored the relationship between extended techniques and fundamentals, suggesting a rise in interest in the pedagogical merits of extended techniques.

Early Materials (1965–1980)

Although composers such as Peter Phillips, John Eaton, and William O. Smith experimented with multiple sonorities and other new techniques in their pieces for clarinet in the early 1960s, most resources for extended techniques did not appear until later in the decade. Richard L. Csomay's 1965 dissertation may be the first scholarly work to deal with new techniques for woodwinds.¹⁰ In an article from the same year, Abraham Schwadron calls for a "contemporary socio-musical renaissance wherein composers, virtuosi, and educators would unite to formulate standard study materials" that would address notational, metrical, and instrument-specific technical issues.¹¹ He also addresses the role of the performer, who he believes should educate society and bridge the so-called cultural gap between performers and composers. One such method for bridging this gap is through performances of contemporary chamber music; the article concludes with a list of nearly 100 post-1900 chamber works scored for clarinet. Schwadron's

10. Richard L. Csomay, "Contemporary Woodwind Materials: A Manual Designed to Aid the Woodwind Player in the Performance of New Music," (DMA diss., Philadelphia Music Academy, 1965).

11. Abraham A. Schwadron, "Contemporary Music for Clarinet," *The Instrumentalist* 29 (June 1965): 73-76.

article is primarily philosophical and only briefly mentions new techniques and hallmarks of contemporary clarinet performance. A 1968 article by John C. Heiss focuses on multiple sonorities for woodwinds.¹² Heiss's article is largely a preliminary attempt at cataloguing and providing fingerings for known multiphonics; notably, the number of multiphonics listed for each instrument is significantly fewer than those listed in later resources, reflecting the scarcity of information on and documentation of multiphonics at the time.¹³

The earliest book written specifically for clarinet that mentions extended techniques seems to be Allen Sigel's *The Twentieth Century Clarinetist*.¹⁴ Written in 1966, this book contains sixteen études covering specific fingering issues that Sigel cites as important to master when playing twentieth century music. Each étude is preceded by at least one short preparatory exercise. Two études feature flutter-tongue, which is no longer widely considered an extended technique, but the book nevertheless merits inclusion in this review as it is one of the first in the clarinet literature to specifically target challenges of twentieth century music.

Italian composer and violinist Bruno Bartolozzi authored the first book covering extended techniques on woodwind instruments, *New Sounds for Woodwind* (1967).¹⁵ This book discusses techniques for flute, oboe, clarinet, and bassoon; saxophone and auxiliary instruments are excluded. Much of the information in this book, while revelatory at the time, is now widespread knowledge amongst performers and composers. Moreover, the fingering charts for clarinet are

12. John C. Heiss, "Some Multiple-sonorities for Flute, Oboe, Clarinet, and Bassoon," *Perspectives of New Music* 7, no. 1 (Fall/Winter 1968): 136-42.

13. Heiss lists a total of twenty-five multiphonics for clarinet, while a recent catalog prepared by Jack Liang lists 604.

14. Allen Sigel. *The Twentieth Century Clarinetist* (New York: Franco Colombo, Inc., 1966).

15. Bruno Bartolozzi, *New Sounds for Woodwind*, ed. and trans. Reginald Smith Brindle (London: Oxford University Press, 1967).

difficult to interpret, as no explanation is given for the labeling system. Bartolozzi ultimately updated the book and published a second edition in 1982. Regardless, the original book gives valuable insight into extended woodwind techniques as they were understood in the 1960s.

Keith McCarty's *Methods for New Music for Clarinet, Book II* (1971) is another early resource for extended clarinet techniques.¹⁶ The book is divided into two sections, the first of which contains technical studies involving extended techniques. These studies are in a variety of keys but do not appear to be presented systematically. Techniques implemented include glissando, flutter-tongue, double tongue, microtones, vibrato, and pitch bends. As McCarty does not offer practice suggestions for the studies, the first section of this book is best used by players with some knowledge of extended techniques.

While less comprehensive than other contemporaneous resources, articles by William O. Smith, Norman Heim, and Paul Zonn stand out in their promotion of experimentation by and adaptability of the modern clarinetist. William O. Smith, widely considered the pioneer of clarinet multiphonics and other extended techniques, describes a number of new sonorities and techniques for clarinet, including “chords” or “double stops” (multiple sounds), muting techniques, key vibrato, and key clicks.¹⁷ This article is distinctive in that the author has extensive experiential knowledge of the techniques discussed; Smith cites three of his own compositions that use the techniques. Smith also acknowledges the difficulty of these techniques, noting, “The student should not be discouraged if his initial attempts to produce any of the preceding examples fail.”¹⁸ The conclusion of the article hints at an idea upon which later

16. Keith McCarty, *Methods for New Music for Clarinet, Book II* (Lubbock, TX: Lariken Press, 1971).

17. William O. Smith, “Contemporary Clarinet Sonorities,” *Selmer Bandwagon* 67 (Fall 1972): 12-14.

18. *Ibid.*, 14.

authors expand—strengthening fundamentals through practicing extended techniques: “It is my hope that these techniques will not only encourage additional experimentation by other clarinetists, but also help the performer improve his control of traditional techniques.”¹⁹

Norman Heim’s article is part of the trend of clarinetists and authors in the 1970s calling for the modern clarinetist to be adaptable to the demands of new literature that includes extended techniques.²⁰ Though Heim’s article mainly functions as a survey, there is a brief mention of extended techniques, including key clicks, air sounds, and “the playing of chords,” which Heim lauds as the “ultimate” new sound.²¹ Heim lists eleven pieces that he considers among the best of the avant-garde literature for clarinet, and notes techniques required for each piece. Like Heim and Smith, clarinetist Paul Zonn introduces a catalog of sounds in his article and describes select techniques in greater detail.²² However, Zonn lists only a few representative works that use these techniques, describing most of the techniques outside the context of repertoire. Like Smith, Zonn encourages clarinetists to experiment, concluding, “The next step must be yours. The gate is open, the garden before you.”²³

In a 1975 article, Lawrence Singer advocates for a new notation system for woodwind multiphonics that prioritizes timbre and intensity, based on “dominating frequencies.”²⁴ Singer argues that such a system will help composers to use multiphonics more meaningfully. While

19. Ibid.

20. Norman Heim, “The Clarinet and Avant-Garde Music,” *Woodwind World* 12 (December 1973): 12; 14; 29.

21. Ibid., 14.

22. Paul Zonn, “Some Sound Ideas for Clarinet,” *The Clarinet* 2, no. 2 (February 1975): 17-20.

23. Ibid., 20.

24. Lawrence Singer, “Woodwind Development: A Monophonic and Multiphonic Point of View,” *Woodwind World—Brass & Percussion* 14, no. 3 (June 1975): 14-16.

considering textures and colors of multiphonics could aid in developing a new notation system for woodwind multiphonics, Singer's suggestion to use a numerical progression to differentiate weak and strong audible intensities is problematic, as the intensities may differ from player to player. Despite its impracticality as a pedagogical resource for clarinetists, this article, like many others from the 1960s and 1970s, provides valuable historical perspective on woodwind multiphonics, particularly in terms of their notation.

Clarinetist and pedagogue Ronald Caravan has contributed several notable works to the pedagogical literature for contemporary clarinet performance. Caravan's 1974 dissertation is the first to catalog and provide exercises for extended clarinet techniques.²⁵ Caravan emphasizes multiple sonorities, noting many performers' inexperience with this technique due to lack of resources available at the time. Although Caravan discusses both clarinet and saxophone in the text, stating that the instruments "seem to involve similar characteristics and adjustments of tone production"²⁶ for the techniques, most subsequent scholarship on extended techniques has distinguished between clarinet and saxophone.

Caravan's dissertation set the foundation for his later pedagogical publications. In a 1975 article, Caravan details a procedure for introducing multiphonics to young clarinetists.²⁷ First, he recommends building on students' natural curiosity about the instrument by using familiar fingerings. Next, the teacher should introduce unfamiliar fingerings within the context of familiar fingerings; for example, have the student first play G3, then lift the left-hand index finger.

25. Ronald Caravan, "Extensions of Technique for Clarinet and Saxophone" (DMA diss., Eastman School of Music of the University of Rochester, 1974).

26. *Ibid.*, vi.

27. Ronald Caravan, "Introducing Multiple Sonorities to the Young Clarinet Student," *Woodwind World—Brass and Percussion* 14, no. 1 (January 1975): 16-19.

Finally, the student should begin with an upper partial, using a multiphonic fingering, then add lower partials. Caravan observes, “It appears that in the beginning, multiphonic production is easier when one attempts to introduce lower partials while sustaining an upper one than vice versa.”²⁸ Caravan also lists three principal advantages of introducing multiphonics to young clarinetists: 1) developing sensitivity to and flexibility in voicing; 2) developing aural skills, and 3) developing an understanding of the clarinet’s “tonal resources.”²⁹ This article is a concise pedagogical resource, with short exercises throughout, and is one of the earliest publications to discuss the pedagogy of an extended technique.

Caravan’s work *Five Duets for One Clarinetist* (1976) introduces the concept of singing while playing.³⁰ Caravan offers useful performance notes regarding execution of this technique, emphasizing that it may be necessary to transpose the pieces depending on the performer’s vocal range. The duets themselves are rhythmically simple, allowing the clarinetist to focus on the vocal aspect. They also feature mostly stepwise motion in the voice and primarily narrow intervals between the clarinet and voice, ranging from unison playing to a minor seventh apart. Though this technique can be challenging, these duets are an excellent resource. Caravan notes that they can be utilized for study or for performance as a five-movement work.

Caravan’s *Preliminary Exercises and Etudes in Contemporary Techniques for Clarinet* (1979) is a collection of sixteen études for clarinet, covering timbre variation, quarter-tones, and multiphonics.³¹ In addition, Caravan provides preliminary exercises for the multiphonic section,

28. Ibid., 18.

29. Ibid., 18-19.

30. Ronald Caravan, *Five Duets for One Clarinetist* (New York: Seesaw Music, 1976).

31. Ronald Caravan, *Preliminary Exercises and Etudes in Contemporary Techniques for Clarinet* (Oswego, NY: Ethos, 1979).

covering the use of the voice as well as both conventional and special fingerings for producing multiple sounds. The final page lists techniques such as glissando, variation in articulation, and percussive effects that are not incorporated or explained in the preceding exercises or études. Much of this book contains excellent pedagogical materials that are simple and approachable for clarinetists who have little experience with extended techniques.

Caravan's third pedagogical work, *Polychromatic Diversions: 10 Graded Compositions Using Non-Traditional Techniques* (1979), is a collection of ten short pieces for clarinet, not intended to be performed in its entirety as a multi-movement work.³² Extended techniques include quarter-tones, timbre variation, multiphonics, vibrato manipulation, glissando, portamento, flutter-tongue, air sounds, key clicks, hand pops, mouthpiece alone, and lip buzz. This collection is another practical component of the literature surrounding extended clarinet techniques.

Like Caravan, clarinetist Gerald Farmer also contributed significantly to the early resources for extended clarinet techniques with his dissertation, which formed the basis for his ensuing book. Farmer's dissertation catalogs and organizes multiphonic trills and tremolos for clarinet, representing the first comprehensive attempt at such a catalog. Farmer outlines the history of clarinet multiphonic use in the repertoire, citing composers who have called for clarinet multiphonics, and reviews existing resources by Bartolozzi, Caravan, Rehfeldt, Smith, and more. Farmer presents the multiphonic trills and tremolos in three categories: category I includes the most reliable multiphonics, while category II includes those that are slightly more

32. Ronald Caravan, *Polychromatic Diversions: 10 Graded Compositions Using Non-Traditional Techniques* (Oswego, NY: Ethos, 1979).

difficult to produce. Category III, with just thirty-nine entries, includes multiphonics with “a unique pulsating character,” or beats, caused by close upper partials.³³

Nicholas J. Valenziano and F. Gerard Errante both published multiple-part articles in early 1977 covering aspects of contemporary clarinet performance. Valenziano’s articles deal mainly with notation considerations, with a list of five pieces of clarinet repertoire utilizing new symbols and techniques at the end of part two.³⁴ F. Gerard Errante’s three articles offer a concise introduction to techniques such as multiple sonorities, microtones, glissando and portamento, flutter-tongue, vocal effects, and air sounds.³⁵ Errante also mentions percussive effects, instrument alterations, and theatrical effects, which had not been widely discussed in extant resources at that point. The purpose of Errante’s series is to inform the reader of select techniques and cite notable compositions that implement them; it is not intended to be comprehensive nor is it especially useful as a pedagogical resource. However, part two of the series contains several examples that may be of interest when working with microtones and microtonal trills. Errante refers the reader to works by Caravan and Phillip Rehfeldt, commending their multiphonic fingering charts in particular.

A dissertation by George Plasko represents the second attempt at a comprehensive survey of contemporary clarinet techniques—following Caravan’s 1974 dissertation—and a discussion

33. Gerald Farmer, “Multiphonic Trills and Tremolos for Clarinet” (DMA diss., University of Oregon, 1977), 106.

34. Nicholas J. Valenziano, “Contemporary Notational Symbols and Performance Techniques for the Clarinet (Part 1),” *The Instrumentalist* 31, no. 8 (March 1977): 94-97; Valenziano, “Contemporary Notational Symbols and Performance Techniques for the Clarinet (Part 2),” *The Instrumentalist* 31, no. 9 (April 1977): 70-74.

35. F. Gerard Errante, “Contemporary Aspects of Clarinet Performance (Part 1),” *Woodwind World–Brass and Percussion* 16, no. 1 (January 1977): 6-7; 17; Errante, “Contemporary Aspects of Clarinet Performance (Part 2),” *Woodwind World–Brass and Percussion* 16, no. 1 (January 1977): 20-21; 26; Errante, “Contemporary Aspects of Clarinet Performance (Part 3),” *Woodwind World–Brass and Percussion* 16, no. 3 (May 1977): 8-9.

of production strategies.³⁶ The purpose of this dissertation is to fill the void of a single resource that lists and discusses the production of new clarinet techniques. Plasko covers flutter-tongue, sudden dynamic shifts and extreme registral leaps, glissando, microtones, multiphonics and monophonics, mouthpiece-reed effects, key sounds, and sounds produced through instrumental adaptation or addition. While this dissertation may have been useful as a compendium, its practicality is limited. Unlike contemporaneous works by Caravan and Farmer, Plasko omits multiphonic and microtonal fingering charts and instead focuses on the use of select techniques in the literature.

Plasko's work can be viewed as a precursor of another attempt at a comprehensive resource for contemporary clarinet techniques, one that has seen enduring success in subsequent decades. Originally published in 1977 and revised in 1994, Phillip Rehfeldt's book *New Directions for Clarinet* has become an indispensable reference for the contemporary clarinetist.³⁷ Rehfeldt provides an overview of fundamentals on clarinet; monophonic fingering charts, including microtonal and color fingerings as well as E-flat and bass clarinet fingerings; multiphonic fingering charts, including trills and tremolos; a catalog of effects such as pitch bends, flutter-tongue, teeth-on-reed, vocal sounds, and circular breathing; a commentary on electronic applications and performing with electronics; appendices covering two prominent composers for clarinet, Eric Mandat and William O. Smith; notes on the E-flat contrabass, altissimo fingerings, and difference tones; a reproduction of Donald Scavarda's *Matrix for Clarinetist*; and three music bibliographies. The pedagogical scope of this monograph is limited, as it lacks detailed performance instructions regarding production of several techniques,

36. George M. F. Plasko, "Contemporary Performance Effects on the Clarinet in Selected Music Literature from 1960 to 1974" (DMA diss., University of Cincinnati, 1975).

37. Phillip Rehfeldt, *New Directions for Clarinet* (Berkeley: University of California Press, 1977).

particularly those listed in the “Catalog of Effects.” Nevertheless, *New Directions* represents a significant milestone in the evolution and cataloguing of extended clarinet techniques and remains one of the most popular resources for clarinetists and composers.

Along with Rehfeldt’s *New Directions* and Plasko’s 1975 dissertation, Giuseppe Garbarino’s *Metodo per clarinetto* (1978) is another one of the earliest compilations of unconventional techniques for the clarinet.³⁸ This work is divided into two principal parts. Part one focuses on single sounds, including quarter-tones, timbral variations, and “special effects” such as portamento, glissando, and the use of the teeth on the reed. Part two focuses on multiple sounds, or “homogenous chords,” and timbral variations, trills, glissando, and other “special effects” with multiple sounds. Garbarino also includes a study guide as an appendix, where he provides notes for executing the preceding studies. Although this book is relatively thorough for its time, it is unsuitable for players with little to no experience performing contemporary techniques. The exercises are complex and occasionally unclear, and as Garbarino situates the performance directions in a different section than the exercises themselves, the player must shift back and forth.

Frank Dolak’s book *Contemporary Techniques for the Clarinet: A Selective, Sequential Approach through Prerequisite Studies and Contemporary Études*³⁹ is the published version of Dolak’s 1979 doctoral dissertation.⁴⁰ The book contains over thirty prerequisite studies, seven études, four “Four Part Chorales for Two Clarinetists,” six exercises for clarinet and voice, and

38. Giuseppe Garbarino, *Metodo per clarinetto*, trans. Reginald Smith Brindle (Milan: Edizioni Suvini Zerboni, 1978).

39. Frank Dolak, *Contemporary Techniques for the Clarinet: A Selective, Sequential Approach through Prerequisite Studies and Contemporary Études* (Lebanon, IN: Studio P/R, Inc., 1980).

40. Frank Dolak, “Augmenting Clarinet Technique: A Selective, Sequential Approach through Prerequisite Studies and Contemporary Etudes” (DMA diss., Ball State University, 1979).

two solo pieces for clarinet and tape. Dolak's études are lengthy, ranging from two to five pages, and are generally appropriate for players who already have some experience with extended techniques. The solo pieces for clarinet and tape, *Vapors* and *Epigone*, are similarly complex, made more so by the technology required to perform the pieces. Dolak provides few directions for learning to play the études, so the prerequisite studies, covering lip bends, harmonics, dyads, quarter-tones, and the altissimo register, are likely to be the most helpful pedagogically. Dolak notes in the dissertation—but not the published book—that the purpose of the prerequisite studies is to isolate and drill a given technique before placing it into a musical context.⁴¹ The intention behind Dolak's prerequisite studies aligns with the goal of the original materials in this dissertation.

Second Wave of Scholarship: 1981–2020

Organizing the first wave of materials chronologically assists in tracing the evolution of and categorizing extended techniques, and allows us to observe how authors understood these techniques during their early development. However, the development of scholarship throughout the second wave is less linear. By the early 1980s, many extended techniques for clarinet—especially multiphonics, microtones, and percussive effects—had been established and were in common use in the repertoire. Phillip Rehfeldt's *New Directions* also served as an important landmark for codifying extended techniques in the first wave, as it was, and arguably still is, the most comprehensive resource for contemporary clarinet performance. As a result, most scholarship written between 1980 and 2020 does not so much seek to explain existing techniques as it aims to strengthen and develop certain threads introduced by earlier materials. Therefore, organizing the second wave of materials according to their content allows for the examination of

41. Ibid., abstract.

what kinds of statements authors make about extended techniques. The five major categories of scholarship published between 1980 and 2020 are as follows: 1) treatises, method books, and compendiums, 2) writings on the relationship between fundamentals and extended techniques, 3) dissertations containing methods or catalogs, 4) commission projects, and 5) online resources.

It should be noted that a second significant body of recent scholarship examines extended clarinet techniques in the context of a particular composer's oeuvre and/or style, or in the context of several composers linked by the same nationality. Dissertations by Virginia Costa Figueiredo, Katie Marie Morell, and Pance Zaev explore contemporary clarinet techniques in the music of Portuguese, Finnish, and Macedonian composers, respectively.⁴² Amanda R. Morrison and Rebecca Tout d'Alessio, and Jessica Speak review Eric Mandat's works and life as a composer, clarinetist, and teacher.⁴³ Performance guides to works by Kimmo Hakola and Jörg Widmann have been completed by Erin Elizabeth Vander Wyst and Zachary Dierickx, and Kristen House offers analyses and performance considerations of select clarinet works by Shulamit Ran.⁴⁴ Finally, a 2019 thesis by Jonathan Galbreath surveys extended techniques in William O. Smith's

42. Virginia Costa Figueiredo, "Music by Contemporary Portuguese Composers: A Study of Extended Clarinet Techniques in Selected Clarinet Works" (DMA diss., University of California, Los Angeles, 2009); Katie Marie Morell, "Contemporary Clarinet Music in Finland: Three Concertos by Finnish Composers Commissioned for Kari Kriikku" (DMA diss., Ohio State University, 2014); Pance Zaev, "An Annotated Bibliography of Selected Solo and Small Chamber Works for Clarinet in the 20th and 21st Century Written by Macedonian Composers" (DMA diss., University of Nebraska, 2015).

43. Amanda R. Morrison, "Eric Mandat: His Musical Life, A Performer's Perspective of *Preludes, Book 1* and *RrOWZER!*, and a Descriptive Catalog of his Published Clarinet Works (1980–2010)" (DMA diss., Florida State University, 2011); Rebecca Tout d'Alessio, "Eric Mandat (b. 1957): A Multiphonic Meditation on a Composer, Clarinetist and Teacher" (DMA diss., Arizona State University, 2012); Jessica Anne Hall Speak, "Eric Mandat's Pedagogical Style: Teaching Philosophy, Teaching Techniques, and Teaching Elements Within His Unaccompanied Clarinet Works" (DM diss., Florida State University, 2020).

44. Erin Elizabeth Vander Wyst, "Kimmo Hakola's 'Diamond Street' and 'loco': A Performance Guide" (DMA diss., University of Nevada, Las Vegas, 2016); Zachary Daniel Dierickx, "The Clarinet Works of Jörg Widmann: A Performance Guide to *Fantasie for Clarinet Solo* with a Survey of Unaccompanied Clarinet Repertoire and Guide to Contemporary Techniques" (DMA diss., Ohio State University, 2018); Kristen Elizabeth House, "The Concurrence of Traditional and Contemporary Characteristics in Selected Clarinet Music of Shulamit Ran: A Performer's Investigation" (DMA diss., University of Georgia, 2004).

Variants for Solo Clarinet.⁴⁵ While this second body of scholarship is especially useful for performers and certainly has pedagogical value, it is less relevant in the context of this literature review, as the focus of this second body of scholarship is on a particular composer, style, or piece rather than on a set of extended techniques or one specific technique.

Treatises, Method Books, and Compendiums

Although few treatises, method books, and compendiums from the past four decades cover extended clarinet techniques, works by E. Michael Richards, Kelly Burke, Gerald Farmer, and Beate Zelinsky and David Smeyers stand out in their treatment of extended clarinet techniques. Edwin Michael Richards' 1984 dissertation, a treatise on microtonal systems for the clarinet, provides a wealth of resources, including a fingering chart of 827 microtones; a catalog of microtonal, timbral, and atypical trills and tremolos; principles for forming microtonal scales on clarinet; and equidistant microtonal scales consisting of eight, twelve, or sixteen notes to the whole step.⁴⁶ This work remains one of the most comprehensive resources for microtonality as it relates to the clarinet, though the fingering graphics are occasionally difficult to read, and the breadth of information may be overwhelming to some readers. Richards incorporated select material from his dissertation into his 1992 book *The Clarinet of the Twenty-First Century*. This book offers an organological overview of the clarinet as well as discussions on the production of select extended techniques, with emphasis on multiple sounds and microtones.⁴⁷ Richards also includes a chapter on wind controllers and electronic synthesis, an original étude utilizing

45. Jonathan Galbreath, "An Examination and Analysis of the Extended Techniques Used in William O. Smith's *Variants for Solo Clarinet*" (MM thesis, California State University, Long Beach, 2019).

46. Edwin Michael Richards, "Microtonal Systems for Clarinet: A Manual for Composers and Performers" (PhD diss., University of California, San Diego, 1984).

47. E. Michael Richards, *The Clarinet of the Twenty-First Century* (Fairport, NY: E & K Publishers, 1992).

exclusively extended techniques, and an appendix of Karlheinz Stockhausen’s music for clarinet. This book is a useful companion to Rehfeldt’s *New Directions for Clarinet*, as both present similar material in slightly different contexts. Richards’ approach is more grounded in acoustical principles.

Kelly Burke’s 1995 book covers several aspects of a daily warm-up routine for clarinetists.⁴⁸ Chapter 4 covers contemporary harmonic language, where Burke introduces “extended” scale patterns such as modal, blues, whole tone, and pentatonic scales, as well as multiple articulation. The chapter closes with a quarter-tone scale, and exercises for eighteen select multiphonics. Overall, this book is a thorough resource for warm-ups, containing accessible, logically-sequenced exercises, though the pedagogical element in the sections covering extended techniques—in this case, multiple articulation, microtones, and multiphonics—is limited.

Gerald Farmer’s 1982 book *Multiphonics and Other Contemporary Clarinet Techniques* builds on his dissertation by covering the history and production of multiphonics and presenting catalogs of multiphonics and multiphonic trills and tremolos, grouped in three categories based on each multiphonic’s timbral characteristics and suggested physiological strategies for production.⁴⁹ Farmer also includes a chapter on eighteen other contemporary clarinet techniques and briefly discusses contemporary notational techniques. Though this book contains several useful pedagogical exercises for less-experienced players, it is not especially distinctive when compared to contemporaneous works by Rehfeldt and Caravan.

48. Kelly Burke, *Clarinet Warm-Ups: Materials for the Contemporary Clarinetist* (Medfield, MA: Dorn, 1995).

49. Gerald Farmer, *Multiphonics and Other Contemporary Clarinet Techniques* (Rochester, NY: SHALL-u-mo, 1982).

Beate Zelinsky and David Smeyers' anthology *Pro Musica Nova: Studies for Playing Contemporary Music for Clarinet* (1996) contains excerpts from and performance instructions for thirteen solo and chamber works by twentieth century composers.⁵⁰ In their commentary, which is presented in a separate booklet from the excerpts, Zelinsky and Smeyers offer context for each composition, as well as practical performance instructions and clarification of notation methods. This anthology is a good introduction to repertoire involving extended techniques, though most excerpts are rhythmically and notationally complex and suitable for experienced performers.

Dissertations Containing Methods or Catalogs

Several dissertations from the past three decades have included methods or catalogs pertaining to contemporary clarinet techniques. Gary Wilson Behm's 1992 dissertation features an analysis of six works for unaccompanied clarinet containing extended techniques.⁵¹ Of note is Behm's survey of early literature pertaining to extended techniques, and the annotated bibliography of fifty-three works for unaccompanied clarinet—written between 1960 and 1987— involving extended techniques. The annotated bibliography in particular may be useful for teachers and/or students interested in delving into this body of repertoire.

Holly Ann Haddad's 2006 dissertation surveys approaches to multiphonics by three pioneers in contemporary woodwind techniques: Bruno Bartolozzi, William O. Smith, and

50. Beate Zelinsky and David Smeyers, *Pro Musica Nova: Studies for Playing Contemporary Music for Clarinet* (Wiesbaden: Breitkopf & Härtel, 1996).

51. Gary Wilson Behm, "A Comprehensive Performance Project in Clarinet Literature with an Essay on the Use of Extended, or New, Technique in Selected Unaccompanied Clarinet Solos Published from 1960 through 1987" (DMA diss., University of Southern Mississippi, 1992).

