UNIVERSITY OF CINCINNATI

June, 19 76

I hereby recommend that the thesis prepared under my supervision by George Plasko

entitled Contemporary Performance Effects on the Clarinet in Selected Music Literature from 1960-1974

be accepted as fulfilling this part of the requirements for the degree of Doctor of Musical Arts

Approved by:

Scott Reston

Paul Palombo

CONTEMPORARY PERFORMANCE EFFECTS ON THE CLARINET IN SELECTED MUSIC LITERATURE FROM 1960 to 1974.

A thesis submitted to the

Division of Graduate Studies
of the University of Cincinnati

in partial fulfillment of the
requirements for the degree of

DOCTOR OF MUSICAL ARTS IN CLARINET

in the College-Conservatory of Music

1975

by

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Acknowledgements

I should like to thank Dr. Scott Huston and Dr. David Barton for their invaluable assistance in the completion of this thesis and for making many suggestions to improve it. Also a warm thanks to John Gates of the Montagnana Trio for his suggestions on musical examples and his promptness in correspondence. Finally, I thank Dr. Philip Rehfeldt for supplying me on short notice with several difficult to find musical scores.

G.M.F.P.

Foreword

This thesis has been undertaken in an attempt to provide, in a single source, a description of contemporary clarinet effects characteristic in music literature from 1960 to 1974.

I have chosen the topic for five major reasons. 1) I have a particular affection for contemporary music, especially of this period in the literature. 2) 1960 marks a good break-off point for the development of new techniques for the clarinet, designated by the composer. 3) I am of the opinion that few clarinetists are capable of performing music of this period because of lack of knowledge of the techniques for the production of special effects required by the music. 4) I believe that there is a definite omission in the training of the clarinet student in these new techniques because of the lack of available information on the subject. 5) To my knowledge, very few people have attempted to list and discuss in one source how to produce the special techniques required of some of the musical compositions of this period, although there have been isolated examples of particular techniques discussed. For example, Bruno Bartolozzi's book, New Sounds for Woodwind, discusses at length the production of monophonic and multiphonic sounds. However, most sources for these techniques are isolated periodical articles or annotations of particular compositions in

which techniques, but not their method of production, are listed.

Because of the nature and period of the topic very little bibliographical material exists. I have drawn many insights from past and current articles extracted primarily from periodicals. Of actual in-depth books exactly corresponding to this subject, there are none. Of theses and dissertations, there are fewer than a handful that can be used, and only then primarily for their bibliographies. The bulk of my data is gleaned from my own personal observations, experiments and abilities, and from direct interviews and correspondence with those few clarinetists who are knowledgeable in the actual performance of these aspects. Within the thesis I have documented, when necessary, the new clarinet techniques used with selected representative examples from the music literature in which these techniques are used. For each technique used, I have explained the acoustics (if applicable) behind its production, given an actual description of how to produce its sound, and a short observation on the manner in which the effect works within the composition.

I have tentatively divided the main contemporary performance effects on the clarinet into eight basic categories: 1) use of flutter tongue, 2) use of sudden shifts in dynamics and extreme leaps in register, 3) use of three types of glissando -- lip-finger, lip, and finger, 4) use of microtones, 5) use of monophonics and multiphonics, 6) use of mouthpiece-

reed effects, 7) use of key mechanism sounds, 8) use of special sound effects through adaptation or addition of certain devices to the clarinet. These categories are by no means exhaustive; however, they do represent most of the new effects on the clarinet from 1960 to 1974. Every day the many unique possibilities for clarinet sounds are being further probed and, as a result, new effects found.

I

The use of flutter tongue is one of the oldest effects used on the clarinet. Richard Strauss used flutter tonguing on the clarinet in Op. 53 Symphonia domestica, composed 1902-1903. However, not until after 1960 were its possibilities fully exploited. On the clarinet, flutter tonguing can be accomplished in any of three ways. The first type, dental flutter tongue, is accomplished by placing the tip of the tongue behind the upper teeth or against the beginning gum area above the upper teeth. With a fast breath stream going, one quickly flutters the tongue as if saying a series of "errll" sounds. This type is "most useful in soft passages and passages in which legato and minimum distortion of the basic timbre are required."[1] The palate flutter tongue is the second type and is accomplished by placing the flattened tip of the tongue (approximately one inch) firmly against the front of the palate. At the same time a very rapid, forceful stream of air must be directed between the tongue and palate, an action which causes the tongue to vibrate rapidly against the palate, producing the characteristic flutter or buzzing sound. This type of flutter tongue "is useful mainly in loud passages in which an actual distortion of the basic timbre is desirable."[2]

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[1]Allen Sigel, The Twentieth Century Clarinetist (New York, 1966), p. 49.

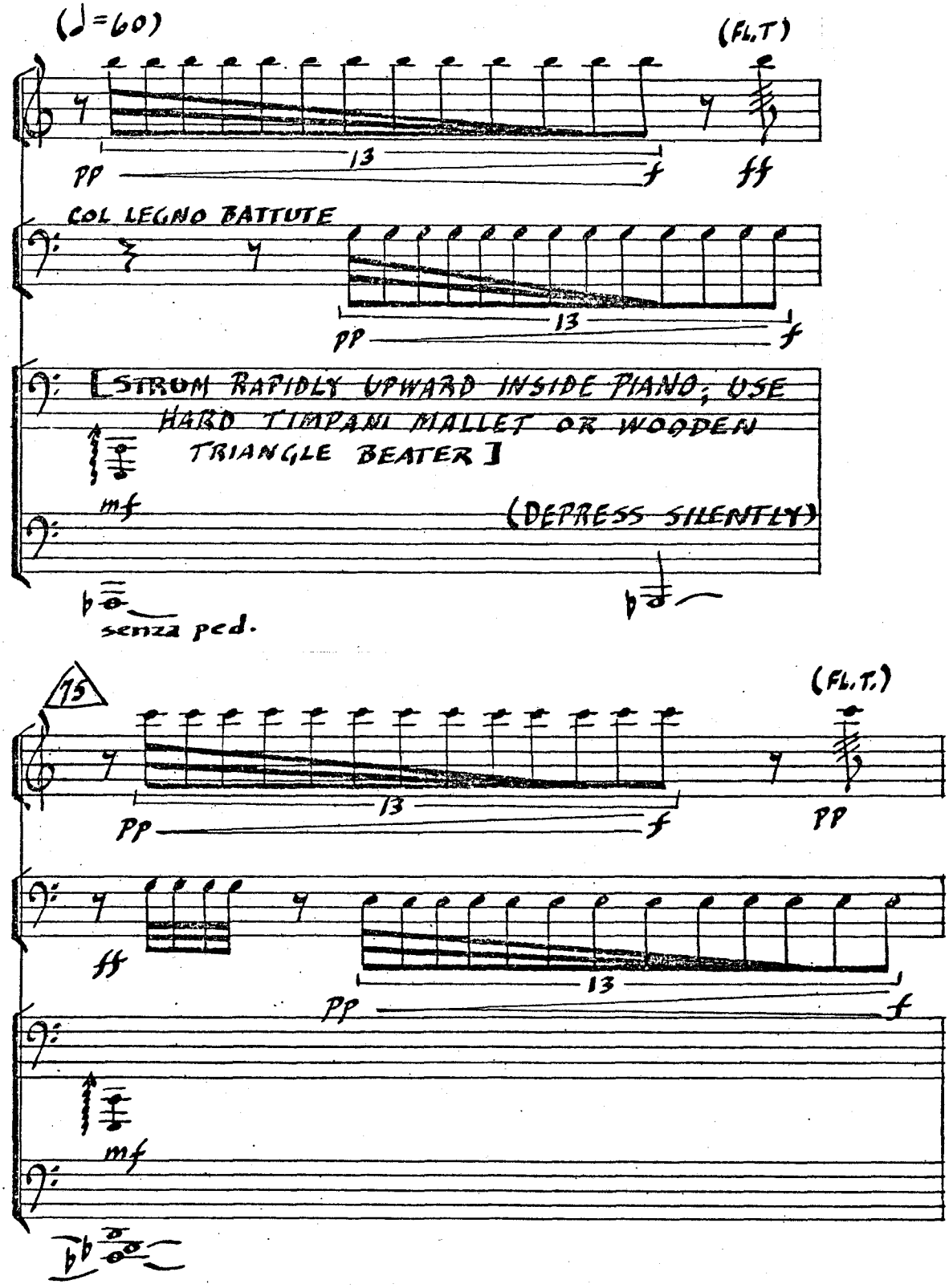
[2]Ibid.

The third type is for those performers who are unable to roll or flutter their tongues because of a coordination or physical problem. It is called the "throat flutter tongue" and is accomplished by relaxing the throat and larynx muscles and gargling as a steady stream of air is forced through the gargling. Although the flutter result is not as accurate or satisfactory as the first two types, it will work for those with tongue coordination problems. Also, this type works best only in loud passages.

If composers were made aware of the two basic types of flutter tongue, they could help the performer by indicating within the score the words "dental flutter tongue" or "palate flutter tongue" or an abbreviated version, such as "Dent. Fl. T." or "Pal. Fl. T.". The addition of this detail would enlighten the performer, particularly when there are no specific dynamic markings within the score.

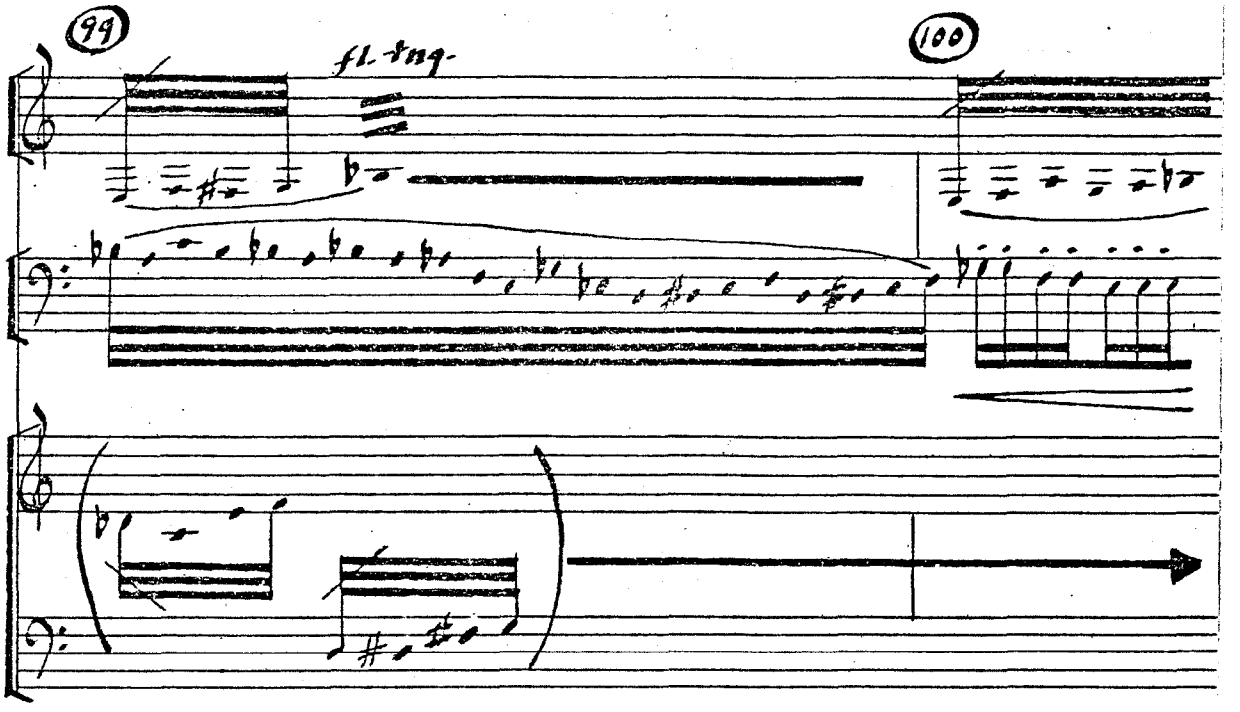
Flutter tonguing within a composition can have a variety of results. Two of the most common are to end an idea or section, or to carry on a texture. In Scott Huston's Life-Styles for clarinet, cello and piano (1972), the use of the high clarinet flutter tongue over the gradually slowing col legno battute of the cello part acts as a sudden halting of that measure's textural idea and sets up the strum of the piano.