Phillip Rehfeldt.⁵² Haddad finds that whereas Bartolozzi's approach involves embouchure flexibility, lip and air pressure, and reed position, Smith's approach involves embouchure and throat flexibility, and Rehfeldt's approach involves only jaw pressure. Haddad also surveys these three scholars' approaches to multiphonic categorization and fingerings, noting that Rehfeldt's multiphonics are the most accessible. Haddad presents a bibliography of clarinet works containing multiphonics, as well as an original catalog/fingering chart containing four categories of multiphonics. Because the fingering chart is organized according to dynamics, it is most helpful for performers who know the timbral and/or dynamic quality of the multiphonic for which they are searching; it is less helpful for performers who want to search for a multiphonic containing a certain pitch or set of pitches.

A 2014 dissertation by Ariana Warren outlines a holistic method for beginning clarinetists, emphasizing interactivity, non-western music, aural and theory skills, and unconventional sounds such as multiphonics and key clicks.⁵³ Although the complete method is included in the appendix, the method is not meant to be used in this form, as Warren intended to design the method as a software application for computer and tablet. However, as of this writing, the application has not been completed.

Jeremy Larkham Ruth's 2018 dissertation is one of few extant sources that explains vocalization—in this case, humming and singing while playing—on a wind instrument from a physiological perspective.⁵⁴ The purpose of the dissertation is twofold: to collect, analyze, and

52. Holly Ann Haddad, "The History and Comparison of Three Diverse Systems of Producing Multiphonics on the B-flat Boehm System Clarinet" (DMA diss., University of Arizona, 2006).

53. Ariana Warren, "21st Century Beginning Clarinet Method" (DMA diss., University of California, San Diego, 2014).

54. Ruth, "Humming and Singing."

utilize quantitative data from a research study to explain physiological differences between the two techniques, and to utilize the information from the study to create a systematic method for clarinetists to learn the techniques and to describe these techniques' possible effects and challenges for composers. The first several chapters of the document are devoted to describing the anatomy involved with clarinet playing and analyzing the data collected in the study. Ruth devotes the final two chapters to describing the method and offering recommendations for composers who wish to learn about either technique. This dissertation and its stand-alone pedagogical method are well-researched contemporary resources on these techniques.

Jack Yi Jing Liang's 2018 dissertation documents a study of multiphonic production on clarinet using ultrasound imaging.⁵⁵ Prior to the ultrasound investigation sessions, Liang cross-referenced multiphonic catalogs by William O. Smith, Phillip Rehfeldt, and Gerald Farmer, as well as compositions by Eric Mandat involving multiphonics. From these resources, Liang created a catalog of 604 dyads for standard Boehm system clarinet using 358 fingering combinations. Each multiphonic was tested over twenty repetitions and assigned a difficulty rating and production strategy. Based on the results of the ultrasound imaging, Liang provides four principal strategies for multiphonic production. Liang's work demonstrates rigorous, thorough, and up-to-date research on clarinet multiphonics. The catalog, organized by pitch and fingering, is particularly useful. Liang also introduces a new binary fingering system that allows users to search multiphonics by fingering.

55. Jack Yi Jing Liang, "Clarinet Multiphonics: A Catalog and Analysis of Their Production Strategies" (DMA diss., Arizona State University, 2018).

Writings on the Relationship between Fundamentals, Extended Techniques, and Pedagogy

Exploring new techniques as a means of improving “traditional” technique has long been promoted by clarinetists. Whether this was one method of appealing to clarinetists who may have been otherwise skeptical of or daunted by extended techniques is debatable but seems likely, given remarks by William O. Smith and Ronald Caravan in particular.⁵⁶ Over the past three decades, clarinetists have scrutinized the relationship between extended techniques and “fundamentals” of clarinet playing more closely, and, by extension, the pedagogical merits of introducing new techniques to students.

In a 1989 article, Eric P. Mandat examines tonal stability and flexibility in clarinet playing through the lens of multiphonic production.⁵⁷ Using the concept of “defocusing”—a relaxation of the conventional embouchure—as a means of exploring timbral flexibility, Mandat introduces four categories of multiphonic fingerings and short exercises for three of the four categories. Mandat’s assertion that “the right kind of practice on the right kind of multiphonics will help increase timbral flexibility in conventional contexts”⁵⁸ resembles propositions made by other pedagogues who have examined the relationship between fundamentals and extended techniques.

In the March 2020 article “Refining Fundamentals through Extended Techniques,” author Tiffany A. Valvo uses four extended techniques as a catalyst for improving fundamentals of

56. “It is my hope that these techniques will not only encourage additional experimentation by other clarinetists, but also help the performer improve his control of traditional techniques,” states Smith in his 1972 article “Contemporary Clarinet Sonorities.” In the 1975 article “Introducing Multiple Sonorities to the Young Clarinet Student,” Caravan lists three advantages for introducing young students to multiple sonorities, all of which are related to fundamentals of clarinet playing.

57. Eric P. Mandat, “Expanding Timbral: Flexibility Through Multiphonics,” *The Clarinet* 16, no. 3 (May–June 1989): 27-30.

58. *Ibid.*, 27.

clarinet playing, such as voicing, tongue position and control, and air flow.⁵⁹ Techniques covered are singing and playing, controlled glissando, stopped and muted tonguing, and overtones and multiphonics. Valvo provides short exercises for each technique as well as a rationale for their use and explanation of their execution. This is a succinct and practical guide for pedagogues wishing to integrate a few basic extended techniques into their teaching practice.

Amy Humberd's 2020 dissertation addresses the lack of pedagogical resources that include extended clarinet techniques in the clarinet curriculum and serves as a resource that fills that deficit. Humberd specifically targets the undergraduate clarinet curriculum and highlights how select extended techniques (portamenti, microtones, singing and playing, multiphonics, and double tonguing) can be used as tools for fundamental development.⁶⁰ Humberd presents systematic exercises—both original and excerpted from existing resources by Michele Gingras and Ronald Caravan—for each technique, as well as a list of select études and literature incorporating the techniques. Appendices include a list of pieces for further study, and multiphonic and microtonal fingering charts. This dissertation is a strong and relevant addition to the conversation surrounding extended clarinet techniques and fundamentals, though Humberd acknowledges that easier pedagogical materials, especially those that cover techniques omitted from the dissertation, are still needed for teaching and learning extended clarinet techniques.

While writings by Mandat, Valvo, and Humberd offer useful examples and compelling justification for teaching select extended techniques to improve tonal flexibility, voicing, air use, and more, few authors in recent years have explicitly addressed the importance of teaching

59. Tiffany A. Valvo, "Refining Fundamentals through Extended Techniques," *The Clarinet* 47, no. 2 (2020): 34-37.

60. Amy M. Humberd, "A Pedagogical Approach for Incorporating Extended Techniques into the Undergraduate Clarinet Curriculum" (DM diss., The Florida State University, 2020).

extended clarinet techniques aside from their contribution to developing elements of traditional technique. In the article “Teaching Extended Techniques,” Linda Merrick advocates for the introduction and exploration of extended techniques in studio lessons, particularly those at the pre-collegiate level.⁶¹ She suggests a number of reasons why these techniques are frequently absent from the pedagogical process, including teachers’ insecurity and/or lack of knowledge regarding repertoire incorporating extended techniques, perceived irrelevance of such techniques to less advanced students, and the belief that learning extended techniques may be detrimental to less advanced students’ ability to learn and retain fundamental skills relating to tone production and embouchure formation. Merrick argues that while teachers undoubtedly face challenges when teaching these techniques, they are responsible for providing their students with a comprehensive musical education that prepares them to confidently and convincingly perform contemporary clarinet works. Merrick addresses select extended techniques from a pedagogical perspective and notes the lack of repertoire and exercises suitable for less advanced players incorporating such techniques.

In his 2020 dissertation, Luke Ellard addresses the pedagogical gap in introductory instructional resources for extended clarinet techniques by presenting six newly-composed études covering quarter tones, multiphonics, vocalizations, guided improvisation, articulation, and graphic notation.⁶² Targeting advanced high school and early college undergraduate students as well as newcomers to contemporary music, Ellard also includes short preparatory exercises and instructions before each étude that function as entry points into a particular technique. The

61. Linda Merrick, “Teaching Extended Techniques,” *Clarinet and Saxophone* 29, no. 2 (2004): 10-12.

62. Luke Michael Ellard, “Bridging the Gap: Introducing Extended Techniques and Contemporary Notation Through Newly Composed Etudes for Clarinet” (DMA diss., University of North Texas, 2020).

études themselves range from one to three and a half pages, are rhythmically straightforward, and focus on only one category of extended technique per étude, allowing performers to practice the techniques with few other demands. The scope of extended techniques covered as well as the accessibility and originality of the études results in an excellent, up-to-date addition to the pedagogical literature for clarinet, though, as with most existing materials, air sounds and certain notation methods are underexplored.

Commission Projects

Two notable commission projects have attempted to fill the gap in appropriate teaching pieces for contemporary clarinet techniques. Rebecca J. Danard's 2011 dissertation presents a collection of twelve études for clarinet, commissioned by the author.⁶³ Each étude involves at least one extended technique; these techniques include timbral trills, multiphonics, vocalizing while playing, key clicks, microtones, and more. Danard provides background and pedagogical commentary for each étude and exhibits the études in their entirety in the appendix. Although the études are intended for advanced high school students and college freshmen, many contain complex rhythms and technical issues that may be challenging for those groups, and a few incorporate multiple extended techniques.

Despite the dearth of extended technique exercises and études suitable for less advanced players, the body of repertoire for this demographic continues to grow, most notably by a recent commission project and dissertation by clarinetist Olivia Meadows.⁶⁴ In the dissertation,

63. Rebecca J. Danard, "Études in Performing Extended Techniques: Twelve Newly-Commissioned Canadian Works for Solo Clarinet" (DMA diss., University of Cincinnati, 2011).

64. Olivia Meadows, "A Program of Study for 21st Century Clarinet Techniques Featuring Five New Compositions for Unaccompanied Clarinet" (DMA diss., Arizona State University, 2019).

Meadows provides an overview and practice suggestions for five newly-commissioned works for unaccompanied clarinet. Meadows offers an intended order of study for the works, which increase in difficulty. Each of the first four works focuses on one pedagogical area of extended technique (notated rubato/musicality, the altissimo register, microtones, and multiphonics, respectively), while the fifth work is a culmination of all aforementioned techniques. Meadows' work is a compelling recent addition to the literature surrounding the pedagogy of extended techniques, and a valuable contribution to the gap in contemporary repertoire for younger and/or less advanced players.

Online Resources

A number of notable online resources for extended clarinet techniques have emerged alongside the rise of the internet over the past two decades, offering performers, pedagogues, and composers easy access to information on these techniques. New music specialist and clarinetist Heather Roche maintains a blog where she addresses numerous aspects of contemporary clarinet techniques, particularly multiphonics. A 2018 post titled "27 Easy Bb Clarinet Multiphonics" [sic] features the results of a survey administered by Roche.⁶⁵ In the survey, a group of thirty-six clarinetists of various backgrounds played through forty-four multiphonics (drawn from Roche's database of 208 multiphonics), then rated each multiphonic's ease of production from 1 ("very easy") to 5 ("can't get this multiphonic to speak at all"). Roche presents the results in three categories: "super easy" multiphonics (attained by over 90 percent of respondents), "very easy" multiphonics (attained by over 80 percent of respondents), and "easy" (attained by over 60 percent of respondents). Roche provides an audio sample and fingering for each multiphonic.

65. Heather Roche, "27 Easy Bb Clarinet Multiphonics," *Heather Roche* (blog), September 13, 2018, <https://heatherroche.net/2018/09/13/27-easy-bb-clarinet-multiphonics/>.

This is a concise, straightforward compilation that can be utilized to create short exercises for students largely unfamiliar with multiphonics.

In another blog post, Roche outlines seven principal categories of air sounds on clarinet: air vs. pitch, vowel sounds and sweeps, taking off the mouthpiece, inhaling, articulation effects, blowing at the mouthpiece, and clarinet as shakuhachi.⁶⁶ Roche provides an audio example for each type of air sound and also includes examples on bass and contrabass clarinets. Her video introduction to the blog post is especially useful, though the information presented in the video differs slightly from the blog post.

In addition to Roche's blog, clarinetists Jason Alder and Gregory Oakes also have valuable resources on their personal websites. Alder's quarter-tone fingering chart is clear and often provides multiple options for each pitch.⁶⁷ Oakes' interactive site allows the user to locate fingerings for multiphonics and microtones.⁶⁸ For multiphonics, the user may specify any of the following criteria: category (all dynamics, flexible; soft attacks, crescendo to *mf-f*; quiet, little to no crescendo; loud, with beats; dyads; and variable in upper partials, shrill), pitch, and dynamics (*pp* to *ff*). For microtones, the user may select the pitch for which they want a fingering. Oakes' resource is notable not only for its thoroughness, but also for its attention to the varied timbral and dynamic qualities of multiphonics, an element which some other resources lack.

66. Heather Roche, "...on writing air sounds for clarinet," *Heather Roche*, February 13, 2014, updated February 15, 2017, <https://heatherroche.net/2014/02/13/on-writing-air-sounds-for-clarinets/>. The shakuhachi is a Japanese notched bamboo flute.

67. Jason Alder, "Resources," *Jason Alder (Bass Clarinetist)*, accessed April 6, 2020, <https://www.jasonalder.com/resources/>.

68. Gregory Oakes, "Clarinet Extended Techniques," *Gregory Oakes Clarinet*, accessed April 6, 2020, <https://www.gregoryoakes.com/multiphonics/index.php>.

Summary

This chapter traces the trajectory of pedagogical resources generated for extended clarinet techniques over the past sixty years. As the body of clarinet repertoire involving extended techniques expanded greatly between 1960–1980, so did the body of materials covering extended clarinet techniques to meet the demands of the repertoire. Materials within the first wave (1965–1980) include books, articles, dissertations, and *étude* collections, most of which take a survey-based approach by establishing, summarizing, and cataloguing extended clarinet techniques, as well as detailing production strategies. Materials within the second wave (1981–2020) encompass a variety of mediums, including compendiums, articles, *étude* collections, dissertations, and an assortment of online sources. Much of the discourse in second-wave materials focuses on developing a specific aspect of contemporary clarinet performance—such as the relationship between fundamentals and extended techniques, or an updated multiphonic catalog—rather than surveying existing techniques as did many first-wave materials.

Despite the substantial number of resources on extended clarinet techniques, the extent to which authors address how to learn and teach these techniques varies. Moreover, there are few pedagogical materials suitable for teaching extended clarinet techniques to young and/or less advanced clarinetists; similarly, there is no compendium of all existing resources to guide selection of materials. While authors such as Ronald Caravan and Olivia Meadows have made especially valuable contributions to the pedagogy of extended clarinet techniques, few resources provide simple exercises to help the clarinetist systematically build proficiency in extended techniques. The original materials presented in part in the following chapters and in their entirety in Appendix B aim to fill that void, and the compendium in Appendix A represents the first comprehensive collection of pedagogical resources for extended clarinet techniques.

CHAPTER 3: PEDAGOGICAL MATERIALS FOR MULTIPHONICS

Multiphonics—acoustic phenomena involving the simultaneous production of two or more pitches by one player—can be produced on the clarinet through four methods. Type 1 multiphonics are generated by changing the voicing on a conventional fingering, while Type 2 multiphonics are generated by changing the voicing on an unconventional fingering.⁶⁹ The third and fourth methods, humming while playing and singing while playing, have been extensively researched, yielding their own discourse, and will not be covered here under the category of multiphonics.⁷⁰ Multiphonic trills and tremolos have also been extensively documented and are beyond the scope of this dissertation.⁷¹

The purpose of this chapter is to provide sufficient context and practical instructions for players to successfully perform Type 1 and Type 2 multiphonics on the Boehm system soprano clarinet. Within these two principal categories of multiphonics, several subcategories exist to further classify multiphonics by specific timbral qualities and technical demands. These subcategories will be discussed later in the chapter.

Background

Multiphonics have been a prominent feature of many compositions since the mid-twentieth century. Bruno Bartolozzi, author of *New Sounds for Woodwind*, believes that there are

69. In this chapter and its corresponding exercises, my multiphonic categorization modifies Sarah Watts' definition of Type 1 multiphonics to include all conventional fingerings on the clarinet, as opposed to only standard low note fingerings. For further reading on Watts' categorization of multiphonics, see Sarah Watts, "Spectral Immersions: A Comprehensive Guide to the Theory and Practice of Bass Clarinet Multiphonics" (PhD diss., Keele University, 2015). "Voicing" refers to the manipulation of the vocal tract while playing.

70. For further information on methods of vocalizing while playing, see Jeremy Larkham Ruth, "Humming and Singing while Playing."

71. For further information on multiphonic trills and tremolos, see Gerald Farmer, "Multiphonic Trills and Tremolos."

two main reasons why the use of multiphonics did not emerge until this time. First, he argues that “the structural evolution of instruments has been derived by exclusively empirical methods,”⁷² which has been conducive to organological development but less so to the development of techniques such as multiphonics. In addition, Bartolozzi writes that the objective of producing “single sounds of maximum timbric homogeneity”⁷³ in order to satisfy musical requirements of past eras has limited the exploration and expansion of instrumental possibilities. In the twentieth century, however, many performers began experimenting with pushing the limits of sonic production on their instruments, leading to the development of extended techniques such as multiphonics.

Woodwind players, particularly in the jazz field, experimented with multiple sounds as early as the 1940s. In his book *The Clarinet of the Twenty-First Century*, E. Michael Richards writes, “We know from recordings and reviews of live performances that jazz clarinetists Sidney Bechet and Pee Wee Russell were fond of buzz tones (in the 1940s and earlier), produced by simultaneously humming and playing.”⁷⁴ Bass clarinetist Eric Dolphy and saxophonist John Coltrane were also some of the first woodwind players to use multiphonics; however, as they would have used these in improvisations, no notated examples exist. Antonio Ferrannini, professor at the Conservatory of San Pietro a Majella of Naples, is credited with documenting this nascent technique in his 1943 book *Ancie battenti*.⁷⁵ Early examples of notated compositions using multiphonics include Luciano Berio’s *Sequenza I* (1958) and Franco Evangelisti’s

72. Bruno Bartolozzi, *New Sounds for Woodwind*, 2nd ed., trans. and ed. Reginald Smith Brindle (London: Oxford University Press, 1982), 3.

73. *Ibid.*

74. Richards, *The Clarinet of the Twenty-First Century*, 142.

75. Rehfeldt, *New Directions for Clarinet*, 41.

Proporzioni (1958), both for flute. The earliest notated example of a clarinet multiphonic, denoted by the word “undertone,” occurs in John Cage’s *Concert for Piano and Orchestra* from 1957–58, though Cage’s exact intentions with this instruction are debatable.⁷⁶

While composer-performer collaborations have always played an important role in the development of instrumental technique, they are especially crucial to the evolution of multiphonics. Berio and Evangelisti both wrote for the Italian flutist Severino Gazzelloni, and Bartolozzi cites the instrumentalists Sergio Penazzi, Lawrence Singer, Pierluigi Mencarello, Detalmo Corneti, and Giuseppe Garbarino as invaluable to the writing of *New Sounds for Woodwind*.⁷⁷ The first pieces with controlled, notated multiphonics in the clarinet repertoire, William O. Smith’s *Five Pieces for Flute and Clarinet* (1961) and John Eaton’s *Concert Music for Solo Clarinet* (1961), were the result of Smith’s experiments with new sounds on his instrument. Smith ultimately wrote dozens of works extending the limits of sound production on the clarinet, influencing countless other composers to do the same.

Today, multiphonics are an integral part of contemporary clarinet technique and repertoire, commonly used in solo, chamber, and orchestral compositions as well as improvisations. Consequently, the study of multiphonics in isolation from the repertoire has become an increasingly necessary component of technical development. Many existing resources, including those by Ronald Caravan, Frank Dolak, Jack Liang, Phillip Rehfeldt, and Heather Roche, aim to assist clarinetists in learning multiphonics by providing fingering catalogs or presenting études.⁷⁸ However, only a few resources target multiphonics in a simple, systematic

76. Haddad, “History and Comparison,” 13-14.

77. Bartolozzi, *New Sounds for Woodwind*, acknowledgements.

78. See “Selected Resources and Repertoire for Further Study” at the end of this chapter.

manner. The purpose of the original materials corresponding to this chapter, therefore, is to add to this small collection of resources with content that is accessible to both seasoned and less-experienced players.

Terminology

A variety of terminologies have been employed to describe the production of multiple sounds on a wind instrument. While some of the earliest terms used, such as *double stops*, *chords*, *harmonics*, *polyphonics*, and *overtones* are unsuitable descriptors, they lend insight into how certain composers and performers initially conceived of this phenomenon. Multiphonics have also been referred to as *double sounds* and *dyads*. The most common terms in use today are *multiphonics*, *multiple sonorities*, and *multiple sounds*; along with these descriptors' universality, they do not contain other connotations as terms such as *harmonics* or *chords*, eliminating possible confusion from performer to performer. For uniformity and ease of understanding, the terms *multiphonics* and *dyads* will be used throughout this chapter. The term *multiphonics* refers to the simultaneous production of two or more pitches, while the term *dyads* refers to the simultaneous production of two or more pitches where two distinct pitches are more audible than others.

Notation

Composers employ many different methods of notation to delineate multiphonics or dyads. Listed below are three principal categories representing the most common methods:

- 1) Multiphonics containing precise pitches
 - a) The multiphonic is generally written as a chord or dyad. The multiphonic may be notated with all ordinary noteheads, as in example 3.1.

Example 3.1. Multiphonic written as a chord with all ordinary noteheads.



- b) The multiphonic may be notated with one or more unconventional noteheads, as in example 3.2 and example 3.3.

Example 3.2. Multiphonic notated with diamond noteheads.



Example 3.3. Multiphonic notated with an ordinary notehead and a diamond notehead.



- 2) Multiphonics containing imprecise or approximate pitches
- a) The multiphonic may be notated with ordinary noteheads with one or more smaller filled-in noteheads (sometimes also in parentheses or brackets), indicating an approximate pitch or pitches which may be less prominent than other pitches (example 3.4).

Example 3.4. Multiphonic notated with ordinary noteheads and a smaller notehead.



- b) The multiphonic may be notated using cluster notation, with boxed noteheads (example 3.5).

Example 3.5. Multiphonic notated with boxed noteheads.



- c) The multiphonic may be notated graphically, with arrows representing a transition between single and multiple sounds (example 3.6). The open circle above the staff indicates a single sound—the notated pitch—and the filled-in circle represents a multiphonic based on the notated pitch.

Example 3.6. Multiphonic notated graphically.



- 3) Multiphonics containing a mixture of precise and imprecise pitches
 - a) The multiphonic may be notated with an ordinary notehead with text (e.g. “overblow” or “overblow to multiphonic”).⁷⁹
 - b) The multiphonic may be notated with an ordinary notehead with “X”s above and text (e.g. “harsh multiphonic”), as in example 3.7.

⁷⁹ Elaine Gould, *Behind Bars* (London: Faber Music, 2011), 258.

Example 3.7. Multiphonic notated with an ordinary notehead and “X”s above.



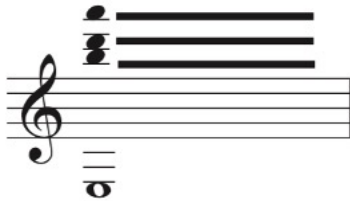
- c) The multiphonic may be notated as an ordinary notehead with the capital letter “M” or “MP” above or through the stem (example 3.8).

Example 3.8. Multiphonic notated with an ordinary notehead and the capital letter “M” above.



- d) The multiphonic’s fundamental pitch may be notated as an ordinary notehead, with higher harmonics indicated with stemless noteheads and lines above (example 3.9).

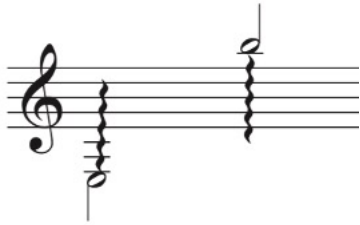
Example 3.9. Multiphonic notated with an ordinary notehead and stemless noteheads and lines.



- e) The multiphonic may be notated with precise pitches indicated by ordinary noteheads and imprecise pitches indicated with wavy lines (example 3.10).⁸⁰

80. Kurt Stone, *Music Notation in the Twentieth Century* (New York: W. W. Norton & Company, 1980), 194.

Example 3.10. Multiphonic notated with ordinary noteheads and wavy lines.



While the methods above are among the more common ways of notating multiphonics on woodwind instruments, they by no means represent a comprehensive listing.⁸¹ The best steps a performer can take in order to ensure an accurate interpretation are to carefully read the performance instructions, listen to recordings when applicable, and, if possible, consult with the composer directly.

Acoustics

Performers should have a foundational knowledge of the physical properties of the clarinet and how its construction affects acoustics and, consequently, multiphonic production. Understanding how the harmonic series functions on the clarinet is particularly essential to successfully executing Type 1 multiphonics, which are based on conventional fingerings.

Every sound has a series of natural overtones, or harmonics, that are successive integer multiples of the fundamental frequency: the first harmonic.⁸² On wind instruments, the fundamental is “determined by a complex interaction between the tone generator (air jet, reed or

81. For further information regarding notation of multiphonics, see Gould, *Behind Bars*, 257-59, and Stone, *Music Notation*, 193-95.

82. For example, if the fundamental frequency is 110 Hz, the frequencies of the harmonics will be 220 Hz (2nd harmonic), 330 Hz (3rd harmonic), and so on.

lips) and the air column of the instrument.”⁸³ Wind instruments’ modes of vibration⁸⁴ contain frequencies close to those of a harmonic series. Performers can excite different harmonics by depressing a register key or changing voicing or embouchure pressure, depending on the instrument.⁸⁵ Harmonics are determined by the specific acoustical properties of each instrument. The clarinet functions as a cylindrical pipe that is closed at one end, dictating that only the odd-numbered partials in the harmonic series resonate, in contrast to the other woodwind instruments, which can play every partial in the series.⁸⁶

The relationship between the clarinet’s modes of vibration and its closed cylindrical pipe system makes the clarinet distinctive among woodwind instruments. Whereas the flute’s second mode of vibration is roughly an octave higher than the first, the clarinet’s second mode of vibration corresponds to the third harmonic, not the second.⁸⁷ Therefore, the third harmonic on clarinet is a twelfth higher than the fundamental pitch. Example 3.11 compares the first few harmonics that are possible on flute and clarinet without changing the fingering of the fundamental pitch.

83. Guy Oldham, Murray Campbell, and Clive Greated, “Harmonics,” *Grove Music Online*, ed. Deane Root, accessed January 13, 2021, <https://www-oxfordmusiconline-com.offcampus.lib.washington.edu/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000050023>.

84. In some texts, these are referred to as “air column resonances.”


85. Oldham, Campbell, and Greated, “Harmonics.”

86. This notion has been challenged by some acousticians and scholars, who have shown through spectral analyses that even-numbered partials are in fact present, with varying degrees of audible perception, in the clarinet’s resonance frequencies.

87. Oldham, Campbell, and Greated, “Harmonics.”


Example 3.11. Harmonics on flute and clarinet.

Flute (written pitch)



Fundamental 2nd harmonic 3rd harmonic 4th harmonic

Clarinet (written pitch)



Fundamental 3rd harmonic 5th harmonic 7th harmonic

Detailed description: The image shows two musical staves. The top staff is for the flute, showing a treble clef with a single note on the middle line (E4) labeled 'Fundamental'. Above it are three notes: one on the first space (E5) labeled '2nd harmonic', one on the second space (G5) labeled '3rd harmonic', and one on the second line (B5) labeled '4th harmonic'. The bottom staff is for the clarinet, also with a treble clef. It shows a single note on the middle line (E4) labeled 'Fundamental'. Above it are three notes: one on the first space (E5) labeled '3rd harmonic', one on the second space (G5) labeled '5th harmonic', and one on the second line (B5) labeled '7th harmonic'.

On the clarinet, it is possible to simultaneously produce one or more of the higher harmonics while maintaining the fundamental pitch, simply by modifying the voicing. Example 3.12 demonstrates three dyads that use the same E3 fingering:

Example 3.12. Three dyads on clarinet using E3 fingering.



Detailed description: The image shows a single treble clef staff with three dyads. Each dyad consists of a lower note and an upper note. The first dyad has a note on the middle line (E4) and a note on the first space (E5). The second dyad has a note on the middle line (E4) and a note on the second space (G5). The third dyad has a note on the middle line (E4) and a note on the second line (B5).

The dyads in example 3.12 are all Type 1 multiphonics because the performer uses the conventional fingering for E3 and manipulates the voicing to excite the higher harmonics.

Voicing

In addition to acoustics, a basic understanding of voicing on the clarinet is crucial to successfully playing multiphonics. Jack Liang, whose research forms the framework for many of the materials associated with this chapter, defines voicing as “the tongue position inside the oral and pharyngeal cavity during clarinet performance.”⁸⁸ The tongue’s mobility sets it apart from

88. Liang, “Clarinet Multiphonics,” 40.

the rest of the vocal tract anatomy, making it a natural choice for manipulating sound production on the clarinet.⁸⁹ Ultrasound studies have found that in “normal” playing, tongue position typically remains high throughout the chalumeau register and descends as the pitch ascends throughout the clarion and altissimo registers.⁹⁰ Because many multiphonics involve the simultaneous production of pitches from separate registers of the clarinet, the appropriate production strategy is often not immediately apparent.

Multiphonic production also requires more flexibility in embouchure position than in “normal” playing. With many multiphonics, even the slightest variance in embouchure or jaw position can affect production. As the performer’s understanding of the physicality of executing certain multiphonics solidifies, the performer will be able to more quickly return to the appropriate production strategy. Emulating different vowels is another common approach to voicing.⁹¹ Practicing voicing exercises can also help players to understand the extent to which all of these elements affect note production. A variety of voicing exercises can be found in method books, articles, and dissertations. Materials by Liang, Tiffany Valvo, and Kelly Burke in particular may be especially useful in supplementing the content here.⁹² Approaching multiphonics as a study in voicing provides an opportunity to develop tongue control, as multiphonic production is essentially an extension of familiar voicing strategies.

89. Ibid.; Steven M. Lulich, Sherman Charles, and Benjamin Lulich, “The Relation Between Tongue Shape and Pitch in Clarinet Playing Using Ultrasound Measurements,” *Journal of the Acoustical Society of America* 141, no. 3 (2017): 1759-68, <http://dx.doi.org/10.1121/1.4978059>.

90. Joshua Gardner, “Ultrasonic Investigation of Clarinet Multiple Articulation” (DMA diss., Arizona State University, 2010); Lulich, Charles, and Lulich, “Tongue Shape and Pitch,” 1759-68.

91. Darleny González and Blas Payri, “A Vowel-Based Method for Vocal Tract Control in Clarinet Pedagogy,” *International Journal for Music Education* 35, no. 3 (August 2017): 436-37, doi: 10.1177/0255761416689840.

92. Burke, *Clarinet Warm-Ups*, 23–24; Jack Liang, “Resources,” *Jack Liang*, accessed June 23, 2020, <https://www.jackliangmusic.com/resources>; Valvo, “Refining Fundamentals,” 34-37.

Production Strategies

A variety of physiological and mechanical factors may affect multiphonic production, the most significant of which is tongue position. Jack Liang's 2018 dissertation covers numerous aspects of clarinet multiphonics in the context of precise dyads that will be helpful to keep in mind when approaching the exercises corresponding to this chapter. Applying results from ultrasound investigative sessions examining tongue motion, Liang outlines four basic strategies for learning multiphonic production:

- A) Lowering the back of the tongue while sustaining the upper note
- B) Raising the back of the tongue while sustaining the upper note
- C) Changing the tongue position to that of the lower note while sustaining the upper note
- D) Raising the root of the tongue (similar to the sensation of constricting the throat) while sustaining the upper note⁹³

Although these strategies may initially seem daunting, Liang points out that they are simply extensions of what we already know, as we manipulate our tongue every day to form different vowels when speaking.⁹⁴ With practice, multiphonic production will not only begin to feel more natural, it may also improve elements of conventional playing.⁹⁵

Even with an understanding of the above strategies, one of the main challenges of multiphonic production is recognizing which strategy to use for a given multiphonic. When practicing, multiphonics and dyads notated with precise pitches should generally be approached from an upper note. Liang presents three benefits of this method: 1) voicing changes will affect higher notes more than lower notes, 2) smaller alterations are needed, and 3) the upper note is

93. Liang, "Clarinet Multiphonics," 44. For production strategy D, Liang suggests using the hard G consonant, as in "go."

94. *Ibid.*, 41.

95. Mandat, "Expanding Timbral Flexibility"; Valvo, "Refining Fundamentals."

often the more difficult of the two to produce.⁹⁶ This supports a statement by Ronald Caravan, who wrote in an 1975 article: “It appears that in the beginning, multiphonic production is easier when one attempts to introduce lower partials while sustaining an upper one than vice versa.”⁹⁷ In musical contexts, however, players may encounter “emergent multiphonics,” in which one or more upper notes emerge from the lowest pitch. Isolating the individual pitches first will aid in producing the multiphonic. Liang writes, “The correct voicing for producing any multiphonic can be described as the intermediate of the voicings for producing the individual notes of the multiphonic.”⁹⁸ While these two basic strategies can be applied to most multiphonics and dyads notated with precise pitches, translating notation indicating imprecise pitches into successful multiphonic production is less clear and may require a good deal of experimentation. Flexibility in the embouchure, tongue, and jaw is essential to discerning production strategies for this type of multiphonic notation. Spectral multiphonics, for example, may involve more jaw motion than in conventional playing.

Liang notes the effect of other physiological factors, such as airstream, embouchure, and lip pressure, on multiphonic production, and that the four strategies are not necessarily the only ways to produce a multiphonic. Furthermore, the multiphonics in Liang’s study were played outside of a musical context. Attempting any of the dyads in Liang’s catalog within a piece of music may prove to be a vastly different experience than attempting them in isolation, as factors such as tempo and dynamics can affect multiphonic production. In addition, performers should recognize that two fingerings for the same multiphonic may have different timbral and/or

96. Liang, “Clarinet Multiphonics,” 43.

97. Caravan, “Introducing Multiple Sonorities to the Young Clarinet Student,” 18.

98. Liang, “Clarinet Multiphonics,” 41.

dynamic qualities, as well as intonation tendencies. Finally, factors such as equipment and fatigue may also influence multiphonic production.⁹⁹

Despite their mercurial nature, clarinet multiphonics can be learned and refined like any other technique. It is important to understand that the execution of multiphonics often requires unconventional modifications to voicing; thus, many multiphonics may feel uncomfortable to play at first. Isolating a particular multiphonic allows the performer to get a sense of what general shape the oral cavity must assume, though this may change slightly day-to-day and even within a practice session, depending on fatigue. Observing and writing down what works during each attempt can also help the performer to discern what may ultimately lead to consistency. If the performer memorizes Liang's categorization of production strategies, a letter next to each multiphonic may suffice.

Type 1 Multiphonics

Type 1 clarinet multiphonics are produced by changing the voicing on a conventional fingering. Each pitch in a multiphonic will come from a different mode of vibration of the fingering. As a minimum of two notes can be produced with every fingering on the clarinet, it is important to always play the desired pitches individually before attempting a multiphonic, especially one that uses a conventional fingering. An example of a Type 1 multiphonic is a multiphonic based on an E3 (example 3.13); changing the voicing activates the higher harmonics while simultaneously maintaining the fundamental pitch. Each individual pitch in this multiphonic can also be produced with the E3 fingering.

99. Harry Sparnaay, *The Bass Clarinet: A Personal History*, 3rd ed., trans. Annelie de Man and Paul Roe (Barcelona, Spain: Periferia Sheet Music, 2012), 134.

Example 3.13. Clarinet multiphonic based on E3.



The multiphonic in example 3.13 belongs to two subcategories of multiphonics: spectral multiphonics and “overblown.” Spectral multiphonics are the only way to play multiphonics in the lowest register of the clarinet. They are produced by using a normal fingering in the chalumeau and overblowing, or manipulating the tongue to produce the higher partials. This results in a fragile and usually harsh collection of pitches belonging to the fundamental pitch’s harmonic spectrum, hence the term “spectral.” Performers may need to experiment with finding more space in the oral cavity and/or lowering the jaw to “realize” the harmonic spectrum. Glissandi on spectral multiphonics are especially dramatic, if not overused in the repertoire; this effect is achieved by varying the tongue and jaw position. Clarinetist Heather Roche recommends learning to play spectral multiphonics on a contrabass or bass clarinet, as production is easier on these instruments.¹⁰⁰ It is also possible to combine spectral multiphonics with other techniques such as vocalization, flutter-tongue, or slap tongue.

Multiphonics can also be produced by overblowing a pitch in the clarion register. These multiphonics usually require production strategy A or C. When using a conventional fingering, they may be more difficult to produce than spectral multiphonics.

Underblown or undertone multiphonics are produced by playing in the second or third register of the clarinet and allowing the lower pitch, or “undertone,” to speak. When using a

100. Heather Roche, “Spectral Multiphonics – Bb and Bass,” *Heather Roche* (blog), September 26, 2016, <https://heatherroche.net/2016/09/26/spectral-multiphonics-bb-and-bass/>.

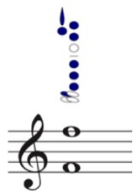
conventional fingering, this type of multiphonic is usually performed at soft dynamics. To give one example of an underblown multiphonic, a C6-G4 dyad is produced by using the conventional fingering for C6, determining “normal” voicing for that note, and then raising the back of the tongue to get the undertone. This undertone is the “grunt” that beginning clarinetists often produce when attempting to play a pitch in the upper clarion. Players may encounter challenges to producing underblown multiphonics when the upper note is between C5 and G5 or in the high altissimo register, or when the multiphonic fingering uses an alternate register key that is lower on the instrument, such as the first finger of the left hand or the bottom trill key.¹⁰¹

Type 2 Multiphonics

Type 2 multiphonics are produced with unconventional fingerings in combination with voicing changes. Many Type 2 multiphonics use cross fingerings, in which the fingering involves closed tone holes below the first open tone hole, creating two different effective tube lengths: one short, one long.¹⁰² An open tone hole within a cross fingering serves two concurrent functions: it acts as an alternate register key, and it terminates the short effective tube.¹⁰³

Example 3.14 demonstrates a Type 2 multiphonic that uses a cross fingering.

Example 3.14. Type 2 multiphonic that uses a cross fingering.



101. Jack Liang, “Clarinet Multiphonics - Undertone Multiphonics,” YouTube, April 8, 2020, video, 19:17, <https://www.youtube.com/watch?v=mBTADO69Xpo&t=914s>.

102. Liang, “Clarinet Multiphonics: A Catalog and Analysis of Their Production Strategies,” 11; Caravan, “Extensions of Technique,” 95-102.

103. Caravan, “Extensions of Technique,” 98-99.

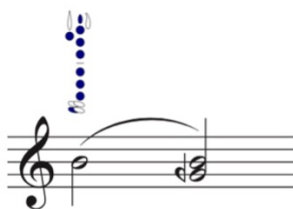
Here, the open tone hole on the upper joint functions as an alternate register key, allowing the player to simultaneously produce two pitches from different registers. This dyad is designated as B-1 in Liang’s catalog: the “B” indicates the player should raise the back of the tongue while sustaining the upper pitch, and the “1” indicates the dyad is produced more easily than the individual pitches.

Alternate register keys commonly facilitate production of underblown multiphonics that use unconventional fingerings. Similarly, emergent multiphonics are produced by overblowing—resulting in a pitch in the second or third register—or underblowing; they are named because the player begins with a single pitch out of which one or more pitches gradually emerge. Emergent multiphonics, both underblown and overblown, may be produced with either a conventional or unconventional fingering. Example 3.15 demonstrates an overblown emergent Type 2 multiphonic, and example 3.16 demonstrates an underblown emergent Type 2 multiphonic. Both use production strategy A.

Example 3.15. Overblown emergent Type 2 multiphonic.



Example 3.16. Underblown Type 2 multiphonic.



Example 3.16 is also an example of a close dyad. These multiphonics consist of two pitches that form an interval no larger than a sixth. Close dyads always require an unconventional fingering in which one or more alternate register keys may be involved. In most cases, the bottom pitch is in the throat register, and the top pitch is in the lower clarion. Close dyads are among the most challenging multiphonics to produce because of the physical precision they demand. Without the right amount of air speed, embouchure force, and voicing manipulation, the player may only be able to produce either the top or the bottom pitch. Therefore, it is important to first play both pitches individually before attempting the dyad. It may also be helpful to practice close dyads while sitting down to more easily access the side keys. Dynamic and timbral characteristics of close dyads are generally soft and airy, as fingerings for close dyads often involve multiple alternate register keys.

Exercises, Studies, and Sketches for Multiphonics: Purpose and Description

As established throughout this chapter, multiphonics are among the most researched and well-documented extended techniques. Yet the level of difficulty posed by many pieces involving multiphonics may deter clarinetists from performing that body of repertoire, and some of the existing pedagogical materials for multiphonics may not be accessible to clarinetists who are new to the technique. Simple études, therefore, are a logical medium for initial development of less familiar techniques. The purpose of the materials associated with this chapter is to equip performers with little or no experience playing multiphonics with the skills and knowledge necessary to play repertoire involving multiphonics, and to provide more experienced performers a framework with which to hone their skills. The materials are divided into three sections: Preparatory Voicing Exercises, Multiphonic Studies, and Multiphonic Sketches. Below is an outline of all materials (table 3.1):

Table 3.1. Outline of original materials for multiphonics.

Section I: Preparatory Voicing Exercises	9 total exercises
Section II: Multiphonics Studies	29 total studies
Type 1 multiphonics: overblown, underblown, spectral	6 studies
Type 2 multiphonics (closely related to conventional fingerings): production strategies A, B, C ¹⁰⁴	15 studies
Type 2 multiphonics (not closely related to conventional fingerings): production strategies A, B, D ¹⁰⁵	6 studies
Close dyads	2 studies
Section III: Multiphonic Sketches	3 total sketches

Performers should begin with Section I, the Preparatory Voicing Exercises, before targeting a subcategory or subcategories of multiphonics. The purpose of these nine exercises is to develop awareness and control of the various parts of the tongue involved with voicing and, by extension, multiphonic production. The Preparatory Voicing Exercises may be played in any order.

The purpose of the twenty-nine Multiphonic Studies in Section II is to improve flexibility and control of voicing when producing multiphonics. To this end, most of the Studies reference Liang’s categorization of production strategies. With the exception of the spectral multiphonics in Nos. 5 and 6, each multiphonic is labeled as it appears in Liang’s catalog, indicating both production strategy (A, B, C, or D) and difficulty rating from 1 (the dyad is easier to produce

104. Criteria for inclusion: multiphonics are categorized as a 1, 2, or 3 in Liang’s catalog, and require a fingering that is one action away from a conventional fingering. “Action” is defined here as depressing or releasing a key or tone hole.

105. Criteria for inclusion: multiphonics are categorized as a 1, 2, or 3 in Liang’s catalog, and require a fingering that is more than one action away from a conventional fingering. “Action” is defined here as depressing or releasing a key or tone hole.

than the individual pitches) to 5 (most difficult to produce).¹⁰⁶ In addition, the Studies emphasize the role of fingerings—both conventional and unconventional—in multiphonic production and are organized accordingly. All of the materials contain simple rhythms and meters so that the player can focus on the technical demands of multiphonic production.

The three Sketches in Section III are short pieces featuring multiphonics in a variety of contexts. Whereas the Studies in Section II are organized by fingering and production strategy, many of the Sketches integrate a variety of subcategories of multiphonics within a single piece. For example, No. 1 implements both Type 1 and Type 2 multiphonics, and the specific multiphonics used require production strategies A and B. Fingering tablatures are included in all Sketches, but production strategies have been omitted to more closely replicate the notation that performers may encounter in repertoire.

Multiphonics in Sections II and III were drawn from Liang’s catalog and Heather Roche’s blog post “27 Easy Bb Clarinet Multiphonics” [sic].¹⁰⁷ These resources were cross-referenced to find the easiest multiphonics listed in both, resulting in seven multiphonics total, which were prioritized when writing the Studies. Other multiphonics used in the Studies primarily come from Liang’s catalog. With the exception of Nos. 1, 28, and 29, all multiphonics in Section II that use production strategy A or B have a difficulty rating of either a 1 or a 2, to minimize potential challenges for players with little multiphonic experience. In Liang’s catalog, there are no category C multiphonic fingerings rated easier than a 2, and no category D multiphonic fingerings rated easier than a 3, so the Studies that use multiphonics in these

106. For a more detailed explanation of Liang’s methodology for determining production strategy and difficulty rating of each multiphonic in his catalog, see Liang, “Clarinet Multiphonics,” 34–39.

107. Roche, “27 Easy Bb Clarinet Multiphonics.”

categories may be more challenging. The close dyads in Nos. 28 and 29 have difficulty ratings of either a 2 or a 3.

Although many different methods of notation can be used to delineate multiphonics, the notation for Sections II and III was chosen with both consistency and comprehensibility in mind. With the exception of the Studies covering spectral multiphonics, the notation delineates dyads comprising precise pitches. Where necessary, fingering tablatures have been placed above each multiphonic at its first occurrence in the study. All multiphonics in Nos. 1-6 of Section II are Type 1 multiphonics and are, therefore, produced by changing the voicing on a conventional fingering. Once players have a foundation of multiphonic production, they will be able to more successfully interpret and perform repertoire featuring a variety of multiphonic notation methods.

Exercises, Studies, and Sketches for Multiphonics: Use and Modifications

The simplistic design of the materials allows performers with varied levels of multiphonic experience to use and modify them with ease. Below are three sets of recommendations for the materials' use, according to the performer's level of experience with multiphonics (beginner, intermediate, or advanced):

Beginner Level

(for players with little or no experience with multiphonics)

Begin with Section I: Preparatory Voicing Exercises.

- Sequence: Nos. 1-9 in order.
- Nos. 1, 2, and 4: Start at quarter=100 and gradually decrease the tempo.
- Nos. 3, 5, and 6: Start at quarter=60 and gradually increase the tempo.
- No. 6: "Flick" register key on beat 2.
- Nos. 7-9: Play out of time; depress register key on second pitch of each exercise.

Proceed to Section II: Multiphonic Studies.

- Sequence: Nos. 3-4, Nos. 7-10, Nos. 11-14, Nos. 19-20, Nos. 22-27
- Before playing each study, attempt to produce the individual notes of the multiphonic using the provided multiphonic fingering. Success in playing the individual notes of the multiphonic should lead to a successful production of the multiphonic.
- All studies may be played out of time until the performer is able to consistently produce each multiphonic in a given study. Note that many of the more difficult studies are omitted from this sequence.

Proceed to Section III: Multiphonic Sketches.

- Sequence: Any

Intermediate Level

(for players with some experience with multiphonics)

Begin with Section I: Preparatory Voicing Exercises.

- Sequence: Nos. 1-9 in order.
- Nos. 1, 2, and 4: Start at quarter=100 and gradually decrease the tempo.
- Nos. 3, 5, and 6: Start at quarter=60 and gradually increase the tempo.
- Nos. 7-9: Play out of time.
- No. 6: “Flick” register key the first time through each repeated section, then play as written on the repeat.

Proceed to Section II: Multiphonic Studies.

- Sequence: Nos. 3-4, Nos. 1-2, Nos. 5-6, then proceed in order through No. 29.
- Before playing each study, attempt to produce the individual notes of the multiphonic using the provided multiphonic fingering. Success in playing the individual notes of the multiphonic should lead to a successful production of the multiphonic.
- All studies may be played out of time as needed.

Proceed to Section III: Multiphonic Sketches.

- Sequence: Any

Advanced Level

(for players with significant experience with multiphonics)

Begin with Section I: Preparatory Voicing Exercises.

- Sequence: Nos. 1-9, any order.
- Nos. 1, 2, and 4: Start at quarter=90 and gradually decrease the tempo.
- Nos. 3, 5, and 6: Start at quarter=70 and gradually increase the tempo.
- Nos. 7-9: Play at a fixed tempo.

Proceed to Section II: Multiphonic Studies.

- Sequence: Nos. 1-29, any order.
- To test recall of production strategies, play each study through without first attempting individual multiphonic fingerings.
- All studies may be played out of time as needed.

Proceed to Section III: Multiphonic Sketches.

- Sequence: Any

Strategies gleaned from multiphonic exploration can be applied to much more than just contemporary repertoire involving multiphonics. Although the principal purpose of these materials is to provide performers with the skills and knowledge necessary to play repertoire involving multiphonics, the exercises have two additional pedagogical benefits: improving performers’ understanding of the role of the tongue in sound production, especially across different registers of the clarinet, and encouraging performers to explore the idea of timbral flexibility. The tongue is an important “articulating organ” within the vocal tract, which also

comprises the oral and nasal cavities, the pharynx, and the larynx.¹⁰⁸ As established earlier in this chapter, emulating different vowels is a common approach to voicing, and voicing exercises can help performers to understand the influence of tongue position on sound production. The multiphonic materials associated with this chapter reciprocally benefit the clarinetist in their development of vocal tract and timbral flexibility, both significant components of traditional playing and contemporary clarinet performance.

Timbral flexibility, according to Eric Mandat, may be accomplished by “defocusing,” or relaxing the conventional embouchure.¹⁰⁹ “Flexibility does not imply a lack of stability,” Mandat notes, “but rather the presence of stability at many different levels simultaneously. Timbral flexibility is effected through subtle changes in embouchure pressure and configuration, tongue position and air pressure.”¹¹⁰ Practicing multiphonics is one means of developing timbral flexibility, which, like vocal tract flexibility, is necessary for many styles of playing. To give one example of how practicing multiphonics can transfer to standard repertoire, Mandat suggests practicing descending dyads—in a similar fashion as Multiphonic Study No. 4—then proceeding to play the *sotto voce* section in the first movement of Johannes Brahms’ Sonata in E-flat Major, op. 120, no. 2.¹¹¹ Timbral flexibility is also essential for certain techniques such as glissando. A study by Claudia Fritz and Joe Wolfe found that while clarinetists generally use a stable vocal tract and embouchure configuration across most of their playing range, this configuration

108. González and Payri, “A Vowel-Based Method,” 436-37.

109. Mandat, “Expanding Timbral,” 27.

110. Ibid.

111. Ibid., 28.

changes dramatically both when playing in the altissimo register and when playing glissandi.¹¹²

While the exercises associated with this chapter were not designed specifically to promote the concepts discussed above, performers may find that increased timbral and vocal tract flexibility are useful and relevant byproducts of practicing multiphonics.

Selected Resources and Repertoire for Further Study

The lists below (tables 3.2, 3.3, 3.4, and 3.5) highlight fingering charts and catalogs, pedagogical resources, and repertoire involving multiphonics. These lists are not intended to be comprehensive; rather, they serve as a reference and entry point for performers and teachers. I have attempted to include both well- and lesser-known solo and chamber repertoire from the past six decades. It should also be noted that although many pieces include multiple extended techniques, most of the entries in table 3.4 and 3.5 feature multiphonics prominently.

Table 3.2. Multiphonic fingering charts and catalogs for clarinet.

Author	Title	Relevant section(s)
Caravan, Ronald	“Extensions of Technique for Clarinet and Saxophone”	pp. 69-72
Farmer, Gerald	<i>Multiphonics and Other Contemporary Clarinet Techniques</i>	Chapter 3
Garbarino, Giuseppe	<i>Metodo per clarinetto</i>	Part 2
Haddad, Holly	“The History and Comparison of Three Diverse Systems of Producing Multiphonics on the B-flat Boehm System Clarinet”	Appendix B
Humberd, Amy M.	“A Pedagogical Approach for Incorporating Extended Techniques into the Undergraduate Clarinet Curriculum”	Appendix C
Liang, Jack	“Clarinet Multiphonics: A Catalog and Analysis of Their Production Strategies”	Appendices A and B

112. Claudia Fritz and Joe Wolfe, “How Do Clarinet Players Adjust the Resonances of their Vocal Tracts for Different Playing Effects?”, *Journal of the Acoustical Society of America* 118, no. 5 (November 2005): 3306-15.

Rehfeldt, Phillip	<i>New Directions for Clarinet</i>	Chapter 3; Appendix A
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Table 3.3. Pedagogical materials for clarinet multiphonics.

Author/Composer	Title	Relevant section(s)
Burke, Kelly	<i>Clarinet Warm-Ups: Materials for the Contemporary Clarinetist</i>	pp. 70-72
Caravan, Ronald	“Extensions of Technique for Clarinet and Saxophone”	Chapters 1 and 2
	<i>Preliminary Exercises and Etudes in Contemporary Techniques for Clarinet</i>	pp. 18-42
	<i>Polychromatic Diversions</i>	Nos. 3, 4, 5, 7, 8, 9, 10
Danard, Rebecca	“Etudes in Performing Extended Techniques: Twelve Newly-Commissioned Canadian Works for Solo Clarinet”	Chan Ka Nim, <i>Speak Out</i>
Farmer, Gerald	<i>Multiphonics and Other Contemporary Clarinet Techniques</i>	Chapters 1-4
Humberd, Amy M.	“A Pedagogical Approach for Incorporating Extended Techniques into the Undergraduate Clarinet Curriculum”	Chapter 6
Mandat, Eric	“Expanding Timbral: Flexibility through Multiphonics”	All
Roche, Heather	“Dyad Multiphonics for B-flat Clarinet Part II”	All
	“Emergent B-flat Clarinet Multiphonics: Part 2 – Underblowing”	All
	“Spectral Multiphonics (B-flat and Bass)”	All
Valvo, Tiffany A.	“Refining Fundamentals through Extended Techniques”	All

Table 3.4. Solo repertoire for clarinet involving multiphonics.