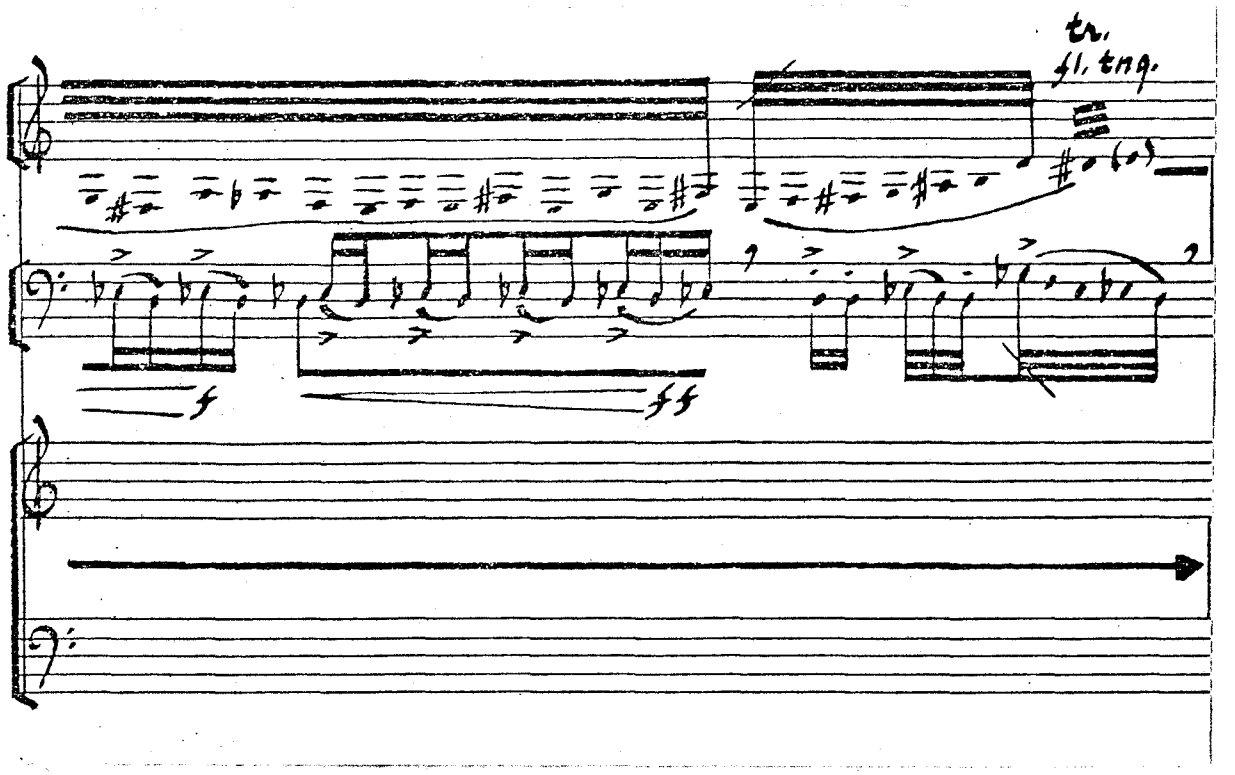
Ex. 1 Huston, Life-Styles, III Mvt., m. 74-75, p. 18



On the other hand, in Ellsworth Milburn's Soli III (1971), also for clarinet, cello and piano, the use of the flutter tongue in the clarinet part tends to keep the texture moving, which works very well because the clarinet is already playing as fast as possible, and by flutter tonguing the B♭ (m. 99) and the D♯ to E trill (m. 100) the speed is maintained if not increased in feeling. In both compositions, the timbral effect is quite different from that of fast repeated notes, which would be a poor substitute for the jolting effect that the flutter tongue can produce.

Ex. 2 Milburn, Soli III, m. 99-100, p. 5





II

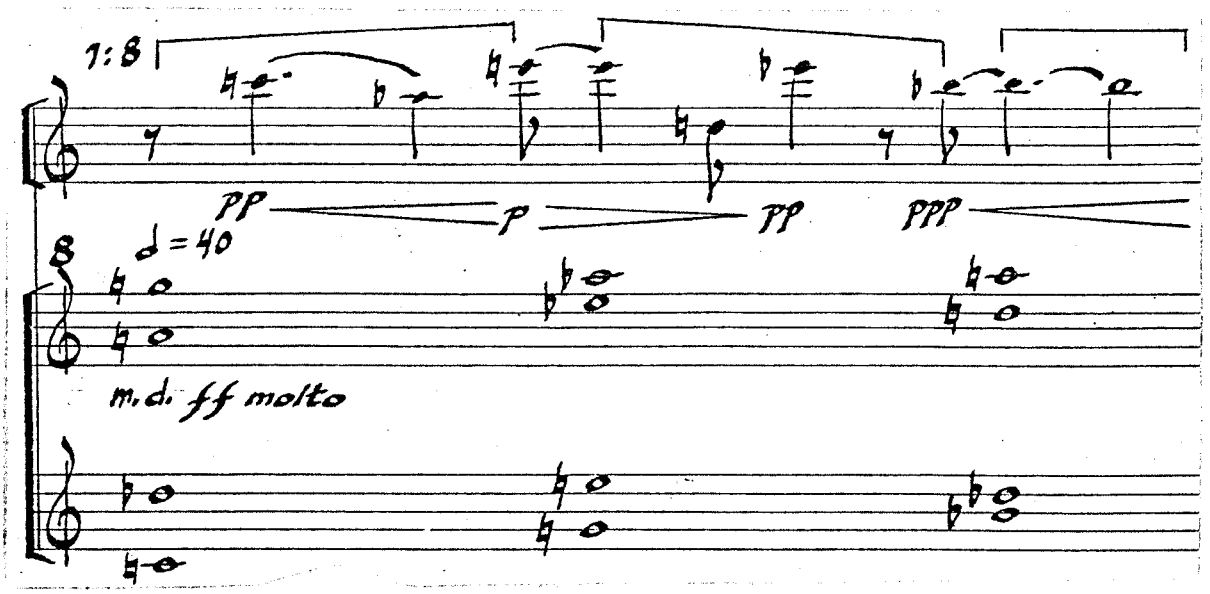
The use of sudden shifts in dynamics and extreme leaps in range are some of the most characteristic effects used on the clarinet. Of all the wind instruments, the clarinet has the greatest range and flexibility in producing sudden dynamic contrasts. Because the instrument overblows at the 12th instead of the octave as do the other woodwinds, it can consequently produce more partials and formants. The result is a greater range. Having a single reed and a cylindrical bore also aids in the control and comparative ease in producing any dynamic level.

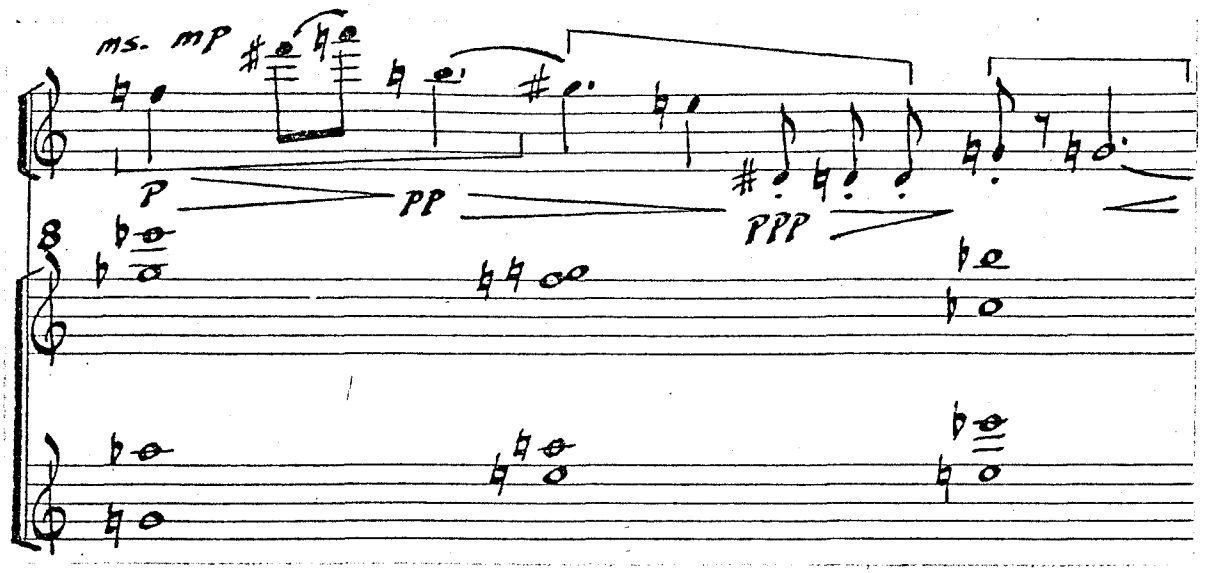
In producing sudden shifts in dynamics and extreme leaps in range, it is important to note that the embouchure of the clarinet player cannot move or adjust. It must remain constant at all times. The tendency to bite harder on the mouthpiece while ascending into the upper registers is to be avoided, as well as loosening of the embouchure when descending into the lower register. When playing a particular composition which makes use of extreme ranges and dynamics, the proper reed is mandatory. The reed doesn't necessarily have to be softer (which many clarinetists seem to think), but it does have to have a softer tip than most orchestral players use. The softer tip gives the flexibility to play in the extreme upper range without having to bite, and also gives a purer, clearer sound in the lower register. A reed which

is generally soft in the heart area tends to have a buzzy, thin quality and will not have the flexibility for playing extreme dynamics of fortissimo and pianissimo and will eventually "close up" on the mouthpiece.

A composition which makes effective use of extreme ranges and sudden dynamic changes is Peter Maxwell Davies' Hymnos for Clarinet and Piano (1967). This work is a virtuosic composition which explores the extremes of technical limitation. The work is structured in a series of sections which become more and more complex as the physical characteristics of the clarinet are strained to their limits. By using the extreme ranges and dynamics possible on the clarinet (and sometimes stretching these capabilities), the music is charged with a highly dramatic quality. Below is a section of the third movement of the composition in which the clarinet dynamic level is from ppp to p throughout the entire movement.

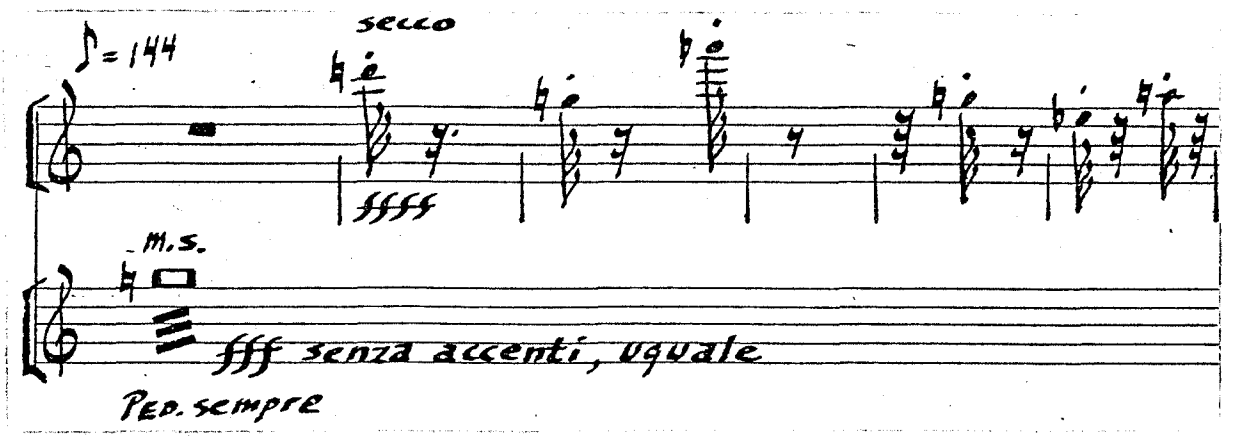
Ex. 3 Davies, Hymnos, III Mvt.