Solo Repertoire	
Composer	Title
Bauck, Martin Rane	<i>kopenhagener stille</i> (2014)
Brand, Spencer	<i>Soliloquize</i> (2019)
Caravan, Ronald	<i>Excursions</i> (1974)
Cox, Jessie	<i>/OR/UN/</i> (2018)
Desportes, Yvonne	<i>La Naissance d'un Papillon</i> (1975)
Mandat, Eric	<i>Chiral Symmetries</i> (2013)
	<i>Winter Fantasy</i> (2019)
Na, SukJu	<i>vkqzhs</i> (2011/12)
Phillips, Peter	<i>Fantasy for Clarinet</i> (1960)
Radulescu, Horatiu	<i>The Inner Time</i> (1982/83)
Ran, Shulamit	<i>For an Actor – Monologue for Clarinet</i> (1978)
Schuller, Gunther	<i>Episodes for Solo Clarinet in B-flat</i> (1964)
Tôn-Thất Tiết	<i>Bao La</i> (1977)
Smith, William O.	<i>Jazz Set for Solo Clarinet</i> (1981)
	<i>Variants</i> (1963)

Table 3.5. Chamber repertoire for clarinet involving multiphonics.

Chamber Repertoire	
Composer	Title
Bolaños, Gabriel	<i>Sonora</i> for flute and clarinet (2015)
Garcia Vitoria, Marc	<i>Mans Enceses</i> for wind trio (2014)
Grisey, Gérard	<i>Talea</i> for flute, clarinet, violin, cello, and piano (1986)
Han, Jinhee	<i>Echo me(ii)</i> for clarinet and trumpet (2019)

Ibarra, Victor	<i>Self-portrait of Anton Rädarscheidt</i> for wind quintet (2016)
Ishida, Sanae	<i>Poèmes enchaînés</i> for soprano, clarinet, cello, piano, and percussion (2016)
Järnegard, Lina	<i>Emellanåt, stundom (occasionally, sometimes)</i> for clarinet, cello, and piano (2016)
Jin, Zhuosheng	<i>A Piece of Watermelon</i> for six musicians and female voice (2019)
Mandat, Eric	<i>Bipolarang</i> for two clarinets (2008)
Rataj, Jakub	<i>IOI</i> for clarinet, cello, and piano (2019)
Santillán Alcocer, Ana Paola	<i>Some people say...</i> for clarinet and piano (2009)
Smith, William O.	<i>Five Pieces for Flute and Clarinet</i> (1961)
	<i>Mosaic</i> for clarinet and piano (1964)
	<i>Musing</i> for three clarinets (1983)

CHAPTER 4: PEDAGOGICAL MATERIALS FOR MICROTONES

Microtones—“any musical interval or difference of pitch distinctly smaller than a semitone”¹¹³—are a quintessential example of an extended technique that requires the clarinetist to navigate their instrument in uncomfortable, often unwieldy ways. “The contemporary clarinet was not designed to play microtones,” writes E. Michael Richards.¹¹⁴ As a result, performers must either manipulate the embouchure or learn unconventional fingerings to produce microtones, though both options present problems. Despite the technical challenges inherent in executing microtones on the clarinet, numerous composers throughout the twentieth and twenty-first centuries have written microtones for the standard Boehm system clarinet, necessitating fingering charts and pedagogical materials to prepare clarinetists to meet the demands of the repertoire. Materials by Ronald Caravan in particular, such as his *Preliminary Exercises and Etudes in Contemporary Techniques for Clarinet* (1979), are thorough and approachable introductions to microtones on the clarinet, but there is a noticeable lack of recent resources that are similarly accessible.

My original materials— Preparatory Microtonal Exercises, Microtonal Studies, and Microtonal Sketches—intend to fill this need. While the Preparatory Exercises, Studies, and Sketches are similar to Caravan’s exercises and études in their overall purpose and rhythmic simplicity, they are distinctive in that they cover two different notation systems commonly used in microtonal music today. The primary purpose of the Preparatory Microtonal Exercises, Studies, and Sketches is to develop technical facility with microtonal fingerings; the secondary

113. Paul Griffiths, Mark Lindley, and Ioannis Zannos, “Microtone,” *Grove Music Online*, ed. Deane Root, accessed July 5, 2020, <https://www-oxfordmusiconline-com.offcampus.lib.washington.edu/grovemusic/view/10.1093/gmo/9781561592630.001.0001/omo-9781561592630-e-0000018616?rskey=wwGefV>.

114. Richards, *The Clarinet of the Twenty-First Century*, 58.

purpose is to develop familiarity with two common notation methods for microtones. In addition to describing the materials and offering suggestions for their use and modification, this chapter covers 1) the history of microtonality as it relates to the clarinet, 2) terminology, 3) notation, including common symbols used for notating quarter-tones as well as different notation methods used for quarter-tones in the clarinet literature, 4) production strategies, and 5) selected resources and repertoire involving microtones.

Background

Although microtonality may seem to be a distinctly modernist compositional trend, the practice of dividing the octave into more than twelve parts can be traced back to at least the late Renaissance in Western art music, and even earlier in Greek, Byzantine, Arab, Turkish, and Persian musical cultures.¹¹⁵ In the twentieth century, most composers approached microtonality either by building instruments with nonstandard tuning, or by writing smaller divisions of the octave within the realm of twelve-note equal temperament.¹¹⁶ Compositional aesthetics such as spectralism, which is based on the physical properties of sound, naturally integrate microtonality by using the close upper partials in the harmonic spectra. Such approaches to microtonality in the twentieth century led to technical developments in and modification of existing Western instruments, varying methods of notation, and, in the case of composers such as Harry Partch, the invention of new instruments.

As of this writing, the quarter-tone clarinet is neither a standard instrument in the literature nor widely available for purchase, but a few notable attempts have been made over the

115. Griffiths, Lindley, and Zannos, "Microtone."

116. Ibid.

past 120 years to popularize the instrument. Composer and clarinetist Richard Stein is credited with designing the first quarter-tone clarinet at the beginning of the twentieth century.¹¹⁷ Two quarter-tone clarinets, one based on the French system and one based on the German system, were built in the 1920s and 1930s by Bohemian instrument-makers V. Kohlert's Sons at the request of Czech composer Alois Hába.¹¹⁸ Another quarter-tone clarinet, designed by German instrument-maker Fritz Schüller in the 1930s, featured one mouthpiece with two parallel bores tuned a quarter-tone apart and operated with a switch, allowing the player to perform a microtonal scale.¹¹⁹ These various endeavors throughout the twentieth century resulted in several compositions written specifically for quarter-tone clarinet, including works by Hába and other Czech composers such as Jirí Pauer, Karel Stepka, and Karel Reiner.¹²⁰ Recent attempts at quarter-tone clarinet construction include a collaboration between clarinetist Gregory Oakes and Denmark-based instrument-makers Lohff & Pfeiffer. This "quarter-tone extended clarinet" is a modified Buffet R13 with two additional keys operated by the right hand, and five new tone holes, all on the lower joint. These changes facilitate quarter-tone production in the lower chalumeau and lower clarion, ranges in which quarter-tones are nearly impossible or extremely awkward on the standard clarinet.¹²¹

117. Eric Hoeprich, *The Clarinet* (New Haven: Yale University Press, 2008), 293; Richards, *The Clarinet of the Twenty-First Century*, 56. Hoeprich states that Stein designed the first quarter-tone clarinet in 1906, while Richards places the instrument's development around 1911.

118. Milan Kostohryz, "Quarter-Tone Clarinet," *The Clarinet* 3, no. 3 (May 1976): 12.

119. Hoeprich, *The Clarinet*, 293; Richards, *The Clarinet of the Twenty-First Century*, 56.

120. Kostohryz, "Quarter-Tone Clarinet," 12.

121. Gregory Oakes, "The Quarter-Tone Extended Clarinet," *The Clarinet* 47, no. 4 (September 2020): 50-52.

Although microtonality has become much more widespread in the literature for the standard clarinet over the past fifty years, the quarter-tone clarinets designed by Hába and Schüller never gained popularity, likely due to players' unwillingness to adapt to design modifications and new technical demands.¹²² Oakes and Lohff & Pfeiffer's quarter-tone extended clarinet seems to be the most promising, user-friendly design yet, though currently the instrument is still the only one of its kind. Until a quarter-tone clarinet is widely available, clarinetists must contend with either embouchure manipulations or unconventional and sometimes cumbersome fingerings on the standard Boehm system clarinet to produce microtones.

Terminology and Notation

While the term “microtone” refers to any interval “distinctly smaller than a semitone,”¹²³ the term “quarter-tone” refers to an interval that is one-half of a semitone and one-quarter of a whole tone, effectively splitting the whole-tone (major second) into four steps and the octave into twenty-four steps. Other divisions of the octave—resulting in intervals such as the one third-tone, two thirds-tone, and one eighth-tone—have been used by composers Iannis Xenakis, Harry Partch, Gérard Grisey, Ben Johnston, and more. “No pitches other than the twelve chromatic degrees of the octave have standard notation,” writes Elaine Gould, author of the music notation manual *Behind Bars*. Therefore, it is essential to clearly define all symbols used for other pitches.¹²⁴ A survey of notation practices implemented in microtonal clarinet literature is beyond the scope of this project; however, performers and teachers should be aware of the lack of a

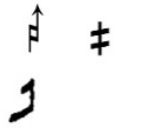



122. Kostohryz, “Quarter-Tone Clarinet,” 12; Richards, *The Clarinet of the Twenty-First Century*, 56.

123. Griffiths, Lindley, and Zannos, “Microtone.”

124. Gould, *Behind Bars*, 94.

universal notation practice for microtones, and, whenever possible, consult performance notes or instructions for clarification. Example 4.1 presents common symbols used for notating quarter-tones, as this is the most prevalent type of microtone, and examples 4.2, 4.3, and 4.4 highlight relevant symbols pertaining to the clarinet literature. A discussion of the notation used in my materials follows in the section “Preparatory Exercises, Studies, and Sketches for Microtones: Purpose and Description.”

Example 4.1. Common symbols for microtones.

One quarter-tone sharp	Three quarter-tones sharp	One quarter-tone flat	Three quarter-tones flat
			

Example 4.2. Microtonal notation in Edison Denisov’s *Sonata for Solo Clarinet*.¹²⁵

One quarter-tone sharp	Three quarter-tones sharp	One quarter-tone flat	Three quarter-tones flat
#	##	b	bb

Example 4.3. Microtonal notation in Eric Mandat’s *Winter Fantasy*.¹²⁶

One quarter-step sharp	One eighth-step flat	One quarter-step flat	Slightly lower than one half-step flat
#	♭	♮	♭

125. Edison Denisov, *Sonata für Klarinette in B solo* (Köln: Musikverlag Hans Gerig, 1973).

126. Eric Mandat, *Winter Fantasy* (N.p.: Cirrus, 2019).

Example 4.4. Microtonal notation in Ronald Caravan’s *Polychromatic Diversions*.¹²⁷

One quarter-tone sharp	Three quarter-tones sharp	One quarter-tone flat	Three quarter-tones flat
♯	###	♭	♭♭

Production Strategies

There are two ways of producing microtones on the standard Boehm system clarinet: through embouchure manipulations or through unconventional fingerings. Like multiphonics, many microtones are produced by using cross fingerings.¹²⁸ Producing microtones, like multiphonics, may require embouchure and tongue flexibility. “A less rigid, soft cushion, ‘pucker-type’ embouchure,” notes clarinetist F. Gerard Errante, “will allow for more latitude in bending a pitch, so that especially in the upper register, a pitch may be lowered as much as a perfect fourth with no change in fingering.”¹²⁹ While this production method can be useful for imprecise microtones, using special microtonal fingerings leads to greater pitch accuracy. The focus of this chapter’s original materials is primarily on learning unconventional fingerings to produce microtones, although some microtones in the lowest register of the clarinet require embouchure manipulations.

Even when using special fingerings, microtones may not be exactly in tune. Initial practice with a tuner is essential to learning microtonal fingerings’ pitch tendencies. “The quarter tone is in tune,” writes Ryan Romine, “...when the needle begins bouncing back and forth

127. Caravan, *Polychromatic Diversions*.

128. Recall that a cross fingering contains closed tone holes above the first open tone hole, creating two different effective tube lengths: one short, one long.

129. Errante, “Contemporary Aspects (Part 2),” 20.

between ‘super sharp’ and ‘super flat.’”¹³⁰ For example, an E one quarter-tone flat should register as a 50-cent sharp D-sharp/E-flat or as a 50-cent flat E-natural. Furthermore, as with notes that are not microtones, there is often more than one fingering for each microtone, and each fingering may produce a slightly different pitch. Performers should consult a microtonal fingering chart to find the best option.

Preparatory Exercises, Studies, and Sketches for Microtones: Purpose and Description

The purpose of the materials is to 1) improve proficiency with microtonal fingerings within familiar scalar patterns, and 2) increase sensitivity to timbral and pitch variance in microtones across registers and, when applicable, between different fingerings for the same note. All materials contain simple rhythms and meters so that the performer can focus on smoothly executing the microtonal fingerings while maintaining good principles of tone quality, voicing, and articulation. Most of the materials contain chromatic and scalar patterns, arpeggios, and passages similar to technical studies by Fritz Kroepsch and Kalmen Opperman, providing players a recognizable framework in which to practice unfamiliar fingerings. Many of the materials also offer choices in terms of tempo to allow the performer to adapt the sketch to their ability level and increase the tempo as they become more proficient. Although the original materials associated with this chapter are labeled “microtonal,” only quarter-tones have been used; there is no further division of the octave in any of the materials.

The materials are divided into three sections. Section I comprises eight Preparatory Exercises, which are modified versions of the microtonal Studies in Section II. Each Preparatory Exercise corresponds to one of the Studies, though the Preparatory Exercises are shorter, use a

130. Romine, *Bassoon Reimagined*, 148.




consistent notation system, and cover a limited range. Unlike the sixteen microtonal Studies, the Preparatory Exercises are organized sequentially by difficulty and should be played in order. Preparatory Exercise No. 1 contains two microtonal pitches, No. 2 contains three, Nos. 3 and 4 contain four, Nos. 5 and 6 contain five, and Nos. 7 and 8 contain six.

Section II comprises sixteen microtonal Studies. The first twelve Studies in this section are organized according to register: chalumeau, throat tones, clarion, and altissimo. As timbral variance in microtones is particularly stark between the different registers of the clarinet, this organization encourages the player to listen carefully within a given register and adjust accordingly. For example, certain microtones in the chalumeau—especially those between A3 and E4—are duller in timbre than those in the clarion and altissimo. The final four studies cover wider ranges and are not limited to one register. Most of the studies are based upon scalar patterns that will be familiar to many players. As in Section I, tablatures for suggested fingerings have been placed above each microtone at its first occurrence in the study, though performers may wish to consult outside fingering charts for other options. Although in this context it is pedagogically practical to place the fingerings in the score, ideally performers will ultimately memorize many of these as they would with conventional fingerings.

While the purpose of the eight Preparatory Exercises and sixteen Studies is primarily to cultivate technical facility with microtonality, the three Sketches in Section III present microtonality in more of a musical context than the preceding sections. Moreover, fingering tablatures have been excluded from the Sketches to allow the performer to test their recall of fingerings from previous studies or choose new fingerings from an outside source. These Sketches may be played in any order.

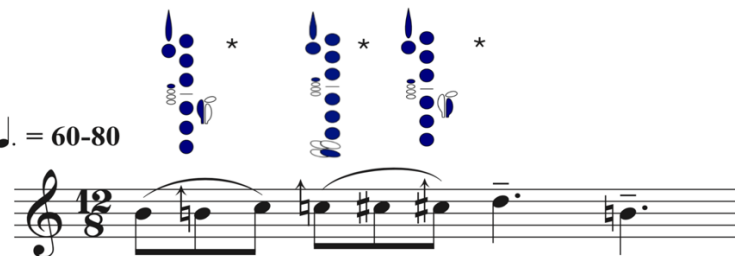
Two different notation systems have been used intentionally for all materials corresponding to this chapter. Although many other notation systems are used in the literature, these were chosen because they are among the most standard. One system, often regarded as the most practical and intuitive, is composed of arrows attached to accidentals, indicating the direction of the pitch modification. In this system, the arrow always modifies the pitch by a quarter-tone. Example 4.5 presents the symbols used in this notation system, and example 4.6 represents a study in Section II that uses this notation.

Example 4.5. Microtonal notation system using arrows.

One quarter-tone sharp	Three quarter-tones sharp	One quarter-tone flat
		

Example 4.6. Microtones, Section II, Study No. 13, m. 1.

♩. = 60-80



The other notation system used in this chapter’s materials comprises signs for one quarter-tone and three quarter-tones sharps first presented in 1756 by Giuseppe Tartini, and a backwards flat sign for one quarter-tone flats.¹³¹ Although Tartini’s system for one quarter-tone sharps is frequently used in the literature, it requires memorization of the symbols—unlike the arrow system—and does not include symbols for one quarter-tone or three quarter-tone flats. The backwards flat sign is among the most common symbols for microtones, particularly in the

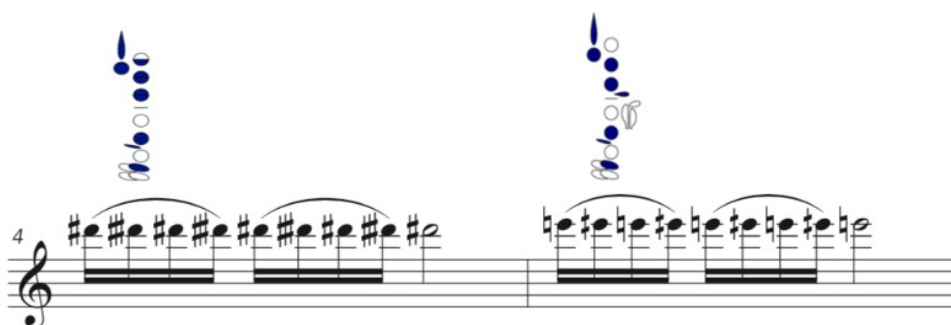
131. Stone, *Music Notation*, 68-69.

woodwind literature.¹³² Example 4.7 presents the symbols used in this notation system, and example 4.8 represents one study in Section II that uses this “modified Tartini” notation:

Example. 4.7. Microtonal notation system with Tartini sharps.

One quarter-tone sharp	Three quarter-tones sharp	One quarter-tone flat
♯	###	♭

Example 4.8. Microtones, Section II, Study No. 10, mm. 4-5.



Each notation system is used consistently within each exercise, study, or sketch; that is, no exercise, study, or sketch contains both the arrow-based system and the system with Tartini sharps. Again, the performer should be aware that these are only two possibilities out of many systems for notating microtones.

Preparatory Exercises, Studies, and Sketches for Microtones: Use and Modifications

Teachers should modify select materials and organize sequentially according to each student’s abilities and prior experience with microtones. The eight Preparatory Exercises in Section I are already organized sequentially by difficulty, so for a performer with no experience

132. Ibid., 69.

with microtones, No. 1 will likely be the most accessible. Since Section II is not organized by difficulty but by register—and every register contains complex fingerings—it may be helpful to simply choose one from each register. I recommend the following order: No. 1, No. 4, No. 9, No. 12, and No. 14. Performers who are more familiar with microtonality can modify the studies to increase difficulty. Experienced performers may attempt to play the studies at their fastest indicated tempo, vary articulation patterns, or experiment with different fingerings for the microtones when possible.

Regardless of modifications, it is crucial to begin by isolating each microtonal fingering before playing through the entire study. Once the player has command of the fingerings, they should play the study slowly and deliberately, noting any timbral and/or dynamic considerations related to the given microtones. For example, Study No. 13 contrasts the timbral differences between microtones in the clarion and chalumeau registers (see example 4.9). Performers will notice that the C4 one quarter-tone sharp and the C4 three quarter tones-sharp are dull in timbre and cannot be played at a loud dynamic.

Example 4.9. Microtones, Section II, Study No. 13, mm. 1-2.

The image shows a musical score for a study in 12/8 time. The tempo is marked as ♩ = 60-80. The score consists of two measures. The first measure contains six notes with microtonal fingerings indicated by blue dots and asterisks above them. The second measure contains six notes, also with microtonal fingerings indicated by blue dots and asterisks above them. The notes in the second measure are grouped into pairs with curved lines underneath.

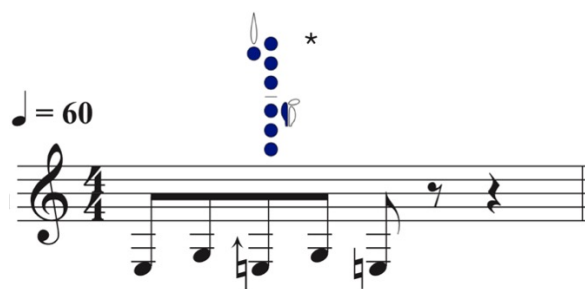
Some materials deliberately feature difficult scalar motion and/or problematic microtonal fingerings. Measure 6 of Microtonal Sketch No. 3 (example 4.10) presents challenging passagework involving the right-hand thumb:

Example 4.10. Microtones, Section III, Sketch No. 3, m. 6.



Microtones in the lower chalumeau register are particularly problematic. In Study No. 2 of Section II (example 4.11), players must manipulate the tongue and/or partially depress the left-hand E/B key to produce the E3 one quarter-tone sharp:

Example 4.11. Microtones, Section II, Study No. 2, m. 1.



It must be emphasized that of all the extended techniques for the clarinet, microtones are among the most cognitively demanding, as they require deliberate and concentrated attention to the physical mechanics of the clarinet. In many ways, learning to play microtones is akin to learning to play a new instrument.

Selected Resources and Repertoire for Further Study

The lists below (tables 4.1, 4.2, 4.3, and 4.4) highlight fingering charts and catalogs, pedagogical resources, and repertoire for the clarinet involving microtones. These lists are not intended to be comprehensive; rather, they serve as a reference and entry point for performers and teachers. I have attempted to include both well- and lesser-known solo and chamber repertoire from the past six decades. It should also be noted that although many pieces include

multiple extended techniques, most of the entries in table 4.3 and table 4.4 feature microtones prominently.

Table 4.1. Microtonal fingering charts and catalogs for clarinet.

Author	Title	Relevant section(s)
Alder, Jason	“Clarinet Quarter-Tone Fingering Chart,” https://www.jasonalder.com/resources/	All
Humberd, Amy M.	“A Pedagogical Approach for Incorporating Extended Techniques into the Undergraduate Clarinet Curriculum”	Appendix B
Oakes, Gregory	https://www.gregoryoakes.com/multiphonics/	Under “Type,” select “Microtones”
Rehfeldt, Phillip	<i>New Directions for Clarinet</i>	Chapter 2
Richards, E. Michael	<i>The Clarinet of the Twenty-First Century</i>	pp. 62-140

Table 4.2. Pedagogical materials for microtones on the clarinet.

Author/Composer	Title	Relevant section(s)
Bozza, Eugène	<i>Graphismes pour clarinette seule</i>	No. 4
Caravan, Ronald	<i>Preliminary Exercises and Etudes in Contemporary Techniques for Clarinet</i>	pp. 10-18
	<i>Polychromatic Diversions</i>	Nos. 1, 2, 3, 7, 8, 9, 10
Danard, Rebecca	“Etudes in Performing Extended Techniques: Twelve Newly-Commissioned Canadian Works for Solo Clarinet”	Richard Désilets, <i>A Micro Tale</i>
Dolak, Frank	<i>Contemporary Techniques for the Clarinet</i>	Sections 1, 2, 6, 9
Errante, F. Gerard	“Contemporary Aspects of Clarinet Performance”	Part 2
Garbarino, Giuseppe	<i>Metodo per clarinetto</i>	Part 1
Humberd, Amy M.	“A Pedagogical Approach for Incorporating Extended Techniques into the Undergraduate Clarinet Curriculum”	Chapter 4
Rehfeldt, Phillip	<i>New Directions for Clarinet</i>	Chapter 2

Table 4.3. Solo repertoire for clarinet involving microtones.

Composer	Title
Bettinelli, Bruno	<i>Studio da concerto</i> (1971)
Brown, Anthony	<i>Outlines</i> (1976)
Caravan, Ronald	<i>Excursions</i> (1974)
Cox, Jessie	<i>/OR/UN/</i> (2018)
Denisov, Edison	<i>Sonata</i> (1972)
Durand, Joël-François	<i>La mesure des choses I. La mesure de l'air</i> (1992)
	<i>Tiodhlac</i> (2001)
Eaton, John	<i>Concert Music for Solo Clarinet</i> (1961)
Hodge, Huck	<i>Innigkeit (nach Außen)</i> (2018)
Laval, Philippe	<i>Des'ires</i> (1999)
Mandat, Eric	<i>Coconut Candy</i> (2000)
	<i>Etude for Barney</i> (1990)
	<i>Winter Fantasy</i> (2019)
Mehlenbacher, Kurt	<i>My Own Thoughts: Caprice for Internal Musings</i> (2018-19)
Na, SukJu	<i>vkqzhs</i> (2011/12)
Poteat, Angelique	<i>Suppress</i> for clarinet in A (2013)
Pottebaum, William	<i>Microsuite</i> (1979)
Ran, Shulamit	<i>For an Actor – Monologue for Clarinet</i> (1978)
Rehnqvist, Karin	<i>Långt borta och nära</i> (2017)
Stalvey, Dorrance	<i>PLC-Extract</i> (1968)
Tôn-Thất Tiết	<i>Bao La</i> (1977)

Table 4.4. Chamber repertoire for clarinet involving microtones.

Chamber Repertoire	
Composer	Title
Grisey, Gérard	<i>Talea</i> for violin, cello, flute, clarinet, and piano (1986)
Ishida, Sanae	<i>Poèmes enchaînés</i> for soprano, clarinet, cello, piano, and percussion (2016)
Jin, Zhuosheng	<i>A Piece of Watermelon</i> for six musicians and female voice (2019)
Kay, Kevin	<i>Quiver</i> for wind quintet (2018)
Quinn, Sean	<i>activating shadows</i> for clarinet and trombone (2020)
Scelsi, Giacinto	<i>Kya</i> for clarinet and seven instruments (1959)
Yamamoto, Hiroyuki	<i>The Wedge is Struck, the Fog Remains</i> for clarinet and piano (2006)

CHAPTER 5: PEDAGOGICAL MATERIALS FOR AIR SOUNDS

Many extended techniques place demands on the player that are contrary to what most performers are taught from a young age. Clarinetists generally strive to produce a pure, focused tone and carefully control the amount of air in the sound. A number of contemporary works, however, exploit air and the breath in unusual and creative ways, requiring clarinetists to expand their approaches to sound production. Although breath or air sounds usually refer to sounds produced through the instrument, the definition here also encompasses vocalizations—such as whispered or spoken phonemes—produced away from the instrument. Air sounds produced through the instrument can be pitched or unpitched, with resultant qualities of sound depending on the use of the reed and embouchure, and the amount of pitch introduced.

Despite their prevalence in the literature, air sounds are often overlooked or underexplored in contemporary clarinet pedagogy, to the detriment of performers who may face unconventional physical demands in the literature without sufficient knowledge of how to address those demands. This chapter and its corresponding materials aim to familiarize performers with historical context, notation, terminology, and production and practice strategies for a variety of air sounds on the clarinet. The materials also serve as supplementary “conditioning” exercises for performers preparing repertoire involving air sounds. Like multiphonics, a range of subcategories exist within the broader category of “air sounds.” Section I isolates several methods and components of air sound production—such as the use of the oral cavity to inform air sound quality—and presents targeted exercises, each focusing on a single concept. Section II combines previously presented techniques in short *étude*-like Sketches.

Background

The emergence of air sounds in the wind repertoire can be traced by means of two distinct threads. The first is an artistic movement, beginning in the late 1960s, in which composers such as Helmut Lachenmann and Heinz Holliger sought to exploit previously unexplored or unconventional sounds by centering them as defining compositional elements. Such works often focused on the extremes and energy of the physical act of producing sound on an instrument, thereby deconstructing and defamiliarizing the listener's experience. Lachenmann termed this approach *musique concrète instrumentale*:

The idea of 'instrumental musique concrete'—i.e. sound as a message conveyed from its own mechanical origin, and so sound as experience of energy, marked the compositional material of my pieces between 1968 (*TemA*) and 1976 (*Accanto*)...It signifies an extensive defamiliarization of instrumental technique: the musical sound may be bowed, pressed, beaten, torn, maybe choked, rubbed, perforated and so on. At the same time the new sound must satisfy the requirements of the old familiar concert-hall sound which, in this context, loses any familiarity and becomes (once again) freshly illuminated, even 'unknown.' Such a perspective demands changes in compositional technique, so that the classical base-parameters, such as pitch, duration, timbre, volume, and their derivatives retain their significance only as subordinate aspects of the compositional category which deals with the manifestation of energy.¹³³

Lachenmann's 1970 work *Dal niente (Interieur III)* for solo clarinet, commissioned and premiered by Eduard Brunner, exemplifies the *musique concrète instrumentale* style.¹³⁴ This piece begins with ghostly subtones and frequent outbursts—akin to one abruptly turning up the volume on a radio—and evolves through key clicks, smacking sounds, whistling sounds, multiphonic shrieks, and variety of air sounds. These independent techniques “become discernible as a multi-level polyphony,” says Lachenmann.¹³⁵ Holliger's “breath” compositions

133. David Ryan, “Composer in Interview: Helmut Lachenmann,” *Tempo* no. 210 (October 1999): 20-21.

134. Helmut Lachenmann, *Dal niente (Interieur III)* (Wiesbaden: Breitkopf & Härtel, 1974).

135. Helmut Lachenmann, *Accanto* (Wiesbaden: Breitkopf & Härtel, 1984), 65.

Pneuma for winds, radios, organ, and percussion (1970) and *(t)air(e)* for solo flute (1980-83) share a similar aesthetic: in these works, like *Dal niente*, breath is composed. “By composing with air, they are composing not only for an instrument, but for an energy,” writes flutist Jennifer Borkowski.¹³⁶ Other notable early works implementing elements of air and breath include George Crumb’s *Eleven Echoes of Autumn* (1965), with markings such as “quasi unvoiced, breathy” in the flute and clarinet parts; Gérard Grisey’s *Charme* (1969), which features gradations of air and pitch throughout; and the third section of Karlheinz Stockhausen’s *Amour* (1974–76), in which the solo clarinetist is instructed to slowly and softly suck the saliva from the instrument during rests.¹³⁷

Just a few years before the advent of Lachenmann’s *musique concrète instrumentale* and Holliger’s breath compositions, clarinetist William O. Smith experimented with air sounds in his own compositions. Smith devotes a brief section to air sounds in the preface to his 1963 work *Variants*, but does not provide notated examples, nor does the technique show up in the score itself. However, the first and sixth movements of Smith’s work *Mosaic* for clarinet and piano, written the following year, briefly feature air-only playing. As pedagogical texts from this time fail to mention this emerging extended technique—instead focusing primarily on multiple sound production—it seems plausible that air sounds gained prominence in the repertoire largely because of performers like Smith.

Indeed, Smith and his compositions represent a larger performer-centric movement, beginning in the 1950s, of exploring new timbral possibilities. Smith himself was inspired to

136. Jennifer Borkowski, *Modernizing Practice Paradigms for New Music: Periodization Theory and Peak Performance Exemplified through Extended Techniques* (Frankfurt am Main: PL Academic Research, 2016), 91.

137. George Crumb, *Eleven Echoes of Autumn* (New York: C.F. Peters Corp, 1972); Gérard Grisey, *Charme* (Milan: Ricordi, 1976); Karlheinz Stockhausen, *Amour* (Kürten: Stockhausen-Verlag, 1978).

explore unconventional sounds on clarinet in the late 1950s after hearing flutist Severino Gazzelloni. Relatedly, *Dal niente* exemplifies a true collaboration between clarinetist Eduard Brunner and composer Helmut Lachenmann. Brunner recalls that they began working together in 1969, about a year before the premiere of *Dal niente*:

“[Lachenmann] had a very clear picture of what he wanted when he composed...[He] came with ideas that I had to translate into sound, if possible, and after making it I would explain to him the physical process... The composition process was as follows: generally, he came with many questions that I had to write down and make into sound. After, he composed many exercises before writing the pieces. They are studies full of ideas, maybe in the same way Beethoven did. Some of them showed music notation, other just words on what he wanted to [hear]... We did not work on every step of the composition; he just gave me small examples. I worked on them and sent him a recording. He composed on agreement with this material.”¹³⁸

Lachenmann and Brunner’s collaboration epitomizes the crucial role that performers played in the early development of many extended techniques, particularly air sounds.

Outside of the repertoire, early documentation of this technique on clarinet is scarce, seemingly overshadowed by the development of multiphonics.¹³⁹ That the most well-known guide to woodwind composition from this era, Bartolozzi’s *New Sounds for Woodwind* (1967), excludes air sounds in its discussion of monophonic timbral possibilities indicates that air-only techniques neglected to catch on as quickly as other new techniques—such as multiphonics—despite the eventual proliferation of the compositional aesthetic led by Lachenmann and Holliger. Even today, few existing pedagogical resources devote as much attention to this technique as they do with multiphonics, microtones, and other common extended techniques, notwithstanding the frequent usage of air sounds in the contemporary clarinet repertoire.

138. Antonio Galindo Agundez, “Conflicts in Contemporary Music Interpretation. Brunner–Lachenmann: A Case Approach” (nondoctoral diss., University of Gothenburg, 2011), 29-30.

139. In a 1973 article, Norman Heim mentions several new techniques, including “blowing air through the instrument but with no reed vibration.” Nicholas Valenziano discusses notation for both air and vocal sounds in two 1977 articles in *The Instrumentalist*. However, none of these writings include pedagogical considerations.

Moreover, although they are among the simpler extended clarinet techniques to conceptualize and execute in isolation, air sounds can be extremely physically demanding when placed in the context of repertoire.

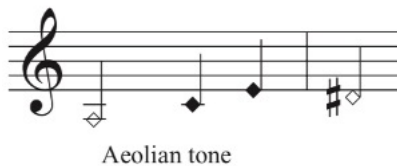
Notation

Notation for air sounds is much less standardized than notation for other extended techniques. Consequently, it is crucial for composers to provide performance instructions and/or a notation key when writing any type of air sounds, especially when using symbols or unconventional noteheads. Listed below are examples of methods for notating pitched and unpitched air sounds as well as vocal techniques.

1) Pitched sounds

- a) The terms “Aeolian tone,” “Aeolian sound,” “breathy tone,” or “breathy sound” may be used in conjunction with ordinary or unconventional noteheads to indicate that some degree of air should be audible in the sound (example 5.1). Unconventional noteheads may also be used independently to indicate the same effect and should be defined in the performance instructions or notation key.

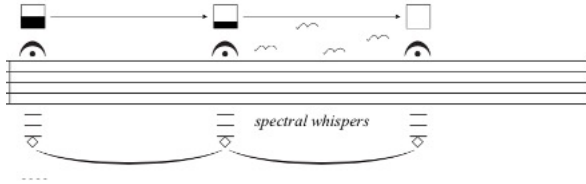
Example 5.1. Notation for aeolian tone.



- b) Graphic notation may be used to indicate gradations of air and pitch. The passage in example 5.2 illustrates a gradual addition of air to the sound, with the empty space in each box representing the amount of air in the sound and

the filled-in area representing pitch. Arrows represent transitions between states.

Example 5.2. Graphic notation indicating gradations of air and pitch.



2) Unpitched sounds

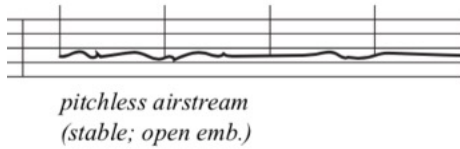
- a) Unpitched sounds are generally notated with unconventional noteheads and may be placed at the top or bottom of the staff, accompanied by text (e.g. “blow air through instrument,” “toneless frullato,” “tonlos”). A “toneless” passage that is to be fingered should use unconventional noteheads as well (example 5.3). Pitches may be faintly discernible even in “toneless” passages, especially in those that are fingered.

Example 5.3. Notation for toneless playing.



- b) On the clarinet, the quality of an unpitched air sound changes depending on embouchure formation. Text or symbols may indicate a normal or “closed” embouchure, or an “open” embouchure where the player lowers the jaw to produce a hollow, diffuse quality of sound.
- c) Unpitched sounds may also be notated graphically to indicate approximate contour (example 5.4).

Example 5.4. Graphic notation indicating approximate contour of unpitched sound.

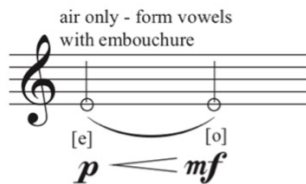


3) Vocalizations

- a) Forming vowels or phonemes with the embouchure can modify timbre.

Desired vowels or phonemes may be indicated below the staff in brackets and accompanied by written instructions (example 5.5). A pronunciation guide may be necessary, qualifying the desired sounds by using a familiar language or the International Phonetic Alphabet (IPA).¹⁴⁰

Example 5.5. Notation directing the performer to form vowels with the embouchure.



- b) Vocal sounds through the instrument

Speaking or whispering is neither as common nor as effective on the clarinet as it is on the flute, as the formation of the clarinet embouchure significantly distorts the text. This technique, indicated with ordinary, crossed, diamond, or circular noteheads, can be performed independently, or in combination with fingered pitches. Furthermore, “a verbal instruction must make it clear that the sounds are not actually voiced,” writes Elaine Gould.¹⁴¹

140. Gould, 249; 451.

141. Ibid., 249.

c) Vocal sounds without the instrument

Speaking or whispering away from the instrument may be indicated with crossed or other unconventional noteheads, accompanied by written directions. Other techniques, such as inhaling or exhaling away from the instrument, may be also notated with unconventional noteheads.

As with most extended techniques, performers will likely encounter many more methods of notation for air sounds than those described here. Furthermore, air sounds may be used in combination with other techniques, such as flutter-tongue or key clicks. Consulting the performance instructions and notation key, as well as experimentation, is essential.

Production and Practice Strategies

Performers should be aware of the many subcategories that exist within the broader category of “air sounds” or “breath sounds.” Although clarinetists may encounter repertoire that uses parts of the instrument independently, this chapter and its corresponding materials focus on sounds produced with the full instrument and the reed in place, as well as vocalizations produced away from the instrument.¹⁴² Table 5.1 highlights several possibilities for air sounds on a single fingering when combining four variables involved in tone or air sound production: reed, embouchure, pitch, and instrument.¹⁴³

142. For a more comprehensive approach to air sounds on the clarinet, see Heather Roche’s videos and blog posts “...on writing air sounds for clarinets,” <https://heatherroche.net/2014/02/13/on-writing-air-sounds-for-clarinets/> and “upper joint stopped air technique,” <https://heatherroche.net/2016/05/29/upper-joint-stopped-air-technique/>.

143. Regarding the reed, “with” indicates that the reed is on the mouthpiece in its normal position, whereas “without” indicates that the reed is removed from the mouthpiece. Regarding the embouchure, “closed” indicates that the embouchure and oral cavity are in a normal, neutral position, whereas “open” indicates that the jaw is lowered and the oral cavity is open. Regarding pitch, “no” indicates air alone, whereas “yes” indicates air and pitch. Regarding the instrument, “through” indicates sound is produced through the instrument, whereas “away” indicates sound is produced away from the instrument, breaking the embouchure.

Table 5.1. Subcategories of air sounds on the clarinet.

Reed	Embouchure	Instrument	Pitch	Result
With	Closed	Through	No	Focused air sound; some faint harmonics.
With	Open	Through	No	Hollow, diffuse air sound.
With	Closed	Through	Yes	“Subtone,” airy tone quality. Can vary amount of pitch vs. air.
With	Open	Through	Yes	Diffuse. Generally louder than closed position.
With	Varies depending on vowel	Through	No – changing vowels	Quality of air sounds changes depending on vowel.
With	Closed	Through	Yes – introducing soft, high harmonics (similar to spectral multiphonics)	“Spectral whispers” with lots of air.
With	Flexible	Through	Yes – teeth on reed	Random high harmonics with lots of air. Less easily controlled than soft spectral multiphonics.
Without	Closed	Through	No	Diffuse.
Without	Open	Through	No	“Whooshing” sound. Louder than closed position.

Players should note the additional possibilities available when changing fingerings, especially when moving between registers, and when quickly switching from a closed to open embouchure or vice versa. In addition, keep in mind that key noise will likely be audible when fingering different notes in conjunction with air.

Air sounds in all subcategories can be deceptively difficult. On the surface, they may seem to be among the easier extended techniques on the clarinet, but in practice, performers face two key challenges: expressivity and physicality. As clarinetists Beate Zelinsky and David Smeyers write, “Clarinetists are put in the position of having to enlarge their expressivity and technical possibilities by mastering the sounds found in this small region that were previously

considered a nuisance, pushed aside and ignored.”¹⁴⁴ In other words, how do we make air sounds musical? The first and most vital approach is to reassess how we conceptualize this technique. Consider the works of Lachenmann, Holliger, and Grisey in which air sounds are substantive compositional elements, not used as mere gimmicks. Performers should familiarize themselves with these works—and more—to understand the vast range of musical, timbral, and expressive possibilities. Another approach is to practice each individual air sound out of context, as one would with conventional technical issues. “The different possibilities of sound production, in all of their subtle variations,” note Zelinsky and Smeyers, “should first be practiced removed from any musical context. One should utilize as much care and attention to detail producing these sounds as one used for so many years of study trying not to produce these very sounds.”¹⁴⁵ This allows the performer to dive deeper into the physical mechanisms involved in air sound production and explore the scope of options available within even one specific technique.

The physical demands of both “normal” clarinet playing and air sound production are notable. Extant studies of wind instrumentalists have yielded mixed conclusions about whether and how lung function impacts wind performance, though research has shown that even clarinet playing that does not involve extended techniques entails a high degree of cardiopulmonary strain.¹⁴⁶ Air sound production in particular may lead to lightheadedness, fatigue, head pressure, or an increased heart rate due to a buildup of carbon dioxide in the lungs. An in-depth discussion of managing the physicality of air sound techniques lies beyond the scope of this dissertation;

144. Zelinsky and Smeyers, “Remarks and Explanation of Signs,” in *Pro Musica Nova*, 6.

145. *Ibid.*

146. Lia Studer et al., “Does Trumpet Playing Affect Lung Function? A Case-Control Study,” *PLoS ONE* 14, no. 5 (May 2, 2019): 2, doi: 10.1371/journal.pone.0215781; Maria L. Hahnengress and Dieter Böning, “Cardiopulmonary Changes During Clarinet Playing,” *European Journal of Applied Physiology* 110, no. 6 (August 2010): 1199–1208, doi: 10.1007/s00421-010-1576-6.

however, performers may consider principles drawn from sports science when preparing physically demanding compositions. A significant body of literature has examined the intersecting and unique challenges faced by sport athletes and musicians, with some researchers asserting that musicians are indeed athletes.¹⁴⁷ While the physiological impacts of extended clarinet techniques have yet to be extensively researched, flutist and researcher Jennifer Borkowski has proposed that some of the physical demands of performing complex contemporary repertoire—especially those involving extended techniques—may be mitigated by implementing a periodization schedule to improve breath capacity and stamina.¹⁴⁸ Periodization involves the systematic alteration of work and recovery or rest periods so that the trainee reaches the performance, or “peaks,” in an optimal state. Although this strategy can be applied to the preparation of any repertoire, it may be especially useful when preparing repertoire involving a high degree of physicality, such as works involving “composed air.”

In this context, clarinetists may consider implementing the following components of periodization: interval training, tapering, and recovery and rest. Interval training can function as endurance conditioning during practice sessions. Within the periodization schedule, individual practice sessions should consist of a warm-up, followed by interspersed interval training and active rest periods. The purpose of the interval training periods, according to bassoonist Terry Ewell, is to work towards fatigue by concentrating on a specific group of muscles, then work a different group of muscles during the active rest periods. For example, the performer might focus

147. Randall W. Dick et al., “Athletes and the Arts—The Role of Sports Medicine in the Performing Arts,” *Current Sports Medicine Reports* 12, no. 6 (2013): 397-403; Barbara Paull and Christine Harrison, *The Athletic Musician: A Guide to Playing Without Pain* (Lanham, MD: Scarecrow Press, 1997); Nicholas F. Quarrier, “Performing Arts Medicine: The Musical Athlete,” *Journal of Orthopaedic & Sports Physical Therapy* 17, no. 2 (February 1993): 90-95.

148. Borkowski, *Modernizing Practice Paradigms*.

on building endurance by playing long tones during each interval training period, then focus on finger dexterity, rhythm, or articulation during the active rest periods.¹⁴⁹ For compositions requiring unusual uses of the breath, performers should focus on developing respiratory muscle strength during each interval training period. Long tones in particular are crucial, note researchers Maria Hahnengress and Dieter Böning, as they “might reduce respiratory muscle fatigue during a prolonged strenuous performance.”¹⁵⁰ Regardless of the specific technique emphasized in interval training, relevance is key: performers should strive to put the body through a similar type of stress that the composition itself demands so that the body adapts to the technique.¹⁵¹ Tapering, another component of periodization, involves “a decrease in the volume of work, either gradual or sudden, while practicing at a high intensity level [before a performance].”¹⁵² Sport athletes may taper their training up to two weeks before a competition. This allows the body to operate “at a higher level of fitness since the body will recover some lost energy,”¹⁵³ which is especially necessary in physically demanding repertoire. Finally, allocating time for rest and recovery is essential, as one of the goals of periodization is to situate a performance during a recovery phase so that the body has enough energy to operate optimally.

Although the above claims are grounded in Borkowski’s argument that a modernized approach to musical practice and peak performance is necessary due to contemporary music’s

149. Terry Ewell, “Advice from a Double Reed Weekend Warrior,” June 2020, International Double Reed Society 1st Virtual Symposium, 31:33, <https://www.idrs.org/video/collection/terry-ewell/>.

150. Hahnengress and Böning, “Cardiopulmonary Changes,” 1207.

151. Borkowski, “Issues of Stamina in Modern Music: Answers from Sports Science,” (paper presented at the First International Conference of Students of Systematic Musicology, Graz, Austria, November 14–15, 2008), 17; Bronwen Ackermann, Roger Adams, and Elfreda Marshall, “Strength or Endurance Training for Undergraduate Music Majors at a University?,” *Medical Problems of Performing Artists* 17, no. 1 (March 2002): 39-40.

152. Borkowski, *Modernizing Practice Paradigms*, 54.

153. Borkowski, “Issues of Stamina,” 14.

demand of intellectual and physical involvement, these connections have not been extensively explored. As air sounds in particular have often been overlooked or underemphasized throughout the development of extended techniques and their subsequent documentation, the dearth of research in this specific area may speak to its irrelevancy to a broad audience of pedagogues. However, because aspects of traditional pedagogy do not adequately address challenges inherent in contemporary music, particularly in repertoire with unusual physical demands, these connections are conducive to further interdisciplinary research between sports science and music performance, especially regarding the physical demands of contemporary music for winds. Future research is needed to examine the relationship between contemporary repertoire involving unconventional uses of the breath and physiological impacts on clarinet playing.

Studies and Sketches for Air Sounds: Purpose and Description

It is impractical to cover every type of notation that composers have used for air sounds on clarinet. Therefore, the primary purpose of the materials associated with this chapter is to present a variety of possible air sounds on the clarinet and corresponding methods of notation. The secondary purpose is to create a framework that encourages performers to produce those sounds meaningfully and musically. As Borkowski writes, “Air sounds are simple. Air sounds played musically are not.”¹⁵⁴ These materials may also serve as supplementary “conditioning” exercises for performers preparing repertoire involving air sounds.

The materials are divided into two sections: Studies and Sketches. The nine Studies cover several different methods of notation for air sounds, though notation is consistent with each individual study. Brief explanations precede each study. These Studies may be thought of as targeted technical exercises and are organized accordingly by technique: pitched sounds,

154. Borkowski, *Modernizing Practice Paradigms*, 87.

unpitched sounds, combinations of pitched and unpitched sounds, and vocalizations. Performers may play the Studies in any order, though it may be helpful to start with the first study. No. 1 presents gradations of air versus pitch by percentage (e.g., 100 percent pitch; 50 percent air, 50 percent pitch) to help the performer conceptualize and calibrate the balance between tone and air. Nos. 2–3 focus on subcategories of pitched air sounds, such as Aeolian tone and spectral whispers. Nos. 4–5 encourage the performer to observe how unpitched air sounds can be affected by changes in embouchure (open or closed) and fingering. The final four Studies, Nos. 6–9, introduce vocalizations—both through and away from the instrument—as well as notated inhales and exhales. The vocalizations target familiar, accessible sounds such as vowels (No. 9) and consonants. It should be acknowledged that the vocalization-based Studies were composed primarily for performers who are familiar with the English language.

The three Sketches, like the Sketches in other chapters, present air sound techniques in more of a musical context than the Studies. Additionally, each Sketch comprises multiple types of air sounds in an attempt to replicate what may be encountered in the repertoire. For example, No. 3 (“Marigold”) incorporates whispered text from Edgar Allan Poe’s poem *The Sleeper*, closed and open embouchure, graphic notation to indicate gradation of air versus pitch, lip smacks, inhales and exhales, spectral whispers, and more, all to create an atmosphere that amplifies the opening text (example 5.6). The Sketches may be played in any order.

Example 5.6. Air Sounds, Section III, Sketch No. 3, mm. 12-13.

The musical notation consists of a single staff with five lines. It contains several notes and symbols: a triangle on the first line, a note on the first space, a note on the second line, a note on the second space, a note on the third line, a note on the third space, a note on the fourth line, a note on the fourth space, and a note on the fifth line. Below the staff, the words "[moon]", "[June]", and "V" are aligned with the first, second, and third notes respectively. Below the entire staff, the instruction "sub. P" is written.

Studies and Sketches for Air Sounds: Use and Modifications

Materials may be approached by difficulty or as conditioning exercises to help build respiratory muscle strength for repertoire requiring unusual uses of the breath. Below are three sets of recommendations for the materials' use, according to the performer's level of experience with air sounds (beginner, intermediate, or advanced). These pedagogical sequences need not be followed strictly; rather, they are guidelines that may be modified further according to each performer's abilities and goals.

Beginner Level

(for players with little or no experience with air sounds)

Begin with **Section I: Studies.**

- Sequence:
 - No. 1, No. 2, No. 4, No. 6, No. 8
- No. 8: practice at quarter=60–70
- Note that the more challenging studies have been omitted from this sequence.

Proceed to **Section II: Sketches.**

- No. 2
- Note that the more challenging sketches have been omitted from this sequence.

Intermediate Level

(for players with some experience with air sounds)

Begin with **Section I: Studies.**

- Sequence:
 - No. 1, No. 2, No. 4, No. 6, No. 8
 - No. 3, No. 5, No. 7, No. 9
- No. 8: practice at quarter=60-80

Proceed to **Section II: Sketches.**

- Sequence:
 - No. 2, No. 1, No. 3

Advanced Level

(for players with significant experience with air sounds)

Begin with **Section I: Studies.**

- Sequence:
 - Nos. 1-9, in order
- Nos. 1, 8, and 9: play at fastest indicated tempo

Proceed to **Section II: Sketches.**

- Nos. 1-3, in order

Performers may wish to use select exercises for endurance conditioning during a periodization schedule. Recall that interval training can function as endurance conditioning during practice sessions. Below is a sample practice regimen (table 5.2) to develop respiratory muscle strength, adapted from Terry Ewell’s model:¹⁵⁵

Table 5.2. Sample practice regimen incorporating Studies for Air Sounds.

Type of practice	Duration
Warm-up: Scales, long tones	15 minutes
Interval Training 1: Air Sounds, Section I, Nos. 3, 7, 8	3 minutes
Active Rest 1: Articulation (in repertoire or pedagogical materials)	10 minutes
Interval Training 2: Air Sounds, Section I, Nos. 3, 7, 8	3 minutes
Break	5 minutes
Active Rest 2: Finger dexterity (in repertoire or pedagogical materials)	10 minutes
Interval Training 3: Air Sounds, Section I, Nos. 3, 7, 8	3 minutes
Active Rest 3: Rhythm (repertoire or pedagogical materials)	10 minutes

Although air sounds currently remain a relatively underdeveloped aspect of contemporary clarinet pedagogy, it is hoped that these materials will encourage performers and teachers to devote more attention to the technique for both practical and pedagogical purposes.

155. Ewell, “Double Reed Weekend Warrior.”

Selected Resources and Repertoire for Further Study

The lists below (tables 5.3, 5.4, and 5.5) highlight pedagogical resources and repertoire for the clarinet involving air and breath sounds. These lists are not intended to be comprehensive; rather, they serve as a reference and entry point for performers and teachers. I have attempted to include both well- and lesser-known solo and chamber repertoire from the past six decades. It should also be noted that although many pieces include multiple extended techniques, most of the entries in table 5.4 and table 5.5 use air, breath, and/or vocalizations as defining compositional elements.

Table 5.3. Pedagogical materials for air/breath sounds on the clarinet.

Author/Composer	Title	Relevant section(s)
Borkowski, Jennifer	<i>Modernizing Practice Paradigms for New Music: Periodization Theory and Peak Performance Exemplified through Extended Techniques</i>	Chapters 5, 6 (6c), 7, 8
Caravan, Ronald	<i>Polychromatic Diversions</i>	Nos. 1, 4, 6, 8, 10
Danard, Rebecca	“Etudes in Performing Extended Techniques: Twelve Newly-Commissioned Canadian Works for Solo Clarinet”	Don Ross, <i>Almost There</i>
Rehfeldt, Phillip	<i>New Directions for Clarinet</i>	Chapter 4
Richards, E. Michael	<i>The Clarinet of the Twenty-First Century</i>	Chapter 4
Roche, Heather	“on writing air sounds for clarinets,” https://heatherroche.net/2014/02/13/on-writing-air-sounds-for-clarinets/	All

Table 5.4. Solo repertoire for clarinet involving air/breath sounds.

Composer	Title
Carraher, Ryan	<i>I wanted to fly from the roof and I fell</i> (2020)
Cox, Jessie	<i>/OR/UN/</i> (2018)
Grisey, Gérard	<i>Charme</i> (1969)

Karger, Reinhard	<i>An Joseph Roth</i> (2012)
Lachenmann, Helmut	<i>Dal niente (Intérieur III)</i> (1970)
Na, SukJu	<i>vkqzhs</i> (2011/12)
Pelz, Ofer	<i>Modifications</i> (2015, rev. 2019)
Stockhausen, Karlheinz	<i>Amour: 5 Stücke für Klarinette</i> (1976)
Widmann, Jörg	<i>Drei Schattentänze, III. African Dance</i> (2013)

Table 5.5. Chamber repertoire for clarinet involving air/breath sounds.