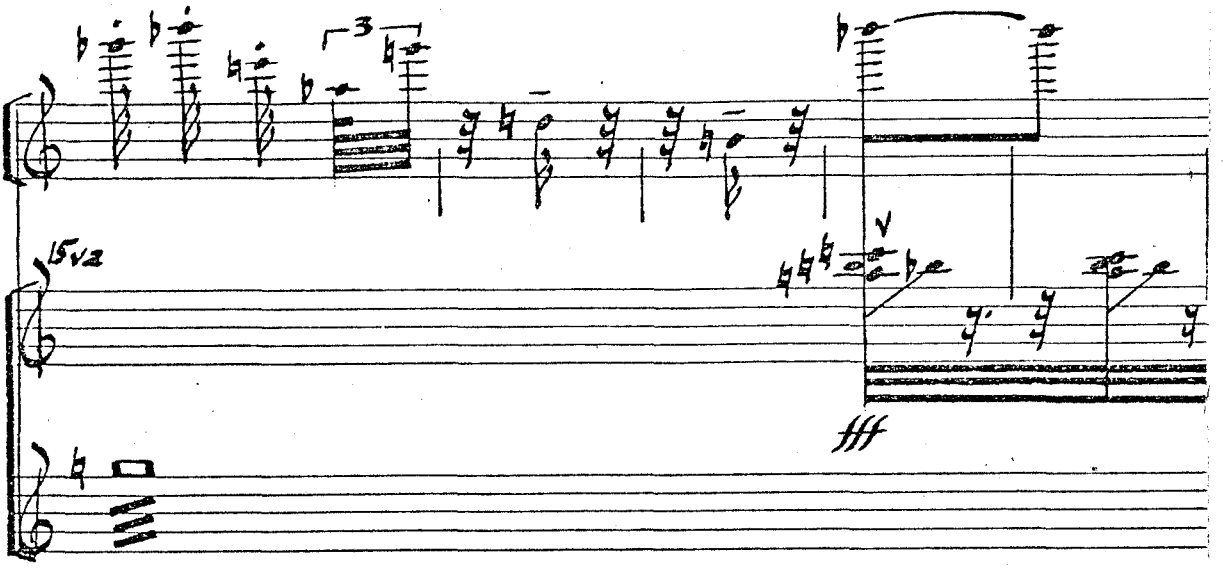




Within the fourth movement of the same composition the extreme upper range of the clarinet is exploited. By incorporating wide leaps from the middle register to the upper register, Davies has created a wild and furious atmosphere. At a fast tempo the use of the clarinet at a loud dynamic level in the extreme upper register imparts the wild feeling. The following excerpt demonstrates extreme range.

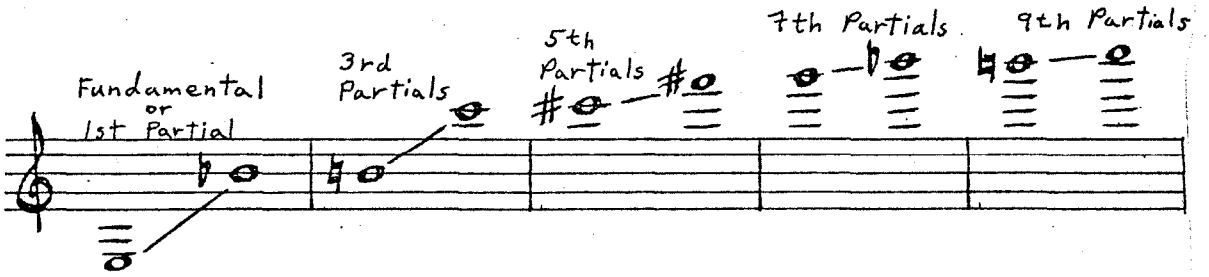
Ex. 3a Davies, Hymnos, IV Mvt.





In writing for the clarinet in the extreme upper ranges, it is imperative that the composer understand the partial system of the instrument. Any fast leaps or passagework contained in notes of the 5th, 7th and 9th partial require care in writing because of the natural tendency of the clarinet to fall back to either its fundamental or its 3rd partial. Below is a chart showing the division of the clarinet range into the various registers, each composed of notes which are the same partials.

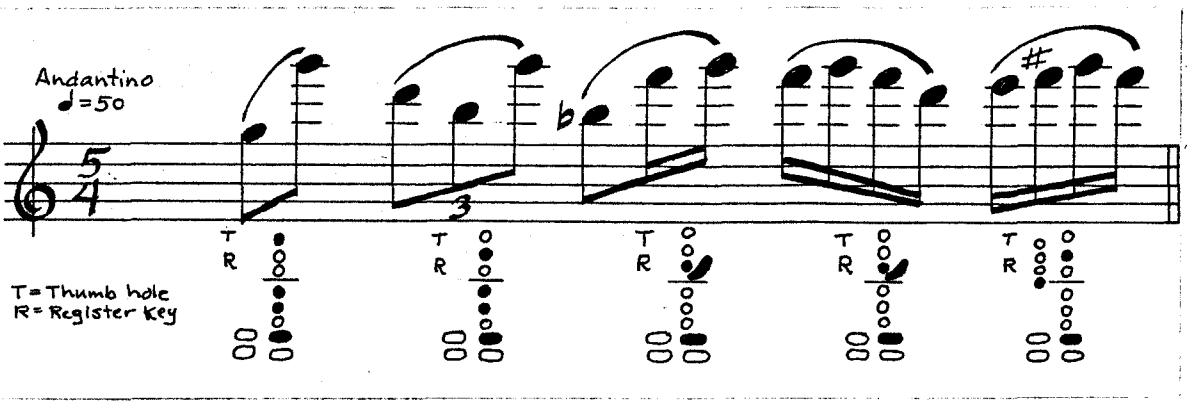
Ex. 4 Clarinet Registers



It is possible for the clarinet to play above c'''' through a slight embouchure change and different partial

fingerings. In the highest register of the clarinet (above c'''), it is common to have fingerings which produce a different partial or register. For example, there are three 7th partial fingerings, two 5th partial fingerings, and one possible 9th partial fingering for g'''. Rapid execution (and avoiding register change therein) often dictates the choice of different fingerings. Often their tuning and/or quality will negate their use at slower tempi. Here is an example in which four different fingerings are used for g'''.

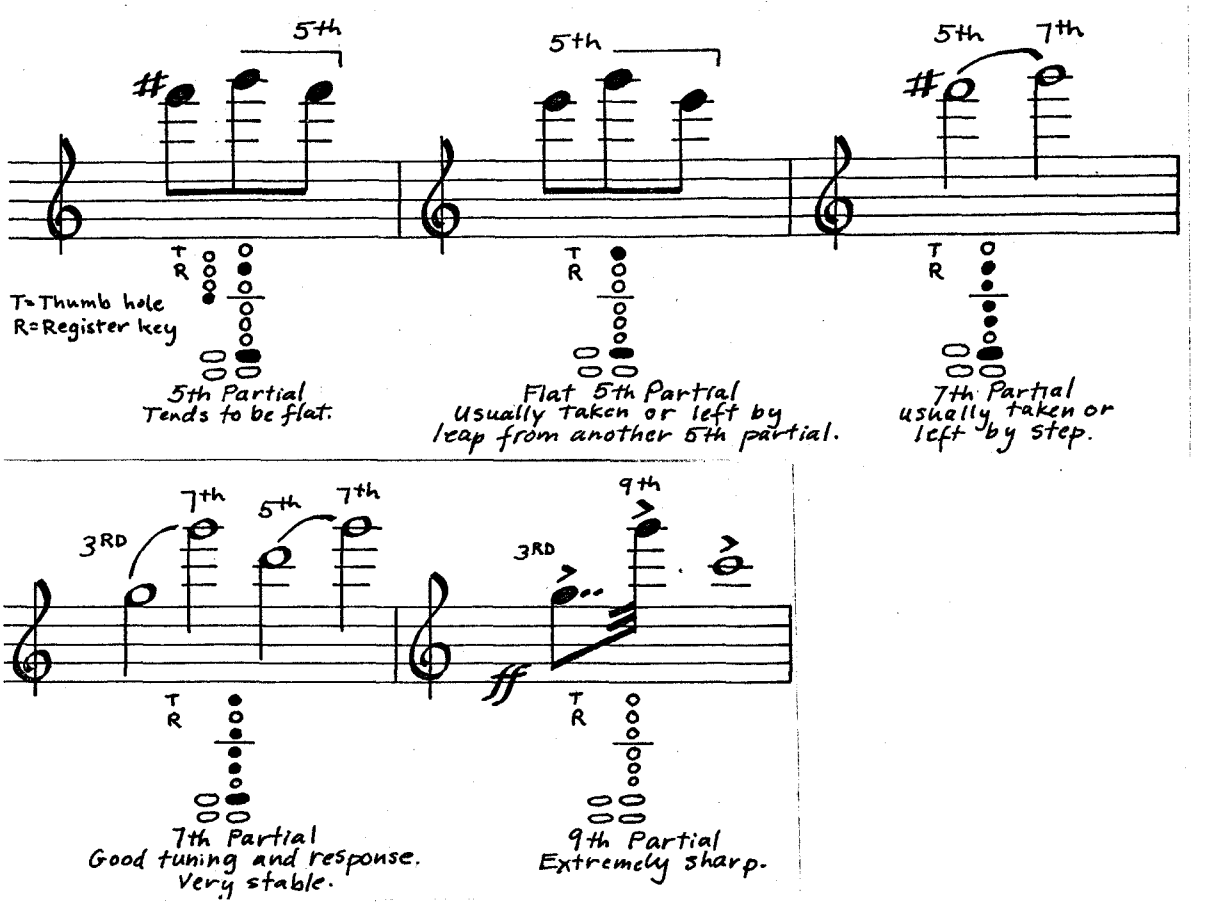
Ex. 5



Consequently, for some fingerings, their use is suggested for tuning advantages. For still other fingerings, good response is the strong feature. When writing wide leaps into the extreme high register of the clarinet, the composer should be aware of which partial fingerings speak better and in tune at a softer level and which partial fingerings can be used for rapid execution where intonation is not important. Likewise, the performer must understand the partial fingering system to execute any of the demands made on him. As an example, the

following chart demonstrates the best partial fingerings to use when playing up to g'''.

Ex. 5a



The effect of sudden shifts in dynamics or extreme leaps and range is an excellent way of setting a mood or atmosphere within a composition. Very rapid playing in the upper register can be extremely dramatic, whereas sudden shifts of dynamics from fortissimo to pianissimo can have an instantaneous quieting and relaxing effect. Drama, tension and relaxation are all mood or atmosphere effects which the clarinet, by playing extremes in dynamics and range, is capable of imparting.

III

The advent and use of glissando technique on the clarinet have traditionally been associated with jazz playing in the United States; however, contemporary music has exploited its use in various compositions. Basically, there are three types of glissandi: the lip-finger combination, the finger glissando, and the lip glissando. For the lip-finger glissando effect, there are two factors which must be treated: variable embouchure pressure and the gradual opening or closing of tone holes. This technique is difficult for the orchestral clarinetist to acquire because, through years of training and practicing, he has developed a firm embouchure and a precise finger action, the exact opposites needed to play this type of glissando. In developing glissando technique the performer should practice in the clarion register by starting "on 'd' with a very loose embouchure and gradually slide the fingers off the rings and at the same time very gradually increase the embouchure and wind pressure."[3] It is important that the finger coordination in sliding off the notes from "d" to high "c" contain no stopping point in between. "Each successive tone should emerge, 'siren' fashion, from the preceding note."[4] In the clarion register, it

[3]Ibid.

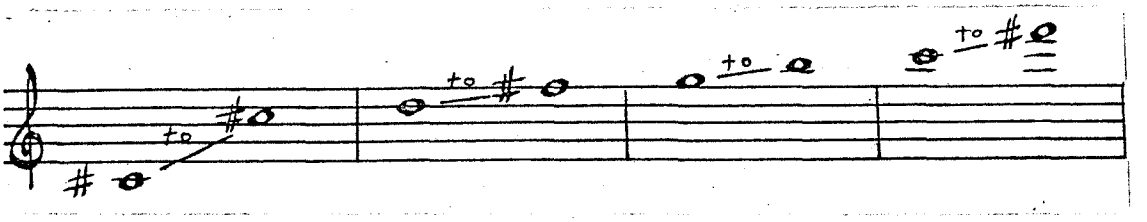
[4]Ibid.

is important that the composer realize that "d" is approximately the lowest pitch on which a clarinetist can smoothly produce the lip-finger glissando without getting a gargling sound. The lip-finger glissando can be used in ascending scale form at practically any speed. However, the descending glissando is impracticable at a slow speed and should be used only in fairly rapid passages.

The finger glissando is characterized by gradually opening or closing one hole of the clarinet at a time with the corresponding finger. The result is the ability to produce a glissando effect within the compass of our conventional half-step -- whole-step system. The finger glissando can be used on any note within the entire clarinet range at practically any dynamic level. The finger glissando is perhaps the easiest to produce.

The use of glissandi produced by lips alone is limited to the intervals shown below in each register.

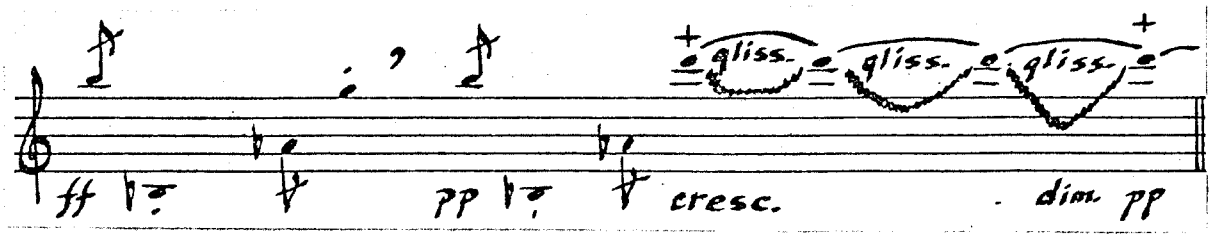
Ex. 6



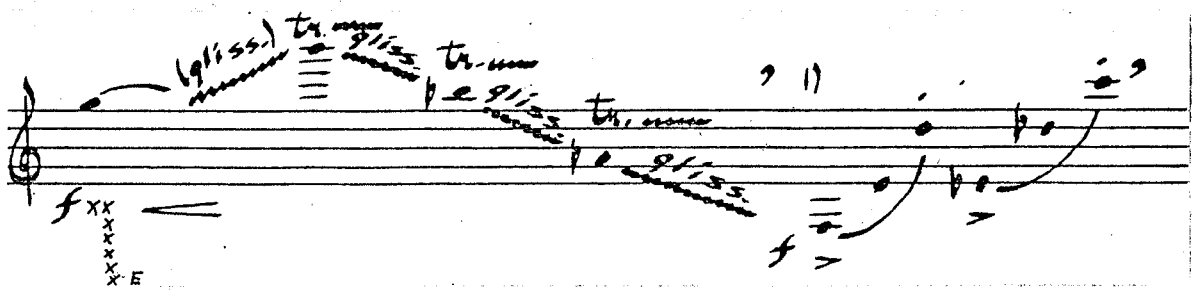
A composition which uses all three types of glissandi is William O. Smith's Variants for Solo Clarinet (1963). The following excerpts from the third and fifth movements display

the three types.

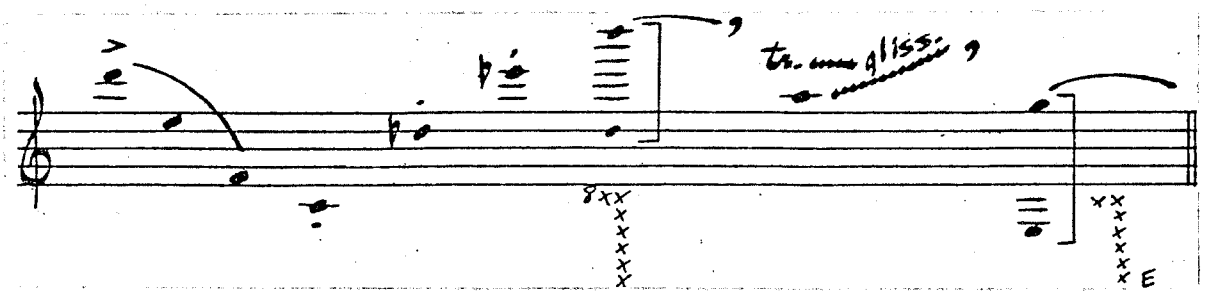
Ex. 6a Lip Glissando, III Mvt., p. 2



Ex. 6b Lip-finger Glissando, V Mvt., p. 3



Ex. 6c Finger Glissando, V Mvt., p. 3



Of the many special effects which the clarinet can produce, the glissando should be approached with caution. It is imperative that the three different types of glissando be understood by both composer and performer. An overuse of glissandi becomes quickly tiresome and sounds artificial or

gimmicky. It should be used sparingly for special moments, such as a very fast "explosion" of an ascending run which involves using many notes within a short time span. This use of glissando gives a brilliant effect and is best suited to the lip-finger glissando. On the other hand, the effect of causing uncertainty or tonal displacement can be fully exploited by a slow glissando using the finger type. The finger glissando is most effective when used slowly from note to note located either a whole step or half step distance apart.

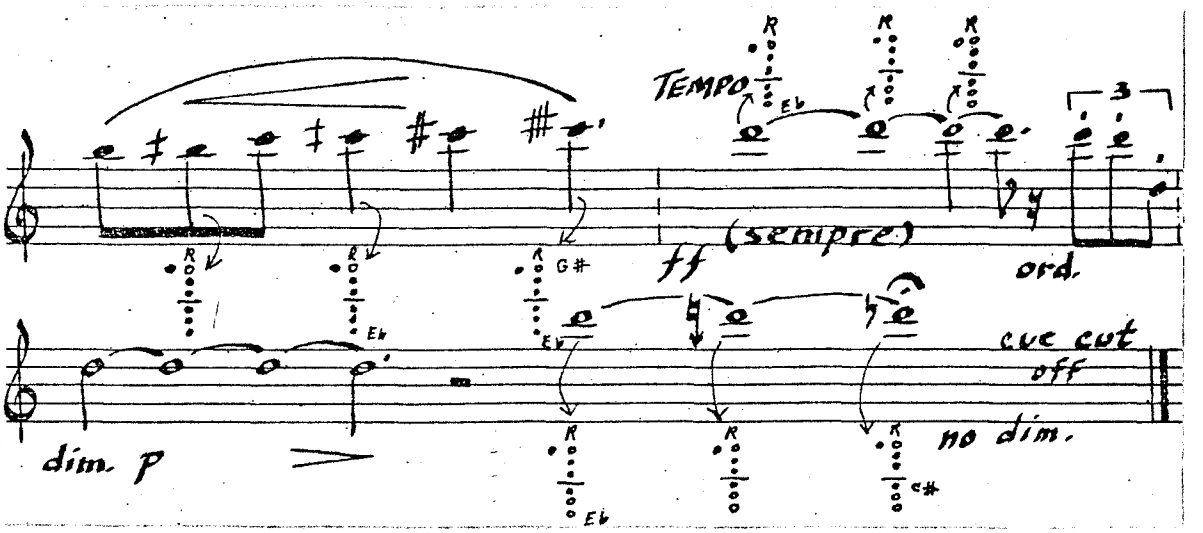
IV

Microtones are not a Western tradition; they have been borrowed from the music of the East. In Western contemporary music, however, the equal temperament system is enlarged and stretched by incorporating microtones. The clarinet, because of its inherent richness of fingerings, can play any note within its range and adjust that note to a microtone either by the use of additional fingers (or omission of certain fingers) or by a slight embouchure change. The notations for microtones are quite varied, but some of the most commonly used symbols are the following:

- ♯ - 1/4 step sharp
- ♭ - 1/4 step flat
- 𝄪 - 3/4 step sharp
- 𝄫 - 3/4 step flat
-  - slightly below 1/2 step sharp
-  - slightly below 1/2 step flat
-  - slightly below natural

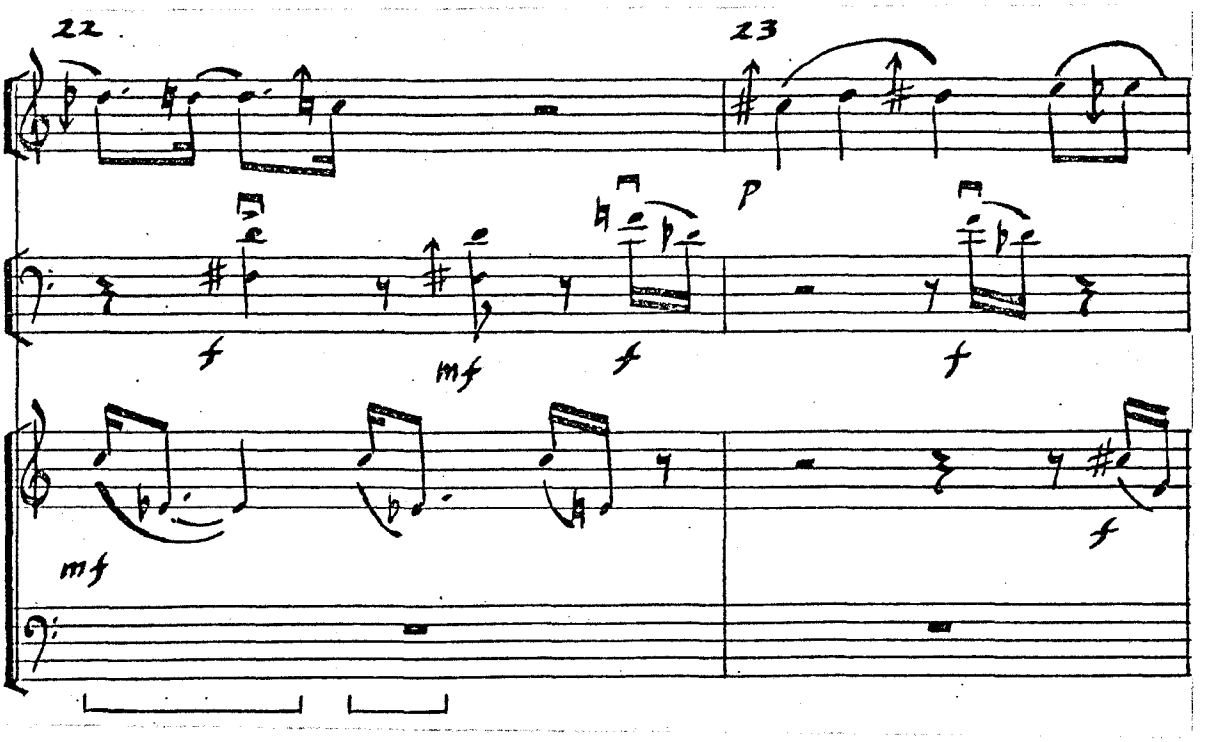
An excellent example of the use of microtones can be seen in Dorrance Stalvey's PLC-Extract (1968). Here the purpose is to emphasize the color change of the three high c-sharps and the three high d's. The color changes which result in microtones are accomplished by the addition or omission of specific fingerings to raise or lower the pitch to the desired level.

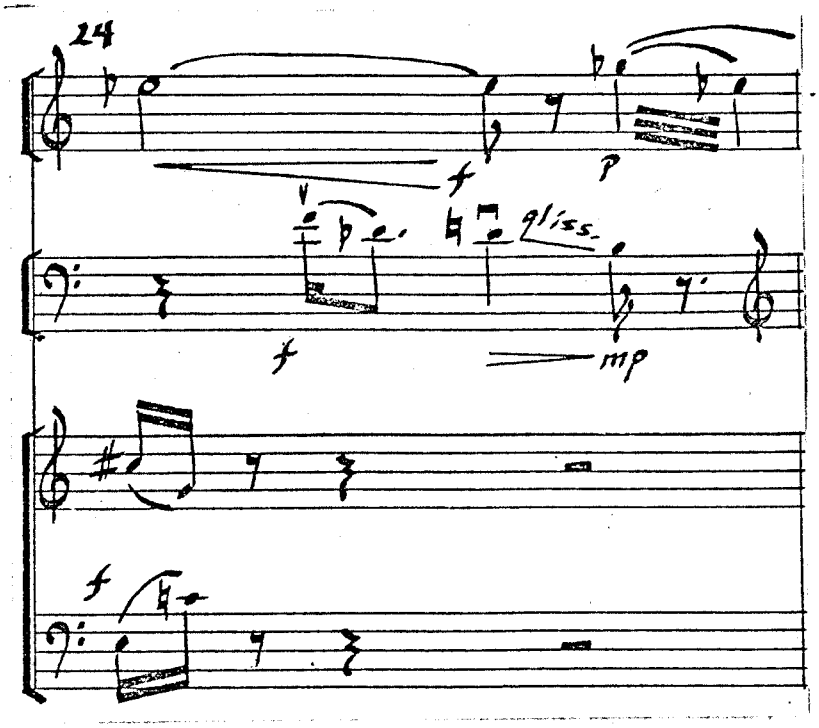
Ex. 7 Stalvey, PLC-Extract, p. 2



An example of the use of microtones within a melodic framework can be seen in Scott Huston's Life-Styles (1972).

Ex. 8 Huston, Life-Styles, III Mvt., m. 22-24, p. 11





Here the fluctuations of a quarter tone higher or lower create a very nervous, jerky feeling, particularly when used within such a short melodic motive as this.

An actual fingering chart consisting of fingerings for all the microtones possible on the clarinet would be impossible to create because of the many differences in the performer's instrument, embouchure and sense of hearing. In general, to raise or lower the pitch of a given note, the bottom finger of the fingering employed should not entirely cover the hole. Depending upon the size of the microtone called for in the score, the performer will cover more of the hole to lower the pitch, thereby causing a smaller microtone; or open more of the hole to raise the pitch, consequently giving a larger microtone. The same principle is used when

the bottom finger of the fingering employed is a key rather than a hole; the amount of space opened or closed by the key will determine the size of the microtone. It is important that the composer realize the technical limitations placed upon the performer when using microtones and that he use them mainly in slower, more melodic passages. If the composer writes microtones within fast, running passages, these written microtones will be impossible to produce technically and tonally.