Composer	Title
Bergman, Erik	<i>Karanssi</i> , op. 114 for clarinet and cello (1990)
Beteta, Xavier	<i>Lasting Shadows</i> for clarinet and piano (2011)
Crumb, George	<i>Eleven Echoes of Autumn</i> for violin, alto flute, clarinet, and piano (1965)
Furrer, Beat	<i>aer</i> for clarinet, cello, and piano (1991)
Garifzyanova, Elvira	<i>Phoenix</i> for flute, clarinet, and bassoon (2006)
Hespos, Hans-Joachim	<i>GELB</i> for eight clarinetists (1979)
Jin, Zhuosheng	<i>A Piece of Watermelon</i> for six musicians and female voice (2019)
Matsushita, Isao	<i>Kochi</i> for three clarinets (1983)
Morrish, Nicholas	<i>Life of Lines II</i> for clarinet (with music boxes), percussion, piano, violin/viola, and cello (2017)
Pelz, Ofer	<i>marchons, marchons</i> for flute, clarinet, violin, cello, and piano (2014-15)
Shirazi, Aida	<i>(Re)Visiting the Land of (Un)Known</i> for clarinet, violin, and piano (2020)
Smith, William O.	<i>Mosaic</i> for clarinet and piano (1964)
Tulve, Helena	<i>stream2</i> for flute, clarinet, violin, cello, and percussion (2006/09)

CHAPTER 6: CONCLUSION

Over the past six decades, composers and performers have explored new timbral possibilities and techniques, resulting in ever-evolving approaches to musical performance. For clarinetists, these extended techniques include multiple sounds or multiphonics, microtones, air or breath sounds, key clicks and other percussive effects, humming or singing while playing, extensions of and modifications to the clarinet, teeth on the reed, and more. Since the mid-1960s, authors have contributed to the pedagogical literature on extended techniques and contemporary clarinet performance with études, treatises, dissertations, articles, and, most recently, online resources. Despite the wealth of resources today on extended clarinet techniques, few authors present pedagogical materials that offer accessible entry points to contemporary clarinet techniques and literature. Consequently, less-experienced clarinetists may be deterred from learning a significant portion of the repertoire from the past several decades, impeding their overall musical development and experience.

In this dissertation, I argue that to cultivate a well-rounded musical education and performer, teachers and students must have access to 1) a compendium of extant pedagogical resources on extended clarinet techniques, and 2) simple, systematic exercises for common extended clarinet techniques that can be modified according to each performer's goals and abilities. To this end, I have compiled a compendium of fifty pedagogical resources surrounding extended clarinet techniques and composed eighty original exercises covering multiphonics, microtones, and air sounds. The compendium, which operates as a reference for both teachers and students, contains five categories of materials: dissertations, books, journal articles, method and étude books, and online resources. Each entry is evaluated on its content, availability, audience, strengths, and limitations. The original materials composed for this dissertation are

sectionalized by technique and further broken down by pedagogical function. The sections on multiphonics and microtones contain preparatory exercises to introduce the basic skills needed for each technique, while the remaining exercises are designed to be modified depending on each performer's goals and abilities. All exercises contain simple rhythms, and many exercises also implement scalar patterns to provide a recognizable framework in which to practice unfamiliar fingerings or techniques.

The materials composed for this project are intended to supplement, not replace, existing pedagogical materials for extended clarinet techniques, and contribute to the small but growing number of resources on extended techniques for the developing clarinetist. The relative simplicity, focus, and systematic organization of my materials allows clarinetists to practice three common extended clarinet techniques in isolation from other demands encountered in repertoire and gain familiarity with notation methods used for these techniques. Just as practicing scales, arpeggios, and long tones improves clarinetists' ability to perform difficult repertoire, establishing a foundation in extended clarinet techniques is vital to both interpreting and physically performing contemporary repertoire. Clarinetists who have a strong foundation in multiphonics, microtones, and air sounds in particular, as well as their corresponding notation methods, will find many contemporary compositions more approachable and comprehensible.

The evolving nature of instrumental technique means that the catalog of extended clarinet techniques is also constantly in flux, thereby illustrating a built-in limitation of this project. Moreover, although the compendium contains resources covering all documented categories of extended clarinet techniques, I have chosen to focus on just three techniques that are prevalent in the repertoire. While this narrow scope allows clarinetists to hone those particular skills, it does so at the expense of developing and explaining other techniques that performers may also

encounter in the repertoire. Further research on the intersection of pedagogy and extended clarinet techniques should prioritize these pedagogically underemphasized techniques to contribute to a more holistic understanding of how to cultivate the contemporary clarinetist.

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- Warren, Ariana. "21st Century Beginning Clarinet Method." DMA diss., University of California, San Diego, 2014. ProQuest Dissertations & Theses Global.
- Watts, Sarah. "Spectral Immersions: A Comprehensive Guide to the Theory and Practice of Bass Clarinet Multiphonics." PhD diss., Keele University, 2015.
- Zaev, Pance. "An Annotated Bibliography of Selected Solo and Small Chamber Works for Clarinet in the 20th and 21st Century Written by Macedonian Composers." DMA diss., University of Nebraska, 2015. ProQuest Dissertations & Theses Global.
- Zelinsky, Beate, and David Smeyers. *Pro Musica Nova: Studies for Playing Contemporary Music for Clarinet*. Wiesbaden: Breitkopf & Härtel, 1996.
- Zonn, Paul. "Some Sound Ideas for Clarinet." *The Clarinet* 2, no. 2 (February 1975): 17-20.

APPENDIX A: COMPENDIUM OF RESOURCES FOR EXTENDED CLARINET TECHNIQUES

The lack of meta-pedagogy within the field of extended techniques is understandable; given the varied nature of students' goals and needs, it is impractical to design a one-size-fits-all method for teaching extended techniques. However, as Hsuan Lee writes, "It is essential that the teacher has a comprehensive understanding of the various influential contemporary and historical pedagogies—as well as keeping abreast of any new developments in the field—such that we may adopt and combine different ideas from different schools as appropriate, in order to meet the demands of the individual learning situation."¹⁵⁶ Accordingly, the aim of this compendium is to provide a near-comprehensive listing and description of such influential pedagogical materials surrounding extended clarinet techniques so that both teachers and students have a body of literature from which to draw. Materials are presented in five categories: dissertations, books, journal articles, method and étude books, and online resources. Pages 105-107 function as a table of contents, while pages 108-135 contain a breakdown of each entry. In the latter section, each entry includes the following criteria for assessment:

1. **Content:** What information does this source contain? Which extended techniques are covered?
2. **Availability:** Where is this source physically located?
3. **Audience:** For whom is this source written?
4. **Strengths:** What does this source do well? How is this source useful to performers and/or teachers?
5. **Limitations:** What limitations does this source have?

156. Hsuan Lee, "Towards a Dynamic Pedagogy: Contemporary Pedagogical Approaches to Basic Violin Technique" (DMA diss., University of Washington, 2003), 3.

Dissertations			
Author	Title	Page in Compendium	Publication Date
Behm	A Comprehensive Performance Project in Clarinet Literature with an Essay on the use of Extended, Or New, Technique in Selected Unaccompanied Clarinet Solos Published from 1960 through 1987	108	1992
Caravan	Extensions of Technique for Clarinet and Saxophone	108	1974
Danard	Études in Performing Extended Techniques: Twelve Newly-Commissioned Canadian Works for Solo Clarinet	109	2011
Dierickx	The Clarinet Works of Jörg Widmann: A Performance Guide to <i>Fantasie for Clarinet Solo</i> with a Survey of Unaccompanied Clarinet Repertoire and Guide to Contemporary Techniques	109	2018
Ellard	Bridging the Gap: Introducing Extended Techniques and Contemporary Notation Through Newly Composed Etudes for Clarinet	110	2020
Farmer	Multiphonic Trills and Tremolos for Clarinet	110	1977
Haddad	The History and Comparison of Three Diverse Systems of Producing Multiphonics on the B-flat Boehm System Clarinet	111	2006
Humberd	A Pedagogical Approach for Incorporating Extended Techniques into the Undergraduate Clarinet Curriculum	111	2020
Liang	Clarinet Multiphonics: A Catalog and Analysis of Their Production Strategies	112	2018
Meadows	A Program of Study for 21st Century Clarinet Techniques Featuring Five New Compositions for Unaccompanied Clarinet	112	2019
Plasko	Contemporary Performance Effects on the Clarinet in Selected Music Literature from 1960–1974	113	1975
Richards	Microtonal Systems for Clarinet: A Manual for Composers and Performers	113-14	1984
Ruth	Humming and Singing while Playing in Clarinet Performance: An Evidence Based Method for Performers and Resource for Composers	114	2019

Warren	21st Century Beginning Clarinet Method	114-15	2014
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Books			
Author	Title	Page in Compendium	Publication Date
Bartolozzi	New Sounds for Woodwind	115	1967
Farmer	Multiphonics and Other Contemporary Clarinet Techniques	116	1982
Gingras	Clarinet Secrets: 52 Performance Strategies for the Advanced Clarinetist	116-17	2006
Heaton/Lawson	“The Contemporary Clarinet,” in The Cambridge Companion to the Clarinet	117-18	1995
Rehfeldt	New Directions for Clarinet, Revised Edition	118	1994
Richards	The Clarinet of the Twenty-First Century	119	1992

Articles			
Author	Title	Page in Compendium	Publication Date
Caravan	Introducing Multiple Sonorities to the Young Clarinetist	119	1975
Errante	Contemporary Aspects of Clarinet Performance, Parts 1, 2, and 3	120-21	1977
Farmer	Clarinet Multiphonics	121-22	1978
Gingras	Mastering New Sounds: A Beginner’s Guide	122	1988
Heim	The Clarinet and Avant-Garde Music	122	1973
Ludewig-Verdehr	A Practical Approach to New and Avant-garde Clarinet Music and Techniques	123	1980
Mandat	Expanding Timbral: Flexibility Through Multiphonics	123	1989
Merrick	Teaching Extended Techniques	124	2004
Schwadron	Contemporary Music for Clarinet	124	1965
Singer	Woodwind Development: A Monophonic and Multiphonic Point of View	125	1975
Smith	Contemporary Clarinet Sonorities	125	1972

Valenziano	Contemporary Notational Symbols and Performance Techniques for the Clarinet, Parts 1 and 2	126	1977
Valvo	Refining Fundamentals through Extended Techniques	127	2020
Zonn	Some Sound Ideas for Clarinet	127	1975

Method and Étude Books

Author/Composer	Title	Page in Compendium	Publication Date
Burke	Clarinet Warm-Ups: Materials for the Contemporary Clarinetist	128	1995
Caravan	Five Duets for One Clarinetist	128-29	1976
	Polychromatic Diversions: 10 Graded Compositions Using Non-Traditional Techniques	129	1979
	Preliminary Exercises and Etudes in Contemporary Techniques for Clarinet	130	1979
Dolak	Contemporary Techniques for the Clarinet: A Selective, Sequential Approach through Prerequisite Studies and Contemporary Études	130-31	1980
Garbarino	Metodo per clarinetto	131	1978
McCarty	Methods for New Music for Clarinet, Book II	132	1971
Sigel	The Twentieth Century Clarinetist	132	1966
Zelinsky and Smeyers	Pro Musica Nova: Studies for Playing Contemporary Music for Clarinet	133	1996

Online Resources

Author	Title	Page in Compendium	Publication Date
Alder	Clarinet Quarter-Tone Fingering Chart	133	N.d
Oakes	Fingering Chart for Multiphonics and Microtones	134	N.d.
Roche	27 Easy Bb Clarinet Multiphonics	134	2018
	...on writing air sounds for clarinets	135	2014/2017

Dissertations

Behm, Gary Wilson. "A Comprehensive Performance Project in Clarinet Literature with an Essay on the use of Extended, Or New, Technique in Selected Unaccompanied Clarinet Solos Published from 1960 through 1987." DMA diss., The University of Southern Mississippi, 1992.	
Content	Two-part dissertation containing the author's lecture recital text, followed by an analysis of six works for unaccompanied clarinet using extended techniques. Of particular note is the survey of early literature pertaining to extended techniques, and the annotated bibliography of fifty-three works for unaccompanied clarinet using extended techniques.
Availability	ProQuest Dissertations & Theses Global
Audience	Performers
Strengths	The annotated bibliography in particular may be useful for teachers and/or students interested in delving into this body of repertoire.
Limitations	Only covers repertoire published between 1960 and 1987.

Caravan, Ronald. "Extensions of Technique for Clarinet and Saxophone." DMA diss., Eastman School of Music, University of Rochester, 1974.	
Content	Resource on extended B-flat clarinet and E-flat alto saxophone techniques for composers, performers, and teachers. Emphasizes multiple sonorities and their acoustical properties, but also covers quarter-tones, timbre and articulation, vibrato, glissando and portamento, percussive and air effects, vocal sounds, mouthpiece alone, and lip buzz. Contains multiphonic fingering charts and études for select techniques.
Availability	ProQuest Dissertations & Theses Global
Audience	Composers, performers, teachers
Strengths	One of the most comprehensive documents on extended clarinet techniques before Phillip Rehfeldt's <i>New Directions</i> . Focuses on multiple sounds, grounded in empirical research. Many accessible studies featuring extended techniques.
Limitations	Not the most up-to-date resource for extended techniques.

Danard, Rebecca J. “Études in Performing Extended Techniques: Twelve Newly-Commissioned Canadian Works for Solo Clarinet.” DMA diss., University of Cincinnati, 2011.	
Content	Collection of twelve études for clarinet, commissioned by the author. Each étude involves at least one extended technique; these techniques include timbral trills, multiphonics, vocalizing while playing, key clicks, microtones, and more.
Availability	OhioLINK (accessible through Google Scholar)
Audience	Teachers and students (advanced high school students and college undergraduates)
Strengths	Contains a practical guide for learning and teaching each étude. Études are presented in their entirety.
Limitations	Many études contain complex rhythms and technical issues that may be challenging for those demographics, and a few incorporate multiple extended techniques. Paper is not indexed in major resources such as ProQuest Dissertations & Theses Global.

Dierickx, Zachary Daniel. “The Clarinet Works of Jörg Widmann: A Performance Guide to <i>Fantasie for Clarinet Solo</i> with a Survey of Unaccompanied Clarinet Repertoire and Guide to Contemporary Techniques.” DMA diss., The Ohio State University, 2018.	
Content	Primary focus is the clarinetist-composer Jörg Widmann, but also includes a guide to extended clarinet techniques (chapter 5), in which the author discusses historical background, production strategies, relevant repertoire, notation, and further resources for each technique.
Availability	ProQuest Dissertations & Theses Global
Audience	Performers
Strengths	Chapter 5 is a succinct and clear introduction to several common extended clarinet techniques, including multiple sonorities, multiple articulation, air sounds, flutter and slap tonguing, microtones, timbral adjustments, and percussive effects.
Limitations	In the guide, extended clarinet techniques are discussed with varying degrees of depth, and no musical examples are provided.

Ellard, Luke Michael. “Bridging the Gap: Introducing Extended Techniques and Contemporary Notation Through Newly Composed Etudes for Clarinet.” DMA diss., University of North Texas, 2020.	
Content	Presents six newly-composed études covering quarter-tones, multiphonics, vocalizations, guided improvisation, articulation, and graphic notation. Short preparatory exercises and instructions are included before each étude, functioning as entry points into a particular technique.
Availability	ProQuest Dissertations & Theses Global
Audience	Advanced high school and early college undergraduate students; newcomers to contemporary music
Strengths	Études are concise, rhythmically straightforward, and focused on only one category of technique each. Scope is broad, covering not only extended techniques but also spatial and graphic notation and improvisation.
Limitations	Air sounds only mentioned briefly in the context of guided improvisation. Fingerings for quarter-tones and multiphonics are provided on separate pages from the exercises and études themselves.

Farmer, Gerald James. “Multiphonic Trills and Tremolos for Clarinet.” DMA diss., University of Oregon, 1977.	
Content	Catalog of multiphonic trills and tremolos for clarinet, as well as a history of clarinet multiphonic use in the repertoire and review of existing resources by Bruno Bartolozzi, Ronald Caravan, Phillip Rehfeldt, William O. Smith, and more.
Availability	ProQuest Dissertations & Theses Global
Audience	Performers
Strengths	Catalog is useful for locating multiphonic trills and tremolos with particular timbral qualities.
Limitations	Not the most up-to-date resource for extended techniques.

Haddad, Holly Ann. “The History and Comparison of Three Diverse Systems of Producing Multiphonics on the B-flat Boehm System Clarinet.” DMA diss., University of Arizona, 2006.	
Content	Surveys approaches to multiphonics by three pioneers in contemporary woodwind techniques (Bruno Bartolozzi, William O. Smith, and Phillip Rehfeldt) and presents a bibliography of clarinet works containing multiphonics, as well as an original catalog/fingering chart containing four categories of multiphonics.
Availability	ProQuest Dissertations & Theses Global
Audience	Performers
Strengths	The fingering chart is organized according to dynamics, so it is most helpful for performers who know the timbral and/or dynamic quality of the multiphonic for which they are searching.
Limitations	The fingering chart is not ideal for performers who want to search for a multiphonic containing a certain pitch or set of pitches.

Humberd, Amy M. “A Pedagogical Approach for Incorporating Extended Techniques into the Undergraduate Clarinet Curriculum.” DM diss., Florida State University, 2020.	
Content	Targets the undergraduate clarinet curriculum and highlights how select extended techniques (portamenti, microtones, singing and playing, multiphonics, and double tonguing) can be used as tools for fundamental development.
Availability	ProQuest Dissertations & Theses Global
Audience	Teachers and undergraduate clarinetists
Strengths	Systematic exercises (fundamental, intermediate, and advanced levels) for each technique. Appendix A contains a list of pieces for further study, broken down by extended technique. Appendices B and C contain microtonal and multiphonic fingering charts.
Limitations	Exercises are integrated throughout the dissertation, so the format is not especially user-friendly. Only select techniques are covered.

Liang, Jack Yi Jing. “Clarinet Multiphonics: A Catalog and Analysis of Their Production Strategies.” DMA diss., Arizona State University, 2018.	
Content	Documents a study of multiphonic production on clarinet using ultrasound imaging. Multiphonic catalog (containing 604 dyads) is organized by pitch and fingering.
Availability	ProQuest Dissertations & Theses Global
Audience	Advanced/professional clarinetists; teachers; composers
Strengths	Catalog organization is clear; users can easily find multiphonics by pitch and/or fingering. Thorough and up-to-date resource, grounded in rigorous research.
Limitations	Catalog does not cover timbral or dynamic qualities of multiphonics.

Meadows, Olivia Lauren. “A Program of Study for 21st Century Clarinet Techniques Featuring Five New Compositions for Unaccompanied Clarinet.” DMA diss., Arizona State University, 2019.	
Content	Overview of and practice suggestions for five newly-commissioned pieces for unaccompanied clarinet.
Availability	ProQuest Dissertations & Theses Global
Audience	Pieces are intended for high school/college level clarinetists. The author offers an intended order of study for the pieces so that they increase in difficulty.
Strengths	Each of the first four works focuses on one pedagogical area of extended technique (notated rubato/musicality, the altissimo register, microtones, and multiphonics, respectively), while the fifth work is a culmination of all aforementioned techniques.
Limitations	Commissioned pieces are not included in the dissertation itself.

Plasko, George. “Contemporary Performance Effects on the Clarinet in Selected Music Literature from 1960-1974.” DMA diss., University of Cincinnati, 1975.	
Content	A comprehensive survey of the production of several contemporary clarinet techniques, including flutter-tongue, sudden dynamic shifts and extreme registral leaps, glissando, microtones, multiphonics and monophonics, mouthpiece-reed effects (teeth on reed), key sounds, and sounds produced through instrumental adaptation or addition.
Availability	ProQuest Dissertations & Theses Global
Audience	Performers, teachers, composers
Strengths	Mainly interesting from a historical perspective, as this dissertation is the first to document extended clarinet techniques in a single resource.
Limitations	Practicality of this dissertation is limited, as Plasko omits multiphonic and microtonal fingering charts and instead focuses on the use of select techniques in the literature.

Richards, Edwin Michael. “Microtonal Systems for Clarinet: A Manual for Composers and Performers.” PhD diss., University of California, San Diego, 1984.	
Content	Catalog/fingering chart of 827 microtones arranged from low to high, with graphics labeling each pitch’s timbre; catalog of microtonal, timbre, and atypical trills and tremolos. Also covers principles for forming microtonal scales on clarinet; equidistant microtonal scales consisting of eight, twelve, or sixteen notes to the whole step; the effect of volume on quarter-tones’ timbre; examples of easy quarter-tone passages; and legato finger difficulty between conjunct microtones.
Availability	ProQuest Dissertations & Theses Global; book and microform held by select libraries in the USA, Canada, Germany, and Australia
Audience	Advanced/professional clarinetists

Strengths	A thorough and practical resource for clarinetists and composers that targets many aspects of quarter-tone production on the clarinet. Most pitches have multiple possible fingerings; some pitches have as many as twenty-two fingerings, providing performers with many more options than most other resources for clarinet microtones.
Limitations	Fingering graphics are occasionally difficult to read. Wealth of information may be overwhelming to some readers.

Ruth, Jeremy Larkham. "Humming and Singing while Playing in Clarinet Performance: An Evidence Based Method for Performers and Resource for Composers." DMA diss., Arizona State University, 2019.	
Content	Explains physiological differences between humming and singing while playing, and presents a systematic method for performers and composers.
Availability	Dissertation available on ProQuest Dissertations & Theses Global; standalone method available for free on author's website: https://jeremyruth.com/
Audience	Performers, teachers, composers
Strengths	One of few extant sources that explains, based on quantitative data from the author's research study, vocalization on a wind instrument as it relates to physiology.
Limitations	None

Warren, Ariana. "21st Century Beginning Clarinet Method." DMA diss., University of California, San Diego, 2014.	
Content	Outlines a holistic method for beginning clarinetists, emphasizing interactivity, aural and theory skills, unconventional sounds such as multiphonics and key clicks, and non-western music. Complete method is in the appendix, though the method's intended design is a software application for computer and tablet.

Availability	Dissertation available on ProQuest Dissertations & Theses Global. Application-based method not available as of this writing.
Audience	Teachers and beginning clarinetists
Strengths	Focus of method is on developing musical creativity and aural skills, areas which many other beginner method books lack or do not emphasize.
Limitations	Application-based method not available.

Books

Bartolozzi, Bruno. <i>New Sounds for Woodwind</i>. Translated by Reginald Smith Brindle. London: Oxford University Press, 1967.	
Content	Focuses on multiple sounds, microtones, and timbral variations.
Availability	Widely available for purchase. Both editions (1967 and 1982) available for loan through over 600 libraries worldwide (see WorldCat for more information).
Audience	Advanced/professional woodwind players; composers
Strengths	Interesting from a historical perspective, as this is one of the first publications covering the possibilities of extended techniques on woodwinds.
Limitations	Outdated. Clarinet fingering charts difficult to interpret.

Farmer, Gerald. <i>Multiphonics and Other Contemporary Clarinet Techniques</i>. Rochester, NY: SHALL-u-mo, 1982.	
Content	This book primarily deals with the history, production, and cataloguing of multiphonics, and includes several short exercises. Farmer divides the multiphonics into three categories based on their timbral characteristics and suggested physiological strategies for production. Farmer also includes a chapter on eighteen other contemporary clarinet techniques, including microtones, flutter-tongue, air sounds, and percussive effects, and a discussion of contemporary notational techniques.
Availability	Available online at www.scribd.com , and for loan through select university libraries in the US, Canada, the UK, Switzerland, and Australia (see WorldCat for more information). Out of print as of this writing.
Audience	Performers, teachers, and composers
Strengths	Multiphonic exercises in chapter 2 are suitable for less experienced players and include fingering diagrams and brief directions. Examples of notation in chapter 5 useful.
Limitations	Section on humming and playing outdated, as is the bibliography. Discussion of other contemporary techniques is often superficial.

Gingras, Michèle. <i>Clarinet Secrets: 52 Performance Strategies for the Advanced Clarinetist</i>. Rev. ed. Lanham, MD: Scarecrow Press, Inc., 2006.	
Content	In this book, Gingras presents concise strategies for improving tonguing, intonation, technique, tone, and musicianship. Gingras also covers the basics of reeds and equipment, “avant-garde” techniques, klezmer style and repertoire, and technology and electronic music. An accompanying CD contains audio examples of the concepts presented in the text.
Availability	Available for loan through select libraries in the US, Canada, the UK, Denmark, Germany, Switzerland, Spain, and New Zealand (see WorldCat for more information).
Audience	Teachers and advanced performers

Strengths	Chapter 7, “Enhancing Repertoire,” contains practical exercises for glissando/portamento, vibrato, double tonguing, and circular breathing. “Secret 29: Hearing Harmonics and Playing Overtones” in chapter 4 is also useful.
Limitations	Microtones, multiphonics, slap tongue and flutter-tongue, teeth-on-reed, and vocal sounds are grouped together in a single section entitled “Special Sound Effects.” Gingras provides only brief descriptions of each technique and does not present exercises or strategies as in the rest of the book.

Heaton, Roger. “The contemporary clarinet.” In <i>The Cambridge Companion to the Clarinet</i>, edited by Colin Lawson, 163-183. Cambridge: Cambridge University Press, 1995.	
Content	This book chapter covers 1) twentieth century compositional trends, 2) the role of the performer in the development of extended techniques and contemporary repertoire, 3) the role of the bass clarinet and E-flat clarinet in contemporary repertoire, 4) several techniques found in contemporary repertoire (e.g., vibrato, <i>bisbigliando</i> , multiphonics, air sounds, vocal sounds, slap tongue), 5) performing with electronics, and 6) high notes, microtones, and multiphonics, as well as circular breathing and high notes for bass clarinet. The chapter concludes with a “Select List of Some Recent Important Pieces.”
Availability	Print version available for purchase through Amazon, Barnes & Noble, Boosey & Hawkes, and more. Print version available for loan through over 600 university libraries worldwide. Ebook (published 2011) available through over 600 university libraries worldwide.
Audience	Performers, teachers, and amateurs interested in the clarinet

Strengths	Although the chapter functions as an overview, it is more in-depth than many articles and may be a useful starting point for novices. It is practical in that it contains fingering charts for the altissimo register, microtones, multiphonics, and high notes for bass clarinet, in addition to instructions for circular breathing.
Limitations	List of repertoire is limited and does not cover difficulty. No exercises.

Rehfeldt, Phillip. <i>New Directions for Clarinet</i>. Rev. ed. Berkeley: University of California Press, 1994.	
Content	Overview of fundamentals on clarinet; monophonic fingering charts, including microtonal and color fingerings as well as E-flat and bass clarinet fingerings; multiphonic fingering charts, including trills and tremolos; a catalog of effects such as pitch bends, flutter-tongue, teeth-on-reed, vocal sounds, and circular breathing; a commentary on electronic applications and performing with electronics; appendices covering clarinet works of Eric Mandat and William O. Smith; notes on the E-flat contrabass, altissimo fingerings, and difference tones; a reproduction of Donald Scavarda's <i>Matrix for Clarinetist</i> ; and three music bibliographies.
Availability	Available for purchase through Amazon, Barnes and Noble, and other vendors. Available for loan through over 300 libraries worldwide.
Audience	Advanced/professional clarinetists; composers
Strengths	One of the most comprehensive and detailed resources for extended clarinet techniques.
Limitations	Pedagogical scope is somewhat limited.