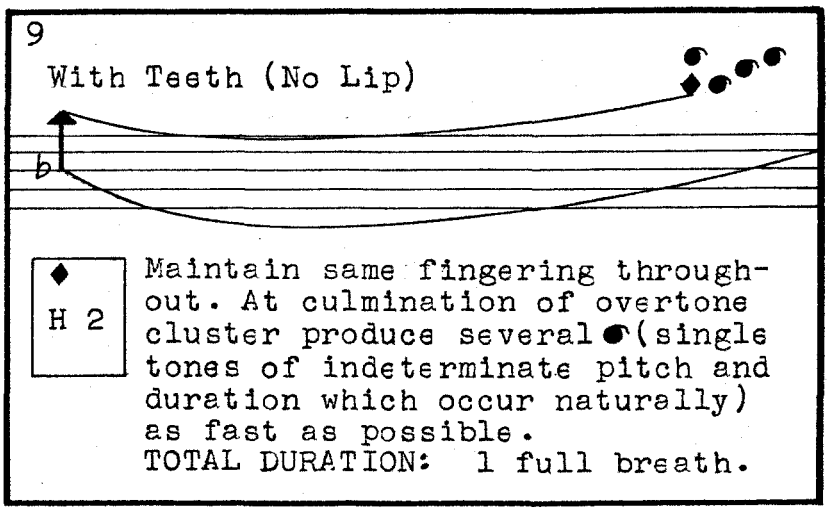
For Western music, the microtone offers the composer a greatly expanded sound range instead of equal temperament's defined twelve tones. For the performer, the use of microtones on the clarinet demands a thorough knowledge of fingerings and, above all, a refined sense of hearing to be able to distinguish between 1/4, 1/2, or 3/4 tones and, if possible, microtones of other denominations.

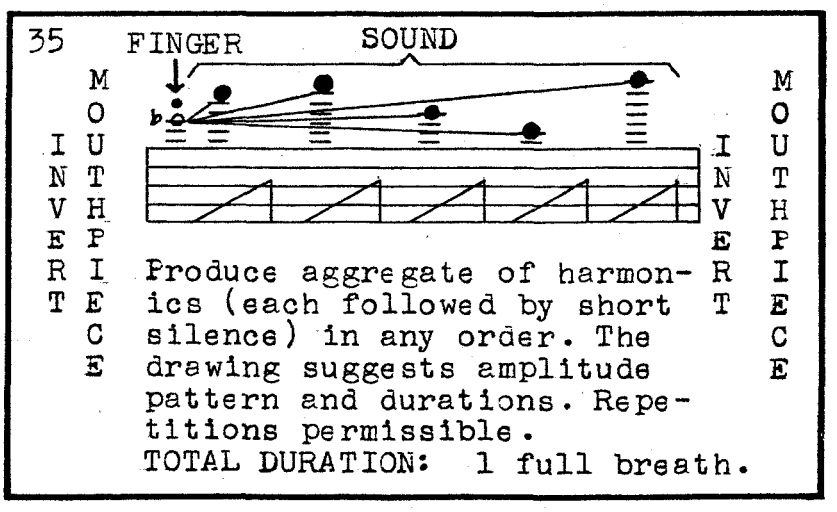
V

The mouthpiece-reed effect has not been used as extensively as the other effects which can be produced on the clarinet. Basically the effect is produced by placing the lower teeth directly against the reed or by turning the mouthpiece around so that the reed is touching the front teeth. This is in direct opposition to the conventional manner of playing the clarinet, which involves spreading the lower lip over the lower teeth and thereby cushioning the reed. The result of placing the teeth on the reed is an illusion of playing harmonics on the clarinet, and is similar to the sound of very high harmonics on the violin. In essence, this is the only way possible to play notes above e''''' on the clarinet. Needless to say, it is extremely difficult for the human ear to distinguish the actual pitch of these notes. These high-note effects can be played at any volume, but they are more convincing and effective when played within a soft dynamic range. When played within a loud dynamic range, the actual single pitch is distorted beyond recognition and the possibility of playing a multiphonic sound becomes great. In producing this effect, the performer is always aware of two major factors: the proper placement of the teeth on the reed and the use of the correct amount of air support. For the best results both in production and control, the teeth should be placed abouth three-quarters of

the distance down on the vamp of the reed and then only very lightly touching it. Secondly, very little air support is needed. If too much air is used, the reed will overblow causing an unrecognizable multiphonic or the effect of merely squeaking on the clarinet. An excellent manner in which to notate the mouthpiece-reed effect is to write into the score either "teeth on reed harmonics" or simply "invert mouthpiece." The ensuing example illustrates these notations.

Ex. 9 Scavarda, Matrix for Clarinettist, squares #9, #35

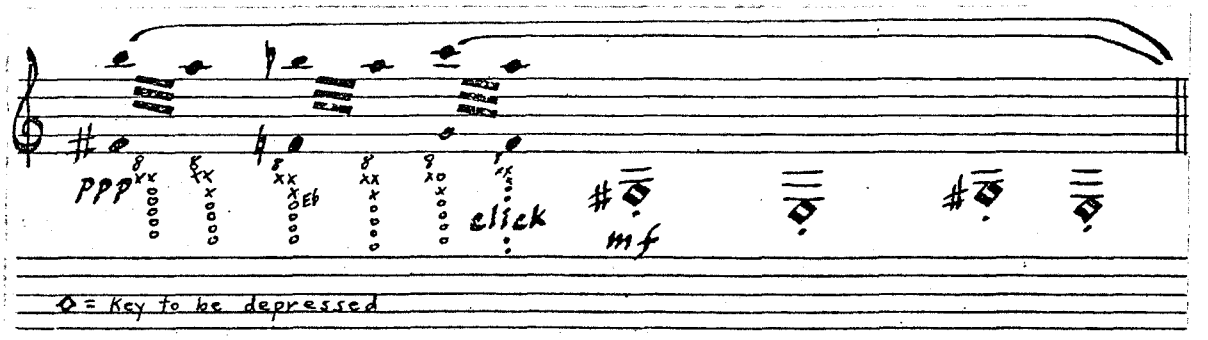




VI

The effect of key mechanism sounds on the clarinet is quite strange and novel; it can be used either totally isolated or in accompanying an actual pitch. For the performer, this technique contains no real difficulties since it is produced by merely hitting (rather than the usual touching) any one or a combination of keys on the instrument. The actual aesthetic effect produced is quite humorous when used alone. However, when used accompanying an actual pitch, the effect is more mysterious and percussive. In notating this effect, the most common means are to write out the words "key click," "key rattles," or "key clack." An example of this effect accompanying an actual pitch is found in William O. Smith's Variants for Solo Clarinet (1963), in which he uses the device to emphasize a solo percussive effect while sustaining a tone.

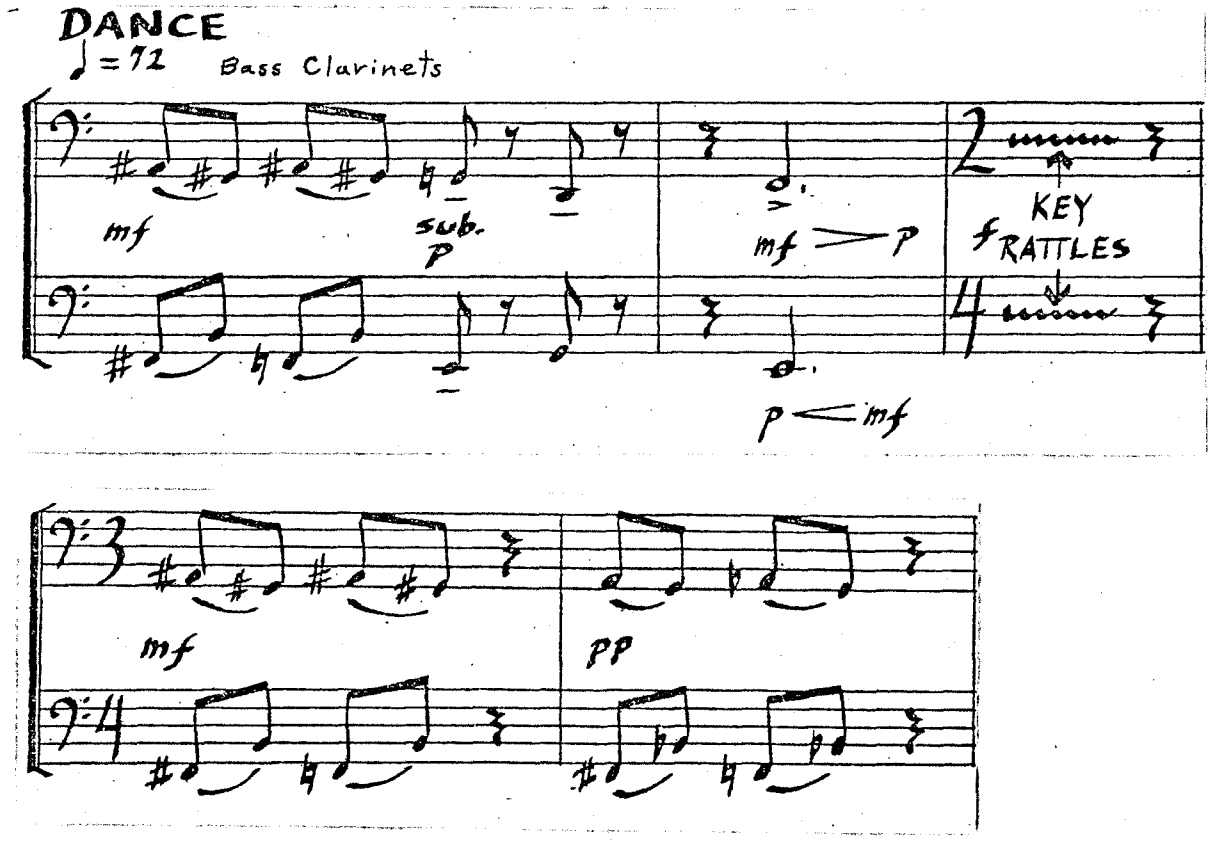
Ex. 10 Smith, Variants, VI Mvt., p. 3



The use of key sound effects alone can be seen in William Sydeman's Clarinet Duo (1973). This particular composition is one of the few which can be labelled "theatrical" because

the performer is to sing and narrate in particular sections within the composition. The effect is quite humorous, particularly since this movement of the work calls for switching to bass clarinet, whose key mechanisms are much louder and noisier than the soprano clarinet. Here Sydeman simply writes "key rattles" for the effect. The performer is left to his own choice of keys.

Ex. 11 Sydeman, Clarinet Duo, III Mvt., m. 1-3, p. 3



On the clarinet, the best choice of keys for volume would be the low E key, either left or right hand little finger, or the low F# key, again either little finger. For maximum effect all the fingers of both hands (except the two thumbs)

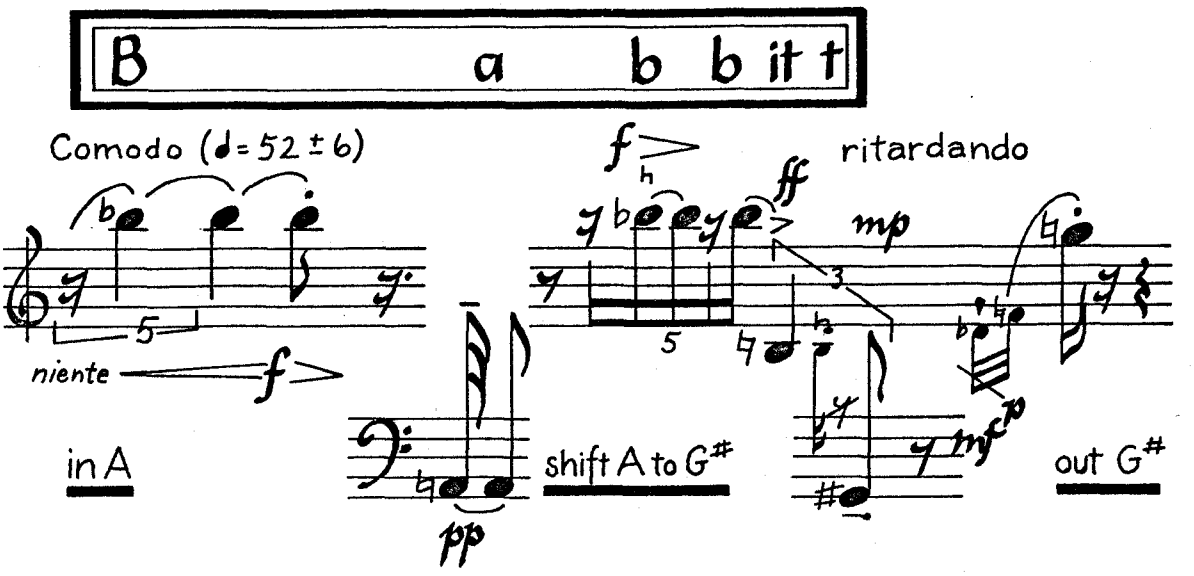
can be used in a very rapid downward and upward slapping motion on the rings and keys.

VII

Special sound effects through adaptation or addition of certain devices to the clarinet, or with the use of the mouthpiece-reed effects, have seldom been used. The basic reason for any adaptation or addition is to extend the range of the instrument or to produce a new color or timbre. Carl Nielsen's Quintet for Oboe, Bassoon, Flute, Clarinet and Horn is an excellent example of an extension of the bassoon range down to a low A in the last chord of the composition. Since the range of the bassoon extends only down to a B flat, the A is achieved through the addition of a tube in the bell, thereby giving greater length to the instrument and, as a result, the means for playing the low A. The clarinet too can have its range extended by increasing its length. In Donald Martino's B,a,b,b,it,t (1967), home-made tubes attached to the bell of the clarinet extend the instrument's range well into the limits of the low register of the bassoon. The notation Martino uses is a simple written direction consisting of the words "in," "out," or "shift" to a particular note. The following example illustrates the effect.

Ex. 12 Martino, B,a,b,b,it,t, p. 1

Clarinet in C
With Extensions



Another special effect caused by an adaptation of the clarinet is muffling of the sound; it can be accomplished by playing with the bell held between the knees or pointing, if sitting, directly into the chair. However, the pitch of the notes produced will be quite flat. The effect, particularly when played in the extreme low register (E, F, F#), is a very veiled, muffled, or foggy sound and is most useful for conveying this type of atmosphere or mood.

VIII

Monophonics and multiphonics are the most complex effects both to discuss and to perform. The prerequisites in understanding them are a thorough knowledge of the acoustics of the clarinet and an application of those acoustical principles to the actual production of these two particular effects. There are two excellent sources which treat monophonic and multiphonic effects: Bruno Bartolozzi's book entitled New Sounds for Woodwind (1967) and an article by Philip Rehfeldt entitled Multiphonics for Clarinet, which was presented to members attending the 1973 Clarinet Convention in Denver, Colorado. The ensuing discussion of monophonics and multiphonics, both from an acoustical and performer's viewpoint, is a synthesis of Bartolozzi's and Rehfeldt's ideas.

The composer is often confronted with the question of whether or not the clarinet (in general, all orchestral instruments) has really reached the limits of its resources. For over 150 years the clarinet range has been defined as e to c'''', with g''' really considered comfortable. However, only within the last ten years approximately has there been an awareness that the clarinet is not limited to the defined limits.

Acoustically the clarinet, because of its cylindrical bore closed at one end, has the properties of a stopped pipe, thus overblowing at the 12th, i.e. the third partial. Conse-

quently, in the harmonic series, the clarinet is basically capable of producing only the odd-numbered partials, although in the extreme upper register some even-numbered partials do occur. The clarinet, like the other woodwind instruments, produces its sound by fingerings based upon a mixed system, comprising a range of fundamental tones in the lower register of the instrument and their various harmonics from which higher notes are derived. The upper register of the clarinet is completed by using partial tones from the harmonic series whose wavelengths are the odd integral fractions of the various fundamentals (1/3, 1/5, 1/7, 1/9). These partial tones are harmonics at the 12th, 17th, 21st and 23rd, and are used in this order to form the upper registers, a fixed order which is never altered. Such a system, though excellent for single sounds of the same timbre, is an obstacle when a performer wants to produce other effects of which the clarinet is capable.

It is a traditional fact that the use of a simple fixed "order of harmonics in the 'mixed system' of sound production has led to the establishment of a single system of fingerings"[5] on the clarinet. These fingerings are most suitable for good intonation and timbre homogeneity throughout its range. There are a few alternative fingerings which have been devised. But almost all of them have been to facilitate certain pas-

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[5]Bruno Bartolozzi, New Sounds for Woodwind (London, 1967), p. 4.

sages, particularly in the upper register. Consequently, a single fingering system has made traditional techniques a closed system excluding any possibilities not contributing to the objectives of timbric unity and intonation.

From the outset, the single fingering system eliminates many different sound possibilities which are only now being discovered. On the clarinet the bulk of these possibilities lies in the use of monophonic and multiphonic sounds. Ironically, these new sounds are based upon the same acoustical principles as the traditional fingering system. The difference lies in the ability to apply the traditional acoustical fixed system to an expanding human ideal which no longer designates sounds as merely "cutting," "hard," "ugly," etc., but rather as to how the sound may be utilized in an organized musical process.

In the distribution of monophonic and multiphonic characteristics throughout the range of the clarinet, it first must be established at which point in the range "the same sound can be emitted with tone-colors of distinctly different quality."[6] This is "the lowest note from which it is possible to generate the same fundamental soundwave with different percentages of its various upper partials."[7] This begins at the acoustical point of the range in which the same sound can be played with different fingerings. On the clarinet this note

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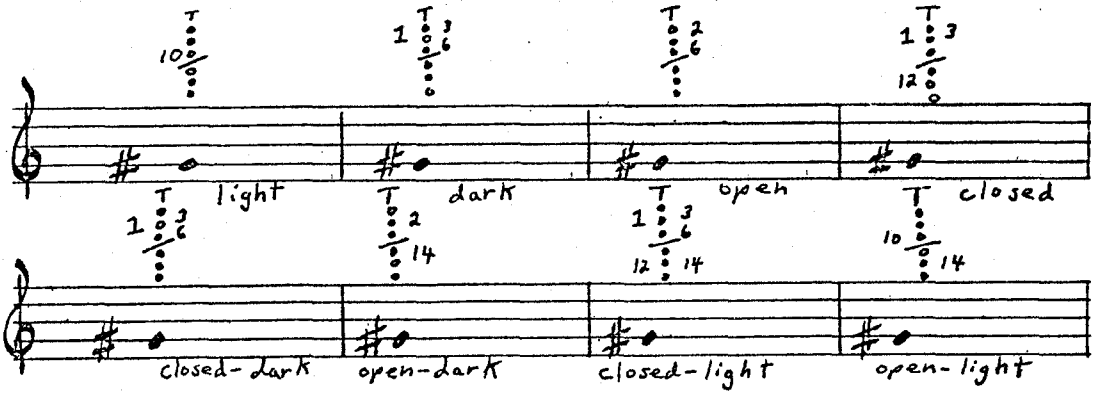
[6]Ibid., p. 8.

[7]Ibid.

is small a. Below this note it is impossible to play sounds with more than one fingering. However, above the small a there are many alternative fingerings for the same note. Using the basic acoustical principle, it is possible for the clarinet to emit from two to six sounds; in other words, the clarinet can generate simultaneously a number of frequencies of vibration and, consequently, can form chordal combinations from even the lowest fundamental. Virtually the entire range of the clarinet is now available for the dual capacity of playing monophonic or multiphonic sounds.

Monophonic sounds on the clarinet are the emission of a given sound and the possible differentiations of timbre for that same sound. This is achieved through an acoustical understanding of the natural harmonics and the artificial harmonics. Basically, the natural harmonics are derived from the "fundamentals" which are determined by the clarinet's stopped cylindrical bore. Only the odd-numbered partials are produced. The artificial harmonics are derived from the number of sounds produced from the same pitch (the apparent fundamental) but obtained by different fingerings. The following example shows the same note (open G#) with fingerings used to produce eight different timbres of that note and a physical description of the respective colors which they produce.

Ex. 13 Bartolozzi, p. 21

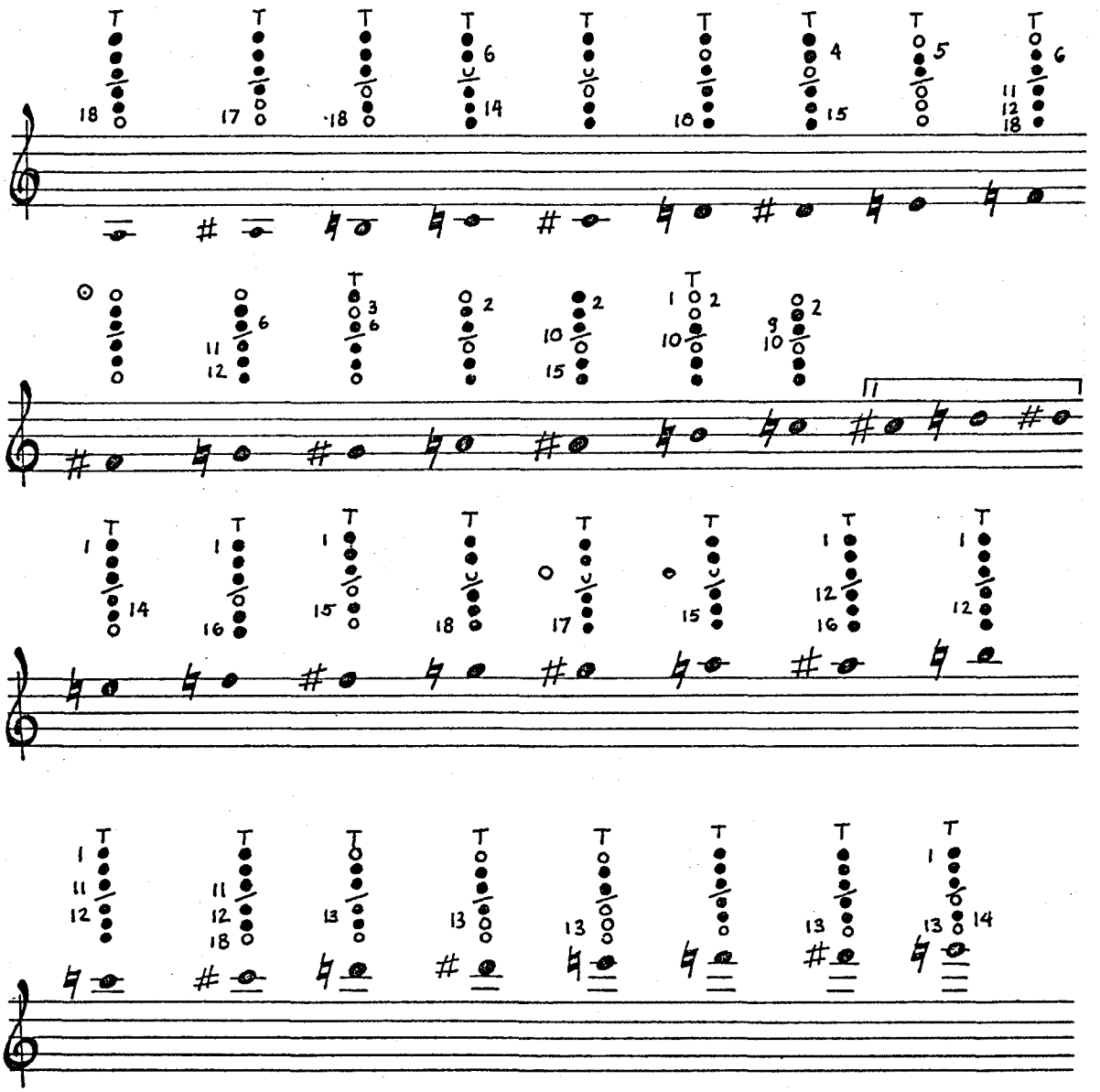


From this theory it is possible to see that the clarinet "no longer comprises only real fundamentals and their natural harmonics, but also apparent fundamentals and their relative artificial harmonics, unified in the intonation of the natural scale."[8] It is important to realize that apparent fundamentals exist because of the extremely slight out-of-tune real fundamentals in the natural scale. A real fundamental which is even slightly out-of-tune (as little as 1/16th of a tone) gives the possibilities of other fundamentals around it. These other fundamentals, which are actually out-of-tune real fundamentals, are called apparent fundamentals. Because of the existing apparent fundamentals, when the clarinet plays a 12th above those fundamentals, the results are artificial harmonics in which the higher the range, the more numerous the artificial harmonics. Consequently, the clarinet has the possibility of producing the same pitch with different timbres and the ability to produce the various artificial