Richards, E. Michael. <i>The Clarinet of the Twenty-First Century</i>. Fairport, NY: E & K Publishers, 1992.	
Content	An organological overview of the clarinet, as well as discussions on the production of select extended techniques, with emphasis on multiple sounds and microtones. Richards also includes a chapter on wind controllers and electronic synthesis, an original étude utilizing exclusively extended techniques, and an appendix of Karlheinz Stockhausen's music for clarinet. An accompanying cassette tape illustrates examples from the text.
Availability	Available for loan through select university libraries in the US, New Zealand, and Australia. Out of print and unavailable to purchase as of this writing.
Audience	Performers and composers
Strengths	Much of chapter 2, which covers microtones and overlaps with Richards' dissertation, may be especially useful for composers. Richards also includes timbral characteristics of microtones.
Limitations	Chart of multiphonics is overly complex.

Articles

Caravan, Ronald. "Introducing Multiple Sonorities to the Young Clarinetist." <i>Woodwind World-Brass and Percussion</i> 14, no. 1 (January 1975): 16-19.	
Content	A pedagogical resource for introducing multiphonics to young clarinetists.
Availability	Available in print in the journal <i>Woodwind World-Brass and Percussion</i> . Scan of article available through Interlibrary Loan.
Audience	Teachers
Strengths	Concise. Contains short exercises throughout.
Limitations	Exercises would be more practical if presented on a separate page for the student.

Errante, F. Gerard. "Contemporary Aspects of Clarinet Performance." Part 1. <i>Woodwind World-Brass and Percussion</i> 16, no. 1 (January 1977): 6-7; 17.	
Content	This article, the first in a three-part series on contemporary clarinet techniques, discusses multiple sonorities, glissando and portamento, and "variations in initiating and terminating tone," such as flutter-tongue, smorzato/smorzando, and slap tongue. Errante explains the basic mechanics of each technique and goes into slightly more detail when explaining the three ways to produce multiple sonorities. He also provides examples of both conventional fingerings and unconventional fingerings.
Availability	Available in print in the journal <i>Woodwind World-Brass and Percussion</i> . Scan of article available through Interlibrary Loan.
Audience	Advanced performers interested in delving into contemporary music
Strengths	A concise introduction to select contemporary techniques.
Limitations	As the article functions as an overview, it is not especially useful as a pedagogical resource. Information about vocalizing while playing is outdated.

Errante, F. Gerard. "Contemporary Aspects of Clarinet Performance." Part 2. <i>Woodwind World-Brass and Percussion</i> 16, no. 1 (January 1977): 20-21; 26.	
Content	This article, the second in a three-part series on contemporary clarinet techniques, discusses unconventional methods of sound production on the clarinet. Techniques covered are microtones; vibrato; and mechanisms of altering timbre, including the timbre trill, the microtonal trill, use of a mute, air sounds, vocal modifications (i.e., humming while playing), and inhibiting vibration of the reed.
Availability	Available in print in the journal <i>Woodwind World-Brass and Percussion</i> . Scan of article available through Interlibrary Loan.
Audience	Advanced performers interested in delving into contemporary music; composers

Strengths	Good overview of select techniques, with notated examples to support the descriptions. Errante cites several compositions that implement the relevant techniques.
Limitations	As the article functions as an overview and lacks true exercises, it is not especially useful as a pedagogical resource.

Errante, F. Gerard. "Contemporary Aspects of Clarinet Performance." Part 3. <i>Woodwind World-Brass and Percussion</i> 16, no. 3 (May 1977): 8-9.	
Content	This article, the third in a three-part series on contemporary clarinet techniques, discusses percussive effects, instrument alterations, and theatrical effects.
Availability	Available in print in the journal <i>Woodwind World-Brass and Percussion</i> . Scan of article available through Interlibrary Loan.
Audience	Advanced performers interested in delving into contemporary music
Strengths	Errante cites several compositions that implement the relevant techniques.
Limitations	No examples are provided to illustrate the techniques, and the discussion is largely superficial.

Farmer, Gerald. "Clarinet Multiphonics." <i>The Instrumentalist</i> 33, no. 3 (October 1978): 48-53.	
Content	Introduction to multiphonics with short exercises in four categories: 1) conventional fingerings, 2) unconventional fingerings, 3) trills and tremolos, and 4) humming and playing.
Availability	Available in print in <i>The Instrumentalist</i> . Scan of article available through Interlibrary Loan.
Audience	Teachers and "experienced clarinetists who have developed proper breath support and a firm embouchure"
Strengths	Concise exercises with clear directions.

Limitations	Exercises for humming and playing are on two staves; the bottom staff is in bass clef, which may be challenging for some players.
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Gingras, Michele. "Mastering New Sounds: A Beginner's Guide." <i>The Clarinet</i> 15, no. 2 (February/March 1988): 56-58.	
Content	Overview of select contemporary techniques: "effects involving throat flexibility," vibrato, portamento, flutter-tongue, circular breathing, and double tonguing.
Availability	Available in print in <i>The Clarinet</i> and online at www.ica.wildapricot.org (International Clarinet Association members only).
Audience	Contemporary music novices
Strengths	Basic descriptions and a few short exercises.
Limitations	Neither comprehensive nor distinctive from similar resources.

Heim, Norman. "The Clarinet and Avant-Garde Music." <i>Woodwind World</i> 12 (December 1973): 12; 14; 29.	
Content	A commentary on avant-garde music and the modern clarinetist, and a survey of contemporary (c.1973) literature for clarinet.
Availability	Available in print in <i>Woodwind World</i> . Scan available through Interlibrary Loan.
Audience	Performers
Strengths	Concise survey of eleven clarinet works from the 1960s and 1970s involving extended techniques.
Limitations	Outdated; not especially useful as a pedagogical resource.

Ludewig-Verdehr, Elsa. “A Practical Approach to New and Avant-garde Clarinet Music and Techniques.” <i>The Clarinet</i> 7, no. 2 (1980):10-15; 38-41.	
Content	A survey of the extant literature on extended clarinet techniques (ca.1980) and presentation of preliminary exercises for multiphonics and singing while playing.
Availability	Available in print in <i>The Clarinet</i> and online at www.ica.wildapricot.org (International Clarinet Association members only).
Audience	Teachers and performers
Strengths	The commentary on the literature is particularly useful.
Limitations	Somewhat outdated, as the body of literature referenced has vastly expanded since this article’s publication.

Mandat, Eric. “Expanding Timbral: Flexibility Through Multiphonics.” <i>The Clarinet</i> 16, no. 3 (May–June 1989): 27-30.	
Content	Examines tonal stability and flexibility in clarinet playing through the lens of multiphonic production.
Availability	Available in print in <i>The Clarinet</i> and online at www.ica.wildapricot.org (International Clarinet Association members only).
Audience	Teachers and performers
Strengths	Short exercises and examples. Concepts can be applied to both traditional and contemporary repertoire.
Limitations	Fingering diagrams can be difficult to read.

Merrick, Linda. "Teaching Extended Techniques." <i>Clarinet and Saxophone</i> 29, no. 2 (2004): 10-12.	
Content	Merrick advocates for the introduction and exploration of extended techniques in studio lessons, particularly those at the pre-collegiate level. Merrick also addresses a few selected extended techniques from a pedagogical perspective, and notes the lack (c. 2004) of repertoire and exercises suitable for less advanced players incorporating such techniques.
Availability	Scan of article available through Interlibrary Loan. Available online at https://www.cassgb.org/magazine/ (Clarinet & Saxophone Society of Great Britain members only).
Audience	Teachers
Strengths	One of few resources that examines the benefits of integrating extended techniques into pre-collegiate studio lessons.
Limitations	More theoretical than practical. Merrick does not provide any pedagogical exercises for the techniques mentioned.

Schwadron, Abraham A. "Contemporary Music for Clarinet." <i>The Instrumentalist</i> 29 (June 1965): 73-76.	
Content	Discussion of the role of the performer, and a compendium of nearly 100 post-1900 chamber works for clarinet.
Availability	Available in print in <i>The Instrumentalist</i> . Scan of article available through Interlibrary Loan.
Audience	Educators and performers
Strengths	Interesting from a historical perspective. The repertoire compendium may also be useful for locating lesser-known twentieth century works.
Limitations	Outdated; not especially useful as a pedagogical resource.

Singer, Lawrence. "Woodwind Development: A Monophonic and Multiphonic Point of View." <i>Woodwind World—Brass & Percussion</i> 14, no. 3 (June 1975): 14-16.	
Content	Singer presents and advocates for a new notation system for woodwind multiphonics that prioritizes timbre and intensity, based on "dominating frequencies." Singer argues that such a system will help composers to use multiphonics more meaningfully.
Availability	Available in print in <i>Woodwind World--Brass & Percussion</i> . Scan of article available through Interlibrary Loan.
Audience	Composers
Strengths	Considering textures and colors of multiphonics may be useful for composers and provide inspiration in developing a notation system for woodwind multiphonics.
Limitations	Not especially useful as a practical or pedagogical resource. Additionally, Singer's suggestion to use a numerical progression to differentiate weak and strong audible intensities is problematic, as the intensities may differ from player to player.

Smith, William O. "Contemporary Clarinet Sonorities." <i>Selmer Bandwagon</i> 67 (Fall 1972): 12-14.	
Content	Overview of select contemporary clarinet techniques, encompassing multiple sonorities, muting techniques, key vibrato, and key clicks.
Availability	Available in print in <i>Selmer Bandwagon</i> . Scan of article available through Interlibrary Loan.
Audience	Student clarinetists, teachers
Strengths	Smith provides brief instructions for performing each technique. He also presents several excerpts from his own compositions <i>Fancies</i> , <i>Mosaic</i> , and <i>Variants</i> , which may encourage readers to seek out and learn these works.
Limitations	As the article functions as an overview, it is not an ideal resource for systematically learning or teaching each technique.

Valenziano, Nicholas J. “Contemporary Notational Symbols and Performance Techniques for the Clarinet.” Part 1, <i>The Instrumentalist</i> 31, no. 8 (March 1977): 94-97.	
Content	Covers notation considerations and performance instructions for select extended clarinet techniques, including air sounds, articulation, change of tone color, flutter-tonguing, glissandi, key clicks, quarter-tones.
Availability	Available in print in <i>The Instrumentalist</i> . Scan of article available through Interlibrary Loan.
Audience	Performers and composers
Strengths	Succinct overview of notation practices for select techniques at the time of the article’s publication.
Limitations	Outdated; many more notation practices have emerged since the article’s publication.

Valenziano, Nicholas J. “Contemporary Notational Symbols and Performance Techniques for the Clarinet.” Part 2, <i>The Instrumentalist</i> 31, no. 9 (April 1977): 70-74.	
Content	Covers notation considerations and performance instructions for select extended clarinet techniques, including multiple sounds, vibrato, and other miscellaneous techniques such as subtone, teeth on reed, “squeaks, indeterminate pitches, and key rattles,” vocal sounds, and more. Lists five pieces of clarinet repertoire utilizing new symbols and techniques.
Availability	Available in print in <i>The Instrumentalist</i> . Scan of article available through Interlibrary Loan.
Audience	Performers and composers
Strengths	Succinct overview of notation practices for select techniques at the time of the article’s publication.
Limitations	Outdated; many more notation practices have emerged since the article’s publication.

Valvo, Tiffany A. “Refining Fundamentals through Extended Techniques.” <i>The Clarinet</i> 47, no. 2 (2020): 34-37.	
Content	Valvo uses four basic extended techniques (singing and playing, controlled glissando, stopped and muted tonguing, and overtones and multiphonics) as a catalyst for improving fundamentals of clarinet playing, such as voicing, tongue position and control, and air flow. Valvo provides short exercises for each technique as well as a rationale for their use and explanation of their execution.
Availability	Available in print in <i>The Clarinet</i> and online at www.ica.wildapricot.org (International Clarinet Association members only).
Audience	Performers—especially those new to extended techniques—and teachers
Strengths	A succinct and practical guide for pedagogues wishing to integrate a few basic extended techniques into their teaching practice.
Limitations	Only select techniques are covered.

Zonn, Paul. “Some Sound Ideas for Clarinet.” <i>The Clarinet</i> 2, no. 2 (February 1975): 17-20.	
Content	Introduces a catalog of sounds and describes select techniques—such as multiphonics—in greater detail. Zonn lists only a few representative works that use contemporary techniques; most of the techniques are described outside the context of repertoire.
Availability	Available in print in <i>The Clarinet</i> and online at www.ica.wildapricot.org (International Clarinet Association members only).
Audience	Performers and composers
Strengths	A good introduction to several common extended techniques and compositions that implement them.
Limitations	Not especially useful as a pedagogical resource.

Method and Étude Books

Burke, Kelly. <i>Clarinet Warm-Ups: Materials for the Contemporary Clarinetist</i>. Medfield, MA: Dorn, 1995.	
Content	Covers several aspects of a daily warm-up routine for clarinetists, including pre-playing warm-ups involving mental and physical preparation and breathing; exercises for long tones; harmonics; intonation; finger motion; articulation; scales; arpeggios; major and minor thirds; dominant and fully diminished seventh chords; chromatic scale patterns, and intervals from minor seconds to octaves. Chapter 4 covers contemporary harmonic language, including modal, blues, whole tone, and pentatonic scales, and multiple articulation. The chapter closes with a quarter-tone scale, and exercises for 18 select multiphonics. In chapter 5, Burke discusses how to warm-up on the day of a performance, and provides an annotated bibliography of select materials to supplement the warm-up.
Availability	Available for purchase through Amazon and several sheet music distributors, including Muncy Winds, Just for Winds, and Groth Music.
Audience	Teachers and performers
Strengths	Clear, sequential organization.
Limitations	For a player with little to no experience playing extended techniques, the sections on multiple articulation, quarter-tones, and multiphonics may prove frustrating or require a teacher who can supply the necessary information.

Caravan, Ronald L. <i>Five Duets for One Clarinetist</i>. New York: Seesaw Music, 1976.	
Content	Five duets introducing the concept of singing while playing.

Availability	Available for loan through select university libraries in the US and Canada (see WorldCat for more information), as well as for purchase through several sheet music distributors, including Just for Winds, Luyben Music, and Sheet Music Plus.
Audience	Teachers and performers
Strengths	Duets are rhythmically simple, allowing the player to focus on the vocal aspect, and feature mostly stepwise motion in the voice and primarily narrow intervals between the clarinet and voice. Performance notes are useful.
Limitations	The technique itself may be challenging to some performers.

Caravan, Ronald L. <i>Polychromatic Diversions: 10 Graded Compositions Using Non-Traditional Techniques</i>. Oswego, NY: Ethos, 1979.	
Content	Collection of ten short pieces for clarinet. Extended techniques include quarter-tones, timbre variation, multiphonics, vibrato manipulation, glissando, portamento, flutter-tongue, air sounds, key clicks, hand pops, mouthpiece alone, and lip buzz.
Availability	Available for loan through select university libraries in the US, Canada, Sweden, and Australia (see WorldCat for more information). Available for purchase through Ethos Publications, Groth Music, Just for Winds, and more.
Audience	Performers
Strengths	Arranged in “graded order.”
Limitations	Requires a basic understanding of extended techniques and newer notation systems. Notation for quarter-tones is confusing and outdated.

Caravan, Ronald L. <i>Preliminary Exercises and Etudes in Contemporary Techniques for Clarinet</i>. Oswego, NY: Ethos, 1979.	
Content	Sixteen études for clarinet covering timbre variation, quarter-tones, and multiphonics. Caravan also provides preliminary exercises for the multiphonic section, covering both conventional and special fingerings for multiple sounds, as well as use of the voice. The final page lists “extension of technique for clarinet” and includes techniques such as glissando, variation in articulation, and percussive effects that are not utilized or explained in the preceding exercises or études.
Availability	Available for purchase through Amazon and sheet music distributors such as Luyben Music, Groth Music, and Hickey’s Music Center. Also available for loan through select university libraries in the US, Canada, Switzerland, and Australia (see WorldCat for more information).
Audience	Performers
Strengths	Appropriate for clarinetists who have little experience with extended techniques. Études are rhythmically simple and may be studied in any order. Fingerings are provided for all unconventional sounds.
Limitations	Some fingerings provided are unwieldy or do not speak well. Additionally, Caravan’s choice of notation for quarter-tones, as in <i>Polychromatic Diversions</i> , is uncommon and may be confusing.

Dolak, Frank. <i>Contemporary Techniques for the Clarinet: A Selective, Sequential Approach through Prerequisite Studies and Contemporary Études</i>. Lebanon, IN: Studio P/R, Inc., 1980.	
Content	Over thirty prerequisite studies, seven études, four “Four Part Chorales for Two Clarinetists,” six exercises for clarinet and voice, and two solo pieces for clarinet and tape.
Availability	Public domain: available to download through IMSLP, clarinetinstitute.com , and more. Available for loan through select university libraries in the US, Canada, and Switzerland. Also available for loan through the New York

	Public Library, the National Library of Australia, and the State Library of Western Australia.
Audience	Performers who already have some experience with extended techniques
Strengths	Prerequisite studies, covering lip bends, harmonics, dyads, quarter-tones, and the altissimo register, are likely to be the most helpful pedagogically. Section 8, featuring simple vocalization exercises, may also be useful.
Limitations	Études are lengthy, ranging from 2 to 5 pages. Few directions for learning the études.

Garbarino, Giuseppe. <i>Metodo per clarinetto</i>. Translated by Reginald Smith Brindle. Milan: Edizioni Suvini Zerboni, 1978.	
Content	Part one focuses on single sounds, including quarter-tones, timbral variations, and “special effects” such as portamento, glissando, and the use of the teeth on the reed. Part two focuses on multiple sounds, or “homogenous chords,” and timbral variations, trills, glissando, and other “special effects” with multiple sounds. Garbarino also includes a study guide with notes for executing the preceding studies.
Availability	Available for loan through select university libraries in the US, Canada, the UK, and Australia (see WorldCat for more information). Available for purchase through select vendors, including Sheet Music Plus, G. Malandra Strumenti Musicali, and Tutto Musica; and for download on Scribd.
Audience	Advanced/professional clarinetists with experience playing extended techniques
Strengths	A thorough compilation of extended/non-traditional techniques for clarinet.
Limitations	Exercises are complex and occasionally unclear, and as Garbarino situates the performance directions in a different section than the exercises themselves, the performer must shift back and forth.

McCarty, Keith. <i>Methods for New Music for Clarinet, Book II</i>. Lubbock, TX: Lariken Press, 1971.	
Content	Section one contains technical studies by McCarty, some involving extended techniques such as glissando, flutter-tongue, double tongue, microtones, vibrato, and pitch bends. These studies are in a variety of keys but do not appear to be presented systematically. Section two consists of “Five Monodies,” written by Mary Snow and dedicated to McCarty.
Availability	Available for loan through select university libraries in the US (see WorldCat for more information).
Audience	Performers with some knowledge of extended techniques
Strengths	Many studies do not use extended techniques at all and feature challenging rhythms; even less advanced players may find these worthwhile.
Limitations	McCarty does not offer practice suggestions for the studies or directions for learning the techniques themselves.

Sigel, Allen. <i>The Twentieth Century Clarinetist</i>. New York: Franco Colombo, Inc., 1966.	
Content	Sixteen études covering specific fingering issues that the author cites as important to master when playing twentieth century music. Each étude is preceded by at least one short preparatory exercise.
Availability	Two editions (Franco Colombo and Belwin Mills) available for loan through select libraries in the US, Canada, the UK, and Australia.
Audience	Advanced performers
Strengths	Preparatory exercises that precede each étude provide accessible entry points for the études themselves.
Limitations	Two études feature flutter-tongue, but no other nontraditional techniques are covered.

Zelinsky, Beate, and David Smeyers. <i>Pro Musica Nova: Studies for Playing Contemporary Music for Clarinet</i>. Wiesbaden: Breitkopf & Härtel, 1996.	
Content	Anthology of excerpts from and performance instructions for solo and chamber works by Giacinto Scelsi, Edison Denissov, Robert HP Platz, Pascal Dusapin, Helmut Lachenmann, Adriana Hölszky, Georg Kröll, Daniel B. Rothman, Iannis Xenakis, Volker Heyn, and Hans-Joachim Hespos. Some excerpts involve auxiliary clarinets.
Availability	Available for loan through select universities in the US, Canada, the UK, and Denmark. Available for purchase through J. W. Pepper, Theodore Front Musical Literature, and more.
Audience	Experienced performers interesting in learning repertoire involving extended techniques
Strengths	Good introduction to several pieces from the contemporary repertoire involving extended techniques.
Limitations	Repertoire is complex, so the book is ideal for players who already have some experience with extended techniques and contemporary notation.

Online Resources

Alder, Jason. "Resources." <i>Jason Alder (Bass Clarinetist)</i>. https://www.jasonalder.com/resources/.	
Content	Clarinet quarter-tone fingering chart.
Availability	Available online at www.jasonalder.com/resources/ .
Audience	Performers and composers
Strengths	Clear, comprehensive, and up-to-date guides for quarter-tones on the Boehm system soprano and bass clarinets.
Limitations	Timbral qualities of microtones not addressed.

<p>Oakes, Gregory. “Clarinet Extended Techniques.” <i>Gregory Oakes Clarinet</i>. https://www.gregoryoakes.com/multiphonics/index.php.</p>	
Content	Interactive site that allows the user to locate fingerings for multiphonics and microtones. For multiphonics, the user may specify any of the following criteria: category (all dynamics, flexible; soft attacks, crescendo to <i>mf-f</i> ; quiet, little to no crescendo; loud, with beats; dyads; and variable in upper partials, shrill), pitch, and dynamics (<i>pp</i> to <i>ff</i>).
Availability	Available online at https://www.gregoryoakes.com/multiphonics/index.php .
Audience	Performers and composers
Strengths	Notable not only for its thoroughness, but also for its attention to the varied timbral and dynamic qualities of multiphonics, an element which some other extended technique resources lack. Audio examples of multiphonics available.
Limitations	Intended for Boehm system clarinets only.

<p>Roche, Heather. “27 Easy Bb Clarinet Multiphonics.” <i>Heather Roche</i>. September 13, 2018. https://heatherroche.net/2018/09/13/27-easy-bb-clarinet-multiphonics/.</p>	
Content	Roche presents twenty-seven dyads in three categories: “super easy” multiphonics (attained by over 90% of respondents in Roche’s survey), “very easy” multiphonics (attained by over 80% of respondents), and “easy” (attained by over 60% of respondents).
Availability	Available online at https://heatherroche.net/2018/09/13/27-easy-bb-clarinet-multiphonics/ .
Audience	Performers, composers, teachers
Strengths	Good introduction to accessible multiphonics for less experienced players. Roche provides an audio sample and fingering for each multiphonic.
Limitations	Intended for Boehm system clarinets only.

<p>Roche, Heather. “...on writing air sounds for clarinets.” <i>Heather Roche</i>. February 13, 2014. https://heatherroche.net/2014/02/13/on-writing-air-sounds-for-clarinets/.</p>	
Content	Outline of seven principal categories of air sounds on clarinet: air vs. pitch, vowel sounds and sweeps, taking off the mouthpiece, inhaling, articulation effects, blowing at the mouthpiece, and clarinet as shakuhachi.
Availability	Available online at https://heatherroche.net/2014/02/13/on-writing-air-sounds-for-clarinets/ .
Audience	Performers, composers, teachers
Strengths	Roche provides an audio example for each type of air sound and also includes examples on bass and contrabass clarinets. The video introduction to the blog post is especially useful.
Limitations	Notation for each air sound is not addressed.

APPENDIX B: ORIGINAL MATERIALS

Multiphonics, Section I

Preparatory Voicing Exercises

Caitlin Beare

No. 1

Clarinet
Sounding Pitch

Musical notation for No. 1, Clarinet Sounding Pitch. A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: G4, A4, Bb4, Bb4, A4, G4, F4, E4, D4, C4, B3, A3, G3, F3, E3, D3, C3. A long slur covers the entire line.

Clarinet
Fingered Pitch

Musical notation for No. 1, Clarinet Fingered Pitch. A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: G4, A4, Bb4, Bb4, A4, G4, F4, E4, D4, C4, B3, A3, G3, F3, E3, D3, C3. A long slur covers the entire line.

Musical notation for No. 1, Clarinet Sounding Pitch (continued). A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: B3, A3, G3, F3, E3, D3, C3, B2, A2, G2, F2, E2, D2, C2, B1, A1, G1, F1, E1, D1, C1. A long slur covers the entire line.

Musical notation for No. 1, Clarinet Fingered Pitch (continued). A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: B3, A3, G3, F3, E3, D3, C3, B2, A2, G2, F2, E2, D2, C2, B1, A1, G1, F1, E1, D1, C1. A long slur covers the entire line.

No. 2

Musical notation for No. 2, Clarinet Sounding Pitch. A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: G4, A4, B4, C5, B4, A4, G4, F4, E4, D4, C4, B3, A3, G3, F3, E3, D3, C3. A long slur covers the entire line.

Musical notation for No. 2, Clarinet Fingered Pitch. A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: G4, A4, B4, C5, B4, A4, G4, F4, E4, D4, C4, B3, A3, G3, F3, E3, D3, C3. A long slur covers the entire line.

Musical notation for No. 2, Clarinet Sounding Pitch (continued). A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: B3, A3, G3, F3, E3, D3, C3, B2, A2, G2, F2, E2, D2, C2, B1, A1, G1, F1, E1, D1, C1. A long slur covers the entire line.

Musical notation for No. 2, Clarinet Fingered Pitch (continued). A single staff in 4/4 time with a treble clef. The melody consists of quarter notes: B3, A3, G3, F3, E3, D3, C3, B2, A2, G2, F2, E2, D2, C2, B1, A1, G1, F1, E1, D1, C1. A long slur covers the entire line.

Multiphonics, Section I
Preparatory Voicing Exercises

No. 8

Musical score for exercise No. 8, consisting of two staves in 4/4 time. The upper staff features a sequence of notes: G4, A4, B4, C#5, C#5, C#5, B4, A4, G4. The lower staff provides a harmonic accompaniment with chords: G4, G4, G4, G4, G4, G4, G4, G4, G4, G4, G4, G4.

No. 9

Musical score for exercise No. 9, consisting of two staves in 4/4 time. The upper staff features a sequence of notes: G#4, A#4, B#4, C#5, B#4, A#4, G#4, G#4, G#4, G#4, G#4. The lower staff provides a harmonic accompaniment with chords: G#4, G#4, G#4, G#4, G#4, G#4, G#4, G#4, G#4, G#4, G#4, G#4.

Multiphonics, Section II Studies

Caitlin Beare

Type 1 multiphonics

No. 1 - Overblown

Clarinet Sounding Pitch

Clarinet Fingered Pitch

No. 2 - Overblown

Clarinet Sounding Pitch

Clarinet Fingered Pitch

No. 3 - Underblown

underblow

No. 4 - Underblown

underblow

sim.

7

No. 5 - Spectral multiphonics

overblow - "sweep"

raucous

No. 6 -
Spectral multiphonics
(à la Grisey)

♩ = 60

8

15

Type 2 multiphonics (closely related to conventional fingerings)

Production strategy A

No. 7

No. 8

No. 9

No. 10

Production strategy B

No. 11: Treble clef, 4/4 time. Dynamics: *f* > *p* < *f*, *p*. Annotations: B-1, ord.

No. 12: Treble clef, 4/4 time. Dynamics: *mp*, *p*, *mp*, *p*. Annotations: B-2, (') (')

No. 13: Treble clef, 4/4 time. Dynamics: *f*, *p*, *f*, *p*, *mf*. Annotations: B-1, B-1

No. 14: Treble clef, 4/4 time. Dynamics: *mp*, *f* >, *mp*, *f* >, *mp*, *f* >, *mp*, *f* >. Annotations: B-1, B-1, B-1, B-1

Production strategy C

No. 15: Treble clef, 4/4 time. Dynamics: *f*, *sub. p*, *f*. Annotations: ord., C-2, * maintain multiphonic fingering, ord.

No. 16: Treble clef, 4/4 time. Dynamics: *p*. Annotations: ord., C-3

*use RH thumb to depress top side key

No. 17

f *p*

C-3

ord.

No. 18

f *sub. p*

C-3 C-2 C-3

voice top note

Various production strategies

No. 19

f *mp* *f* *f* *mp* *f* *mp*

B-1 A-1

No. 20

f *mp* *f* *f* *mp* *f* *mp* *f* *mp*

A-1 A-1 B-1

No. 21

f *p* *p* *f* *sub. p*

D-3 B-2

maintain fingering

*use RH thumb to depress top side key

Type 2 multiphonics (not closely related to conventional fingerings)

Production strategy A

No. 22

f *harsh, buzzy*

A-1

No. 23

f *p*

A-2

Production strategy B

No. 24

f *p*

B-1

No. 25

f *pp* *f* *pp* *mf* *sub. p*

B-2

Production strategy D

No. 26

mf *sub. p* *f* *sub. p* *mp* *p*

D-3

Multiphonics, Section II
Studies

No. 27

f *p* *p-f* *p*

D-3

Close dyads

No. 28

p sempre

A-3 A-2 A-3

No. 29

A-2 A-3 B-2 B-2 B-3 A-2

p sempre

*use RH thumb to depress side key

Multiphonics, Section III

Sketches

Caitlin Beare

No. 1

Slowly and freely

subtone

n

6

finger B_b (underblow)

10

finger A (underblow)

sub. p

mp

14

morendo

No. 2 - Seashell (Scherzo)

♩. = 45-50

fp *f* *p* *A tempo* *sim.*

7

sub. p

12

mf *f*

17

p

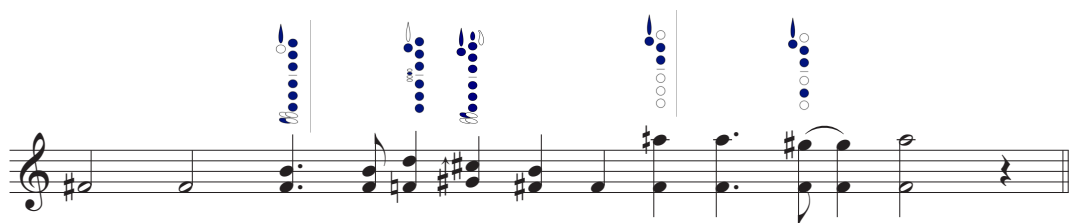
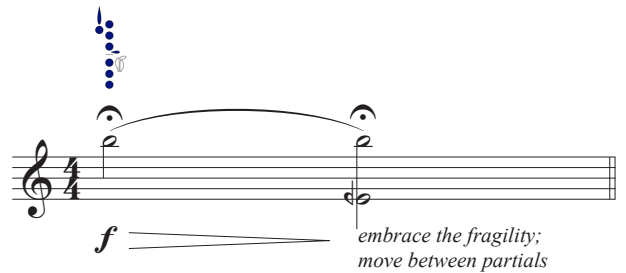
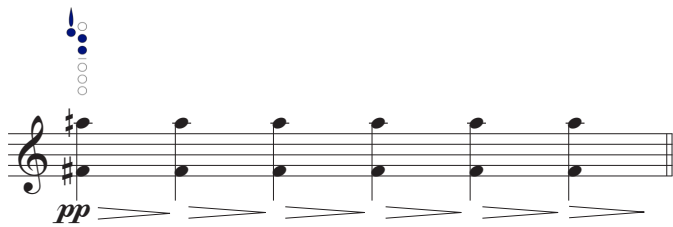
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Multiphonics, Section III

No. 3 - Umber

1. Start at the beginning of any event and proceed to play the remaining events in any order.
2. Each event may be played no more than 3 times, or not at all.
3. Tempos may be chosen freely and should vary from event to event.
4. Vary the amount of time taken between events.
5. Dynamics may be chosen freely, unless otherwise indicated.

Total duration: 2-3 minutes



Microtones, Section I

Preparatory Exercises

Caitlin Beare

No. 1

♩ = 66-80

Diagram 1: C4, C#4, D4, D#4, E4, F4, F#4, G4 (sharp)

Diagram 2: C4, C#4, D4, D#4, E4, F4, F#4, G4 (flat)

No. 2

♩ = 60

pp

Diagram 1: C4, C#4, D4, D#4, E4, F4, F#4, G4 (sharp)

Diagram 2: C4, C#4, D4, D#4, E4, F4, F#4, G4 (flat, asterisk)

Diagram 3: C4, C#4, D4, D#4, E4, F4, F#4, G4 (sharp)

No. 3

♩ = 60-80

repeat 2-4x

repeat 2-4x

5

Diagram 1: C4, C#4, D4, D#4, E4, F4, F#4, G4 (sharp, asterisk)

Diagram 2: C4, C#4, D4, D#4, E4, F4, F#4, G4 (sharp)

No. 4

♩ = 50-80

Diagram 1: C4, C#4, D4, D#4, E4, F4, F#4, G4 (sharp)

Diagram 2: C4, C#4, D4, D#4, E4, F4, F#4, G4 (flat)

Diagram 3: C4, C#4, D4, D#4, E4, F4, F#4, G4 (sharp)

Diagram 4: C4, C#4, D4, D#4, E4, F4, F#4, G4 (flat)

* use RH thumb to depress top side key

Microtones, Section I
Preparatory Exercises

No. 5

♩ = 50-80

No. 6

♩ = 60-80

No. 7

♩ = 60-80

No. 8

♩ = 50-80

* use RH thumb to depress top side key

Microtones, Section II

Studies

Caitlin Beare

No. 1 - Chalumeau

♩ = 60-100

Diagram 1: E (blue), B (white), C (white)
Diagram 2: E (blue), B (white), C (white)
Diagram 3: E (blue), B (white), C (white)

3

Diagram 1: E (blue), B (white), C (white)
Diagram 2: E (blue), B (white), C (white)
Diagram 3: E (blue), B (white), C (white)
Diagram 4: E (blue), B (white), C (white)

No. 2 - Chalumeau

♩ = 60

Diagram 1: E (blue), B (white), C (white) *

Diagram 2: E (blue), B (white), C (white)

Diagram 3: E (blue), B (white), C (white) *

4

Diagram 1: E (blue), B (white), C (white)

Diagram 2: E (blue), B (white), C (white)

No. 3 - Chalumeau

♩ = 60-80

Diagram 1: E (blue), B (white), C (white)

Diagram 2: E (blue), B (white), C (white)

Diagram 3: E (blue), B (white), C (white)

Diagram 4: E (blue), B (white), C (white)

Diagram 5: E (blue), B (white), C (white)

Diagram 6: E (blue), B (white), C (white)

Diagram 7: E (blue), B (white), C (white)

Diagram 8: E (blue), B (white), C (white)

*partially depress E/B key with RH pinky and/or alter tongue position to manipulate pitch

♪ = 60-108

No. 4 - Throat

5

♪ = 60-100

No. 5 - Throat

♪ = 60-80

No. 6 - Throat

sim.

4

No. 7 - Clarinet

♩ = 60-80

5

9

13

No. 8 - Clarinet

♩ = 50-66

4

*use RH thumb to depress top side key(s)

No. 9 - Clarion

$\text{♩} = 60-72$

sempre legato

No. 10 - Altissimo

$\text{♩} = 50-66$

No. 14 - Octaves

♩ = 60-80

No. 15 - Clarion & Chalumeau

♩ = 80

subtone, as smooth as possible

No. 16 - à la Kroepsch

♩ = 50-66

*use RH thumb to depress top side key

Microtones, Section III

Sketches

Caitlin Beare

No. 1 $\text{♩} = 70$ *poco a poco accel.*

mp

3 *poco a poco cresc.*

5 $\text{♩} = 112$

8 *to B₇*

fz \longrightarrow *p*

No. 2 $\text{♩} = 76$ *poco rit.-----a tempo*

4

7 *rit.*

Microtones, Section III
Sketches

No. 3

$\text{♩} = 88$

p

5

f

10

15

poco a poco dim.

20

p

The musical score for No. 3 is written in treble clef with a tempo of quarter note = 88. It consists of five staves of music. The first staff (measures 1-4) is in 3/4 time and begins with a piano (*p*) dynamic. The second staff (measures 5-8) changes to 2/4 time and features a forte (*f*) dynamic. The third staff (measures 9-14) continues in 2/4 time with piano triplets. The fourth staff (measures 15-18) changes to 3/4 time and includes the instruction *poco a poco dim.*. The fifth staff (measures 19-22) returns to 3/4 time and ends with a piano (*p*) dynamic. The score includes various microtonal intervals, indicated by sharp and flat symbols on the notes, and is marked with slurs and triplet markings.

Air Sounds, Section I Studies

Caitlin Beare

No. 1 - Teal

$\text{♩} = 50-60$

p

x5*

- * 1: 100% pitch
- 2: 80% pitch/20% air
- 3: 50% pitch/50% air
- 4: 20% pitch/80% air
- 5: 100% air

No. 2 - Vermillion

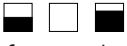
$\text{♩} = 50$ Aeolian tone


pp

5

No. 3 - Olive

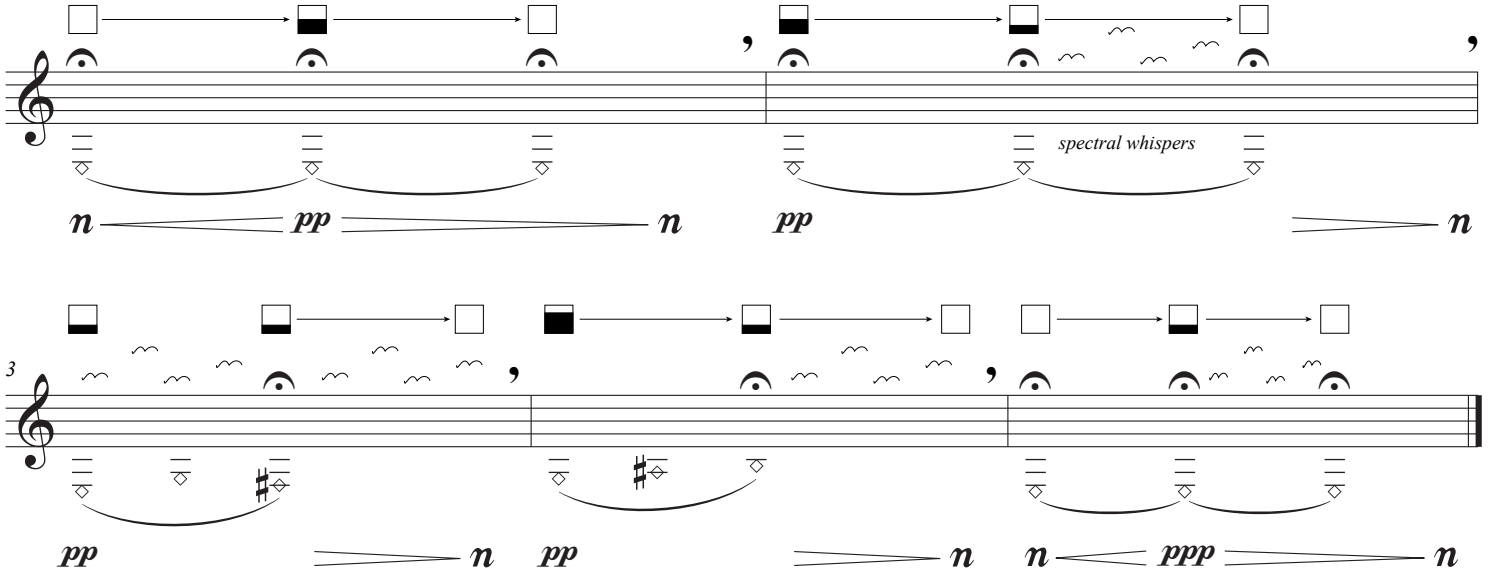
Notation Key:

- Boxes  graphically represent gradations of air and pitch. The empty space in each box represents the amount of air in the sound; the filled-in areas represent the amount of pitch in the sound. Arrows represent a transition between states.

- Spectral whispers  are produced by introducing soft, high harmonics to an airy pitch or pitchless airstream. These whispers should be erratic and arhythmic.

"Olive"

Meditative (*closed emb.*)



The musical notation for "Olive" consists of two staves. The first staff begins with a treble clef and a series of boxes and arrows. The first box is empty, followed by an arrow pointing to a half-filled box, then another arrow to an empty box. This is followed by a comma, a half-filled box, an arrow to a full-filled box, an arrow to a half-filled box, and an arrow to an empty box. The second staff starts with a treble clef and a '3' above the first measure. It contains boxes and arrows, with some boxes having wavy lines above them. The notation includes dynamic markings: *n*, *pp*, *n*, *pp*, *n*, *pp*, *n*, *n*, *ppp*, and *n*. A bracket labeled "spectral whispers" spans the second measure of the second staff. The notation also includes various symbols like wavy lines, arrows, and boxes to represent the gradations of air and pitch.

No. 4 - Aqua

Notation Key:

- All sounds are unpitched. In passages involving different fingerings, pitches may be faintly discernible.
- "Closed embouchure" indicates that the embouchure and oral cavity are in a normal, netural position.

"Aqua"

$\text{♩} = 80-100$

p (only air) (abrupt cut off)
(closed embouchure) with tongue

sim. *sim.* *f*

No. 5 - Mauve

Notation Key:

- "Open embouchure" indicates that the jaw is lowered and the oral cavity is open.

"Mauve"

4-8'' breath contour; maintain fingering
1-2.5'' breath contour; rapid finger gliss.
6-10'' 6-10''

(open emb.) (open emb.) "sh" (open emb.) "oh"
n *pp* *n* *n* *p* *n* *n* *mf* *f* *n*
(some faint harmonics) (allow air to leak from embouchure)

No. 6 - Tangerine

Notation Key:

- [Ha] = "**H**arp" (whispered/unpitched)
- [S] = "**S**nake"
- V = quick inhale through mouth (like a gasp)
- ▣ = quick exhale through mouth
- All vocalizations occur independently of the instrument (breaking embouchure)

"Tangerine"

♩ = 100

The musical score is written in 4/4 time with a tempo of 100 beats per minute. It consists of two staves of music. The first staff begins with a dynamic marking of *mf* and contains a sequence of notes with various articulations: a series of four eighth notes marked *sim.* (simile), followed by a quarter note with a dot, a quarter note with a dot, and a quarter note with a dot and a breath mark (x). This is followed by a half note with a breath mark (x) and a slur, then a quarter note with a dot and a breath mark (x), and another quarter note with a dot and a breath mark (x). The staff concludes with a quarter rest and a diamond-shaped breath mark (◊) with a dynamic marking of *f*. The second staff starts with a dynamic marking of *p* and a breath mark (V) under the first note. It features a sequence of notes with articulations: a quarter note with a dot and a breath mark (x), a quarter note with a dot and a breath mark (x), and a quarter note with a dot and a breath mark (x). This is followed by a half note with a diamond-shaped breath mark (◊), then a quarter note with a dot and a breath mark (x), and a quarter note with a dot and a breath mark (x). The staff ends with a quarter rest and a diamond-shaped breath mark (◊) with a dynamic marking of *f*. A crescendo hairpin is placed below the second staff, starting under the diamond breath mark and ending under the final diamond breath mark.

No. 7 - Copper

Notation Key:

- [S] = "Snake"
- V = Inhale through mouth
- ■ = Exhale through mouth
- All vocalizations occur independently of the instrument (breaking embouchure)

"Copper"

The musical score for "Copper" is written on a single staff in 4/4 time. It begins with a tempo marking of ♩ = 70. The first measure is marked "freely, with intent" and contains two diamond-shaped notes. A bracket above the first two measures is labeled "8-12". The second measure contains a diamond note and a square note. A bracket above the second and third measures is labeled "4-8". The third measure contains a diamond note and a square note. The fourth measure contains a diamond note, a square note, and a diamond note. The fifth measure contains a diamond note, a square note, and a diamond note. The sixth measure contains a diamond note, a square note, and a diamond note. The seventh measure contains a diamond note, a square note, and a diamond note. The eighth measure contains a diamond note, a square note, and a diamond note. The ninth measure contains a diamond note, a square note, and a diamond note. The tenth measure contains a diamond note, a square note, and a diamond note. The eleventh measure contains a diamond note, a square note, and a diamond note. The twelfth measure contains a diamond note, a square note, and a diamond note. The thirteenth measure contains a diamond note, a square note, and a diamond note. The fourteenth measure contains a diamond note, a square note, and a diamond note. The fifteenth measure contains a diamond note, a square note, and a diamond note. The sixteenth measure contains a diamond note, a square note, and a diamond note. The seventeenth measure contains a diamond note, a square note, and a diamond note. The eighteenth measure contains a diamond note, a square note, and a diamond note. The nineteenth measure contains a diamond note, a square note, and a diamond note. The twentieth measure contains a diamond note, a square note, and a diamond note. The score includes various performance instructions such as "p", "n", and "[S]".

8-12"
freely, with intent

4-8"

♩ = 70

p

5

[S]

[S]

10

[S]

n

No. 8 - MaroonNotation Key:

- [Ha] = "**Harp**" (whispered/unpitched)
- [S] = "**S**nake"
- V = Inhale through mouth
- □ = Exhale through mouth
- All vocalizations occur independently of the instrument (breaking embouchure)

"Maroon"

♩ = 60-100

The musical score for "Maroon" is written in 4/4 time with a tempo of 60-100. It consists of three staves of music. The first staff begins with a dynamic marking of *f* and contains several triplet eighth notes. The second staff starts at measure 4 and includes vocalization notations [Ha] and [S] with horizontal lines indicating duration. The third staff starts at measure 7 and continues the musical and vocalization patterns. Various breath marks (V and □) and accents (>) are used throughout the piece.

No. 9 - Cerulean

Notation Key:

- Δ = whispered/voiced independently of the instrument (breaking embouchure)
- \square = whispered into instrument
- \square = spoken into instrument
- Inhales [∇] and exhales [\blacksquare] occur independently of the instrument (breaking embouchure)
- [a] as in English "air"
- [e] as in English "eerie"
- [i] as in English "ieye"
- [o] as in English "opal"
- [u] as in English "use"

"Cerulean"

$\text{♩} = 70-90$

12/4

∇ [a] [e] [i] [o] [u] ∇ [a] [e] [i] [o] [u] ∇ [a] [e] [i] [o] [u]

pp *p cresc.* *more audible breath*

4/4

∇ \blacksquare [a] [e] [i] [o] [u] [u] [o] [i] [e] [a]

pp

7/4

[a] [u] [a] [u] [e] [i] [o] [u] [a]


f p f p f p


Air Sounds, Section II

Sketches

No. 1 - ...the calm before

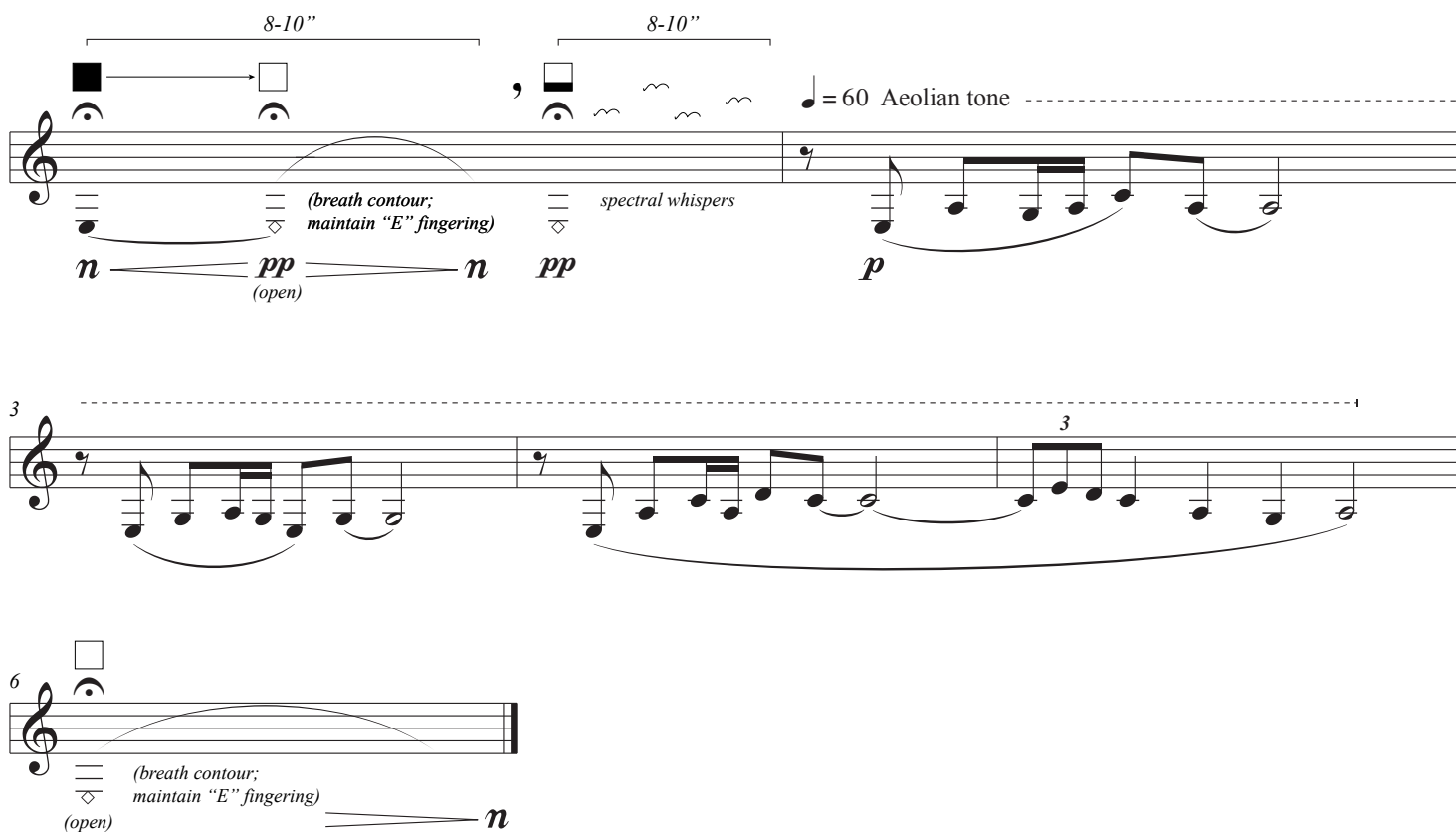
Notation Key:

- Boxes  graphically represent gradations of air and pitch. The empty space in each box represents the amount of air in the sound; the filled-in areas represent the amount of pitch in the sound. Arrows represent a transition between states.

- Spectral whispers  are produced by introducing soft, high harmonics to an airy pitch or pitchless airstream. These whispers should be erratic and arrhythmic.

- "Open embouchure" indicates that the jaw is lowered and the oral cavity is open.

"...the calm before"



8-10" 8-10"

♩ = 60 Aeolian tone

(breath contour; maintain "E" fingering)

spectral whispers

n *pp* (open) *n* *pp* *p*

3

3

6

(breath contour; maintain "E" fingering) (open)

n

The musical score consists of three staves. The first staff begins with a treble clef and a key signature of one flat. It features a series of notes with a breath contour line above them. Above the staff, two boxes with arrows indicate a transition from a half-filled state to an empty state over an 8-10" duration. Below the staff, dynamic markings include *n*, *pp* (open), *n*, *pp*, and *p*. The second staff continues the melodic line with a triplet of eighth notes. The third staff shows a final note with a breath contour line and a dynamic marking of *n*.

No. 2 - Coral

Notation Key:

- "Open embouchure" indicates that the jaw is lowered and the oral cavity is open.
- "Closed embouchure" indicates that the embouchure and oral cavity are in a normal, neutral position.
- In measures 4 & 7: play a pitchless airstream using any fingering
- [V] = inhale through mouth (independently of the instrument)

"Coral"

♩ = 80

*closed emb.
(subtone w/ air)*


*pitchless airstream
(stable; open emb.)*

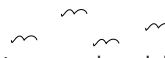
5

p

8

No. 3 - MarigoldNotation Key:

- Boxes  graphically represent gradations of air and pitch. The empty space in each box represents the amount of air in the sound; the filled-in areas represent the amount of pitch in the sound. Arrows represent a transition between states.


- Spectral whispers  are produced by introducing soft, high harmonics to an airy pitch or pitchless airstream. These whispers should be erratic and arhythmic.

- "Open embouchure" indicates that the jaw is lowered and the oral cavity is open.


- Regarding unconventional noteheads, position on staff does not indicate pitch.


-  = flutter tongue during toneless playing ("toneless frullato")

-  = lip smack through instrument (like a kiss)

-  = whisper through instrument

-  = whisper independently of the instrument

-  = inhale through mouth, independently of the instrument

-  = exhale through mouth, independently of the instrument

"Marigold"

whisper (away from instrument)

6-10" $\bullet = 60-66$

"At midnight, in the month of June/
I stand beneath the mystic moon"

(open emb.) $\Rightarrow n$ *pp*

5 (lip smack) *mf* *ppp* *p*

10 (toneless frullato) [moon] [June] V *sub. p*

(closed emb.) $n \Rightarrow f$

15 [mid-] [night] [I] [stand] "woosh" (breath contour) [moon] *f* $\Rightarrow n$ (open emb.)

6-10" *lunga* 6-10" G.P. n

Detailed description of the musical score: The score is written in 4/4 time. It consists of four staves of music. The first staff (measures 1-4) begins with a 'whisper' instruction and a tempo of 60-66. It features a melodic line with a slur and dynamics from *pp* to *n*. The second staff (measures 5-9) includes a 'lip smack' instruction and dynamics from *mf* to *ppp*. The third staff (measures 10-14) is marked '(toneless frullato)' and includes lyrics: [moon], [June], V, and *sub. p*. The fourth staff (measures 15-18) includes lyrics: [mid-], [night], [I], [stand], "woosh" (breath contour), [moon], and a final section marked 'lunga' with a 'G.P.' (Grave Point) instruction. Various articulation symbols like 'emb.' (embouchure) and 'n' (nasal) are used throughout.