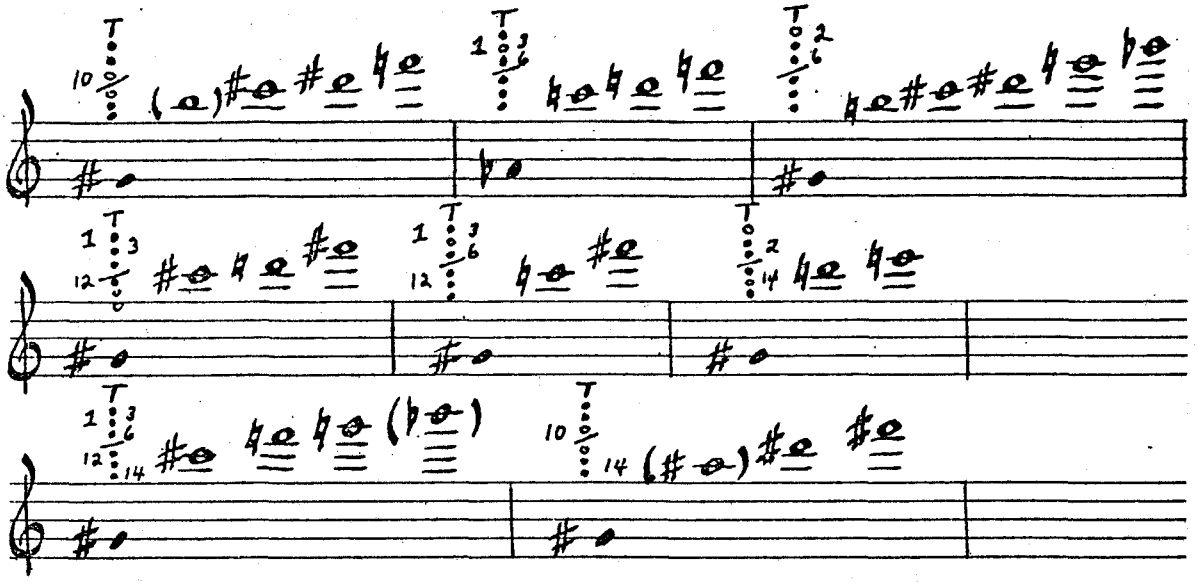
[8] Ibid., p. 13.

harmonics derived from these same sounds. The results are called monophonic sounds and are produced through the use of special fingerings. The example below shows all of the fundamental fingerings of the clarinet followed by a few selected examples of notes using artificial harmonics.

Ex. 13a Bartolozzi, p. 16



Ex. 13b Bartolozzi, pp. 18-19



The artificial harmonics are obtained by a slight modification of embouchure, lip and air pressure. From these examples, "it is evident that the possibility of obtaining different groups of harmonics from the same apparent fundamental leads to a full exploitation of many combinations of artificial harmonics."[9]

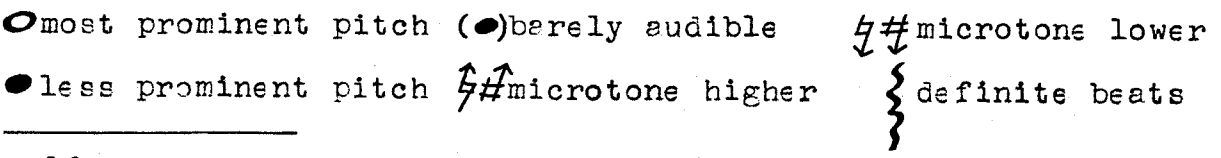
In addition to monophonics, the clarinet can play multiphonics. Basically, multiphonics are the generation, at the same time, of a number of frequency vibrations in the single air column. What this means is that the clarinet not only can produce a large variety of chords, but also can go from a single sound to a group of sounds emitted together or vice versa. In producing any type of multiphonics on the clarinet,

[9]Ibid., p. 19.

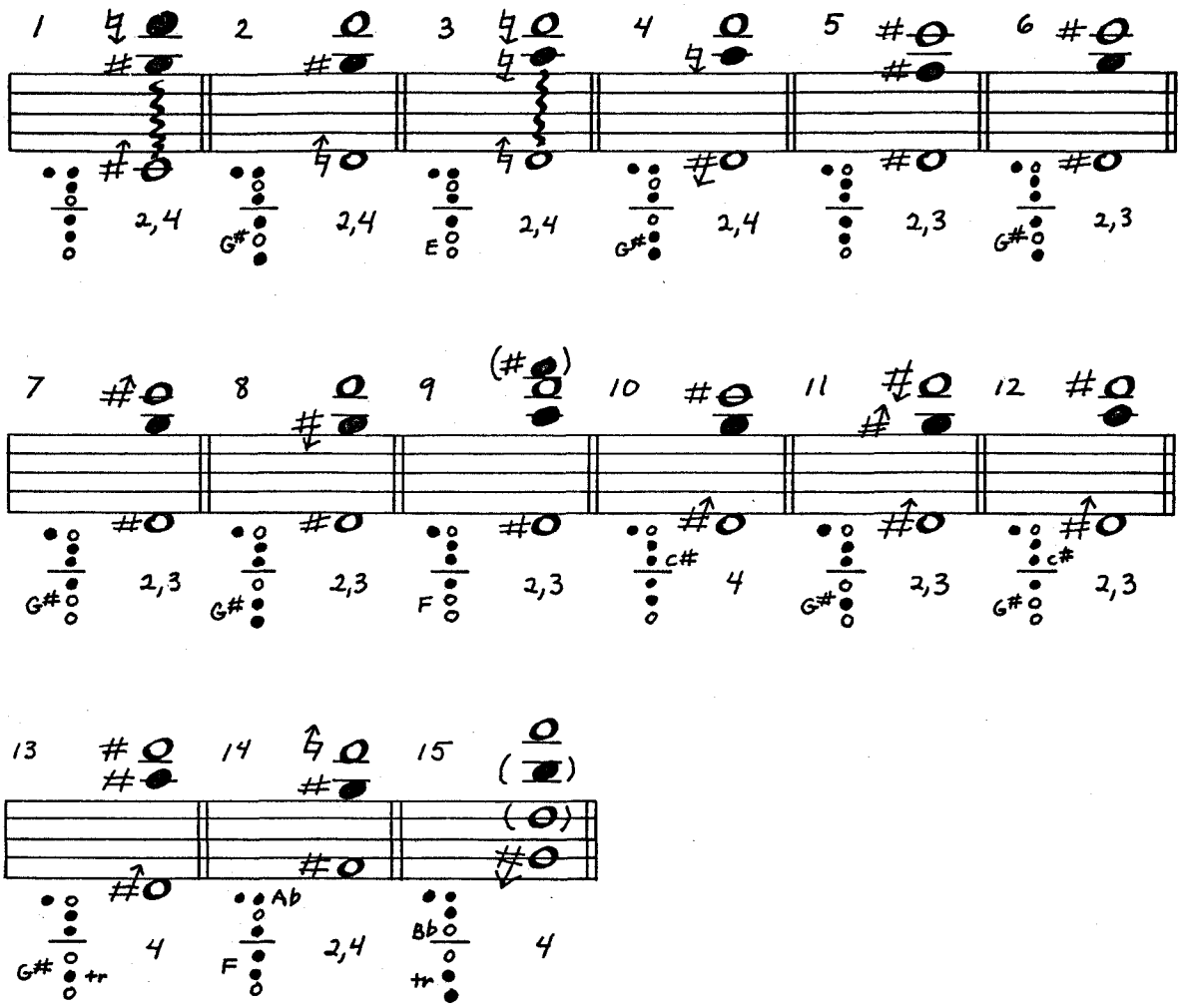
the slight modifications of embouchure, lip pressure, and air pressure are determining factors. Unfortunately, each performer possesses different abilities in this regard. As a result, it is impossible to state precisely how much should be done with the lip, embouchure and air support. Herein lies the performer's difficulty in producing multiphonics, particularly many found in the Bartolozzi book. The acoustical fingerings are the constant factors but the modifications of embouchure, lip pressure and air pressure are variable factors. Unfortunately, these factors vary considerably with different performers. Multiphonics playable by Bartolozzi's colleagues could be quite impossible to duplicate by another performer. It is a challenge to the performer to be sensitive and flexible enough with the three variable factors to produce multiphonic sounds.

Below is a chart[10] consisting of fingerings with which Philip Rehfeldt, prominent clarinetist at the University of Redlands, California, believes most clarinetists will be able to produce multiphonic sounds without much difficulty. The author has tested the fingerings personally and concurs with Mr. Rehfeldt entirely.

Ex. 14 Rehfeldt, Multiphonic Fingerings



[10]Philip Rehfeldt, Multiphonics for Clarinet (Denver Clarinet Convention, July, 1973), p. 1.



The multiphonic possibilities on the clarinet can be broken down into three categories: the linking of monophonic and multiphonic sounds, homogeneous chords, and chords consisting of sounds of different timbre.

The first category is produced when single sounds are played and then "joined to groups of notes in the form of chords (and vice versa) without interrupting the flow of sound and without changing the fingering."[11] The linking

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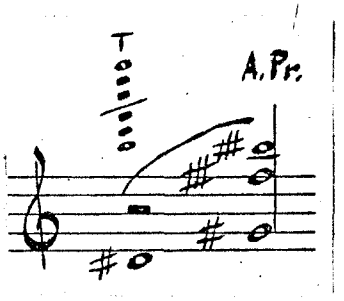
[11]Bartolozzi, p. 36.

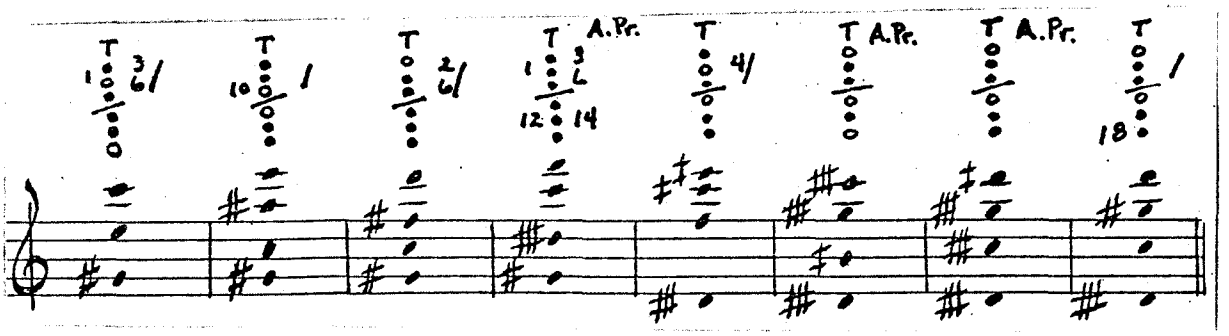
process is made possible through the application of the three variable factors to all the fingerings used for single sounds, and are either fundamentals or apparent fundamentals. The following example demonstrates one application of this technique.

Ex. 15 Bartolozzi, p. 37



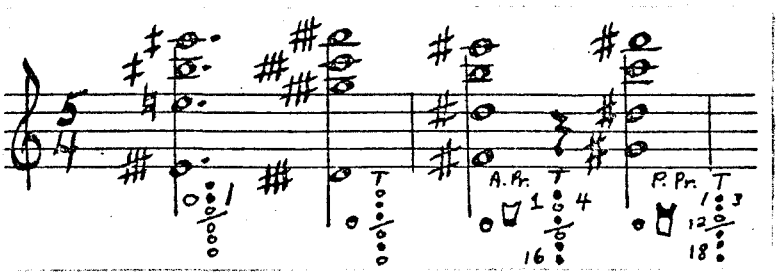
Homogeneous chords may contain up to six sounds. The distinguishing characteristic is that all the sounds are approximately the same timbre and volume as compared to chords containing sounds of different timbre. Homogeneous chords can also be sounded directly without any single note preparation as in the linking of monophonic and multiphonic sounds. The following gives a few fingerings used to produce the accompanying sounds.

Ex. 15a Bartolozzi, p. 40



Homogeneous chords, based on multiphonic fingerings, can be made to produce up to three different chords through three different positions of the reed in the embouchure. The first is normal reed position, the second with more reed than normal, and the last towards the tip of the reed. The chords can be played separately or linked together by merely changing the reed position in the embouchure and reducing or increasing the air pressure. The following contains a few examples of these techniques.

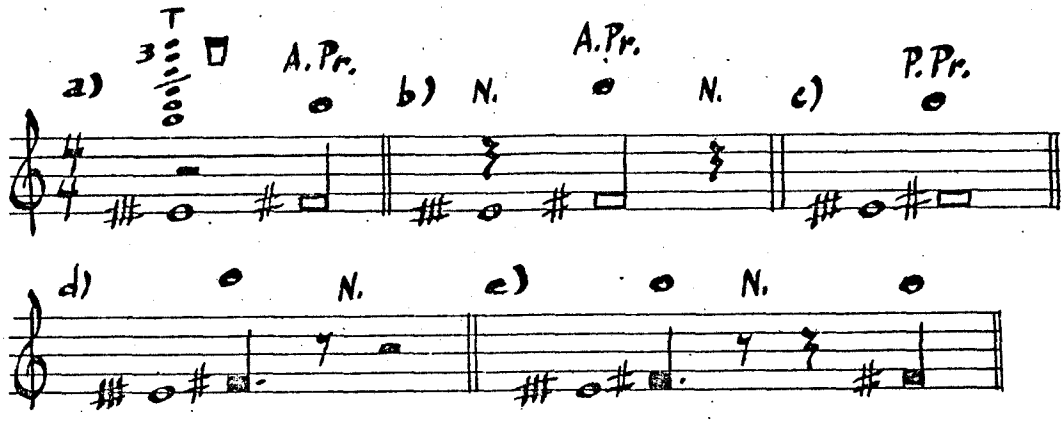
Ex. 15b Bartolozzi, p. 41



The third classification of multiphonics is that which includes chords containing sounds of different timbres. These types of multiphonics differ from homogeneous chords in that they contain sounds of such strongly contrasting color that they may be easily distinguished from homogeneous chords, whose sounds may sometimes be relatively dull and at other times quite bright but usually never totally clearly discernible. Multiphonics containing sounds of different tone color are produced by sounding simultaneously two notes which are very close together, along with their relative harmonics.

These two notes or sounds can be "two fundamentals, a fundamental and a harmonic, or two harmonics."[12] The example below contains some of these possibilities.

Ex. 15c Bartolozzi, p. 43



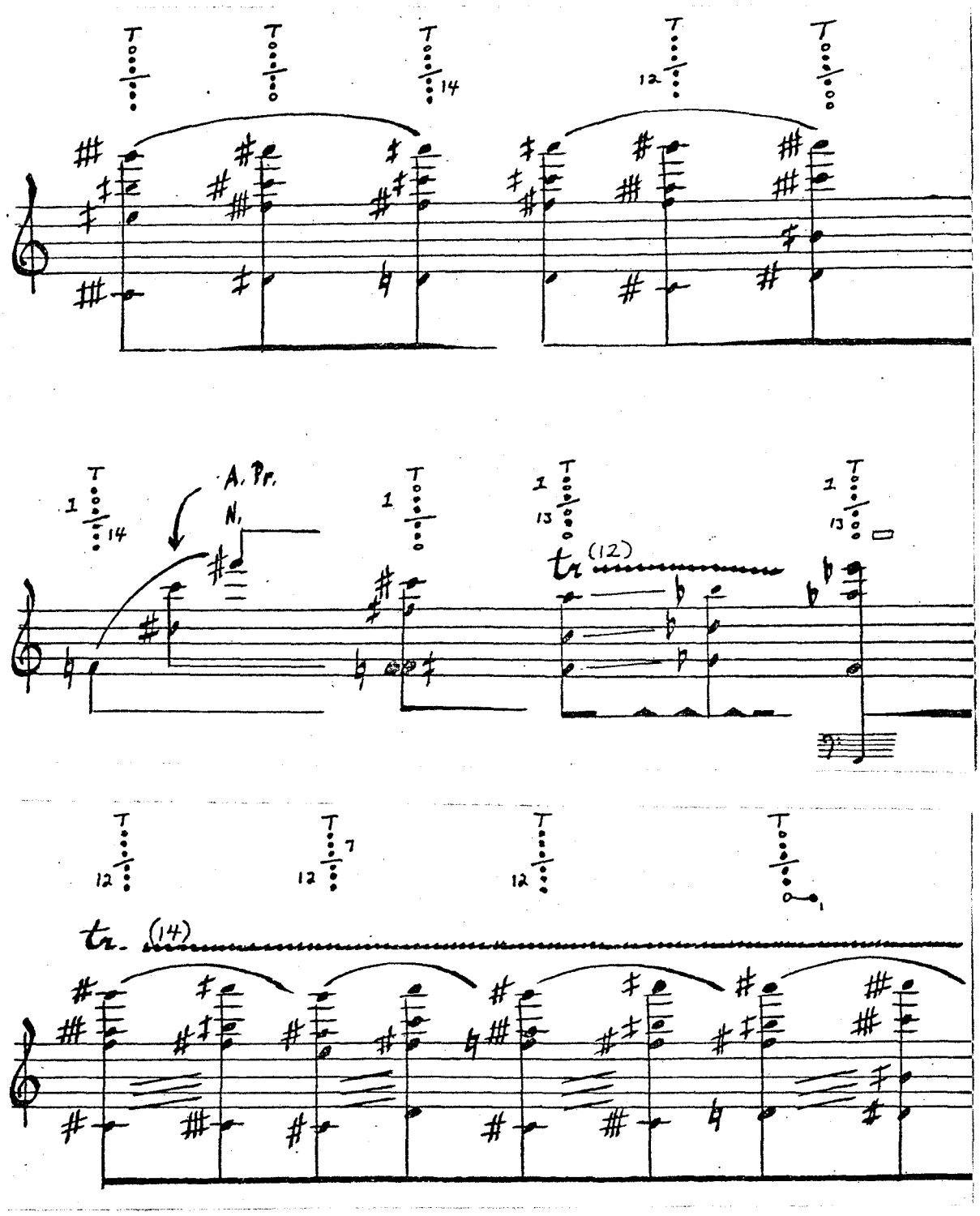
A thorough understanding of the acoustics of the clarinet is requisite to gaining the ability to produce monophonic and multiphonic sounds. However, after the technical knowledge has been mastered, the sensitivity and flexibility of the performer in regard to embouchure, lip pressure and air pressure are the final deciding factors for the production of monophonic and multiphonic sounds on the clarinet.

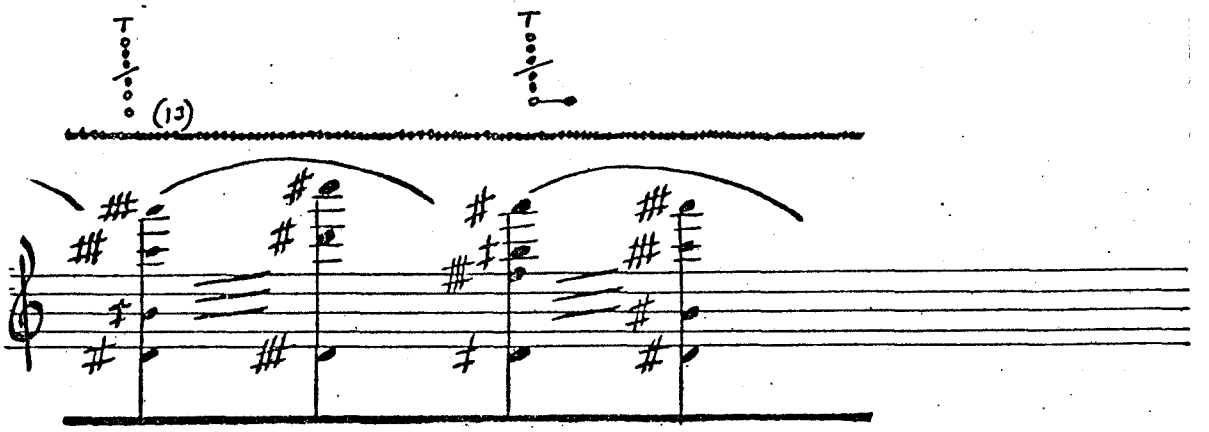
An excellent example incorporating monophonic and multiphonic sounds is Bruno Bartolozzi's Collage (1967), for solo clarinet. In this short composition, Bartolozzi gives the actual fingerings and pitches that are to be realized. The mood which is generated is one of mysteriousness and unearth-

[12]Ibid., p. 42.

liness. Below is a short fragment of the piece.

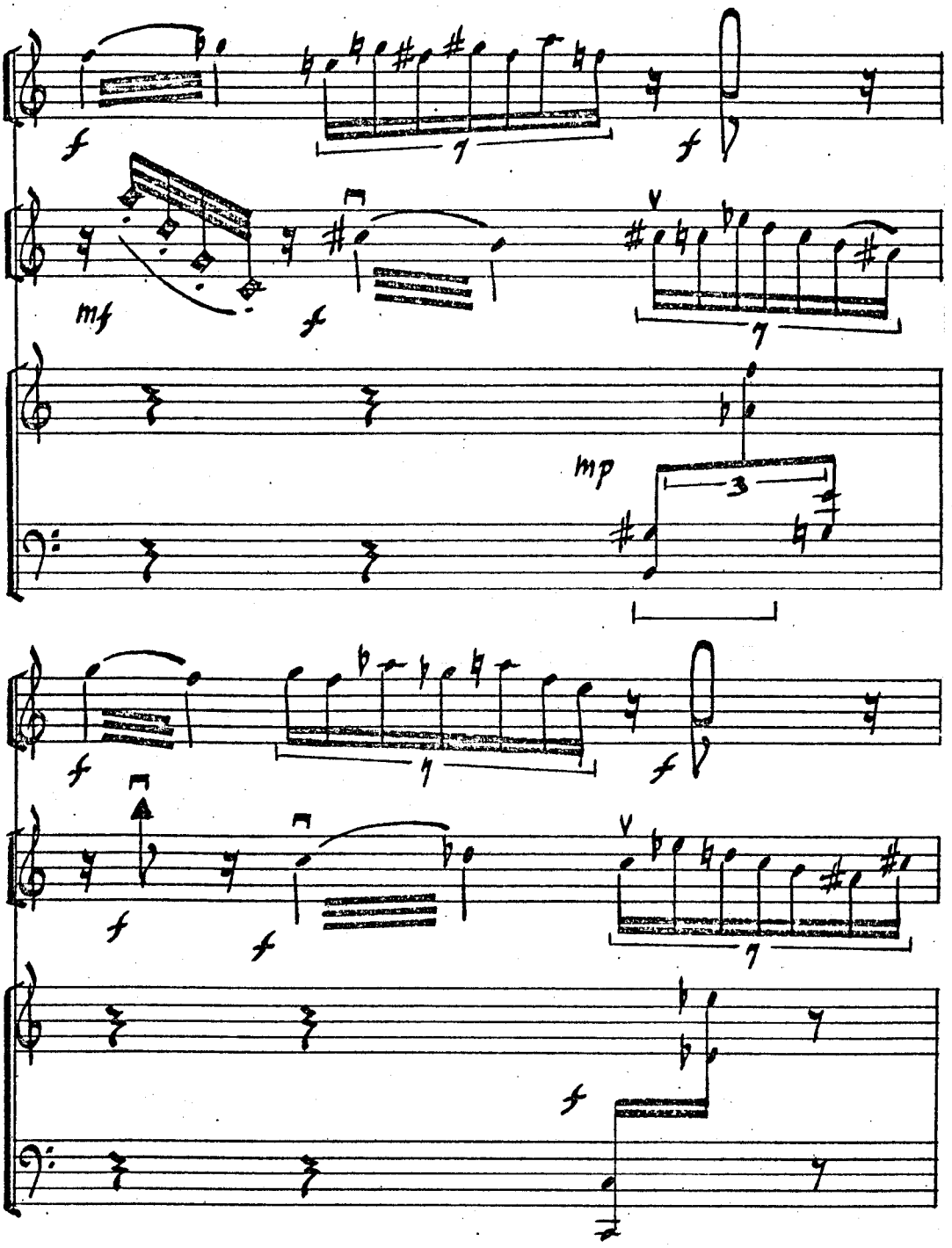
Ex. 16 Bartolozzi, Collage, p. 73 of New Music for Woodwind





Another piece using multiphonics is Scott Huston's Life-Styles (1972). Here he uses the symbol ρ to denote a multiphonic. The effect is quite humorous because it serves to stop the frantic clarinet septuplet texture. (The sound of this very fast multiphonic gives the impression of extreme sarcasm.) The performer has the liberty to use any multiphonic he wishes. But at the extremely fast tempo, it must be one that speaks instantaneously. Below is a short excerpt of this effect.

Ex. 17 Huston, Life-Styles, IV Mvt., m. 95-96, p. 21



Monophonics and multiphonics, compared to the other seven effects previously discussed, contain the greatest

possibilities for new sounds, variety of texture, and atmospheric effect. However, actual production of these effects also demands the greatest control and skill of the performer.

Although this thesis has dealt with eight specific performance effects on the clarinet in music literature from 1960 to 1974, there are others which have been used, such as blowing air (without the mouthpiece and reed) through the instrument or humming through the instrument while fingering it. Without doubt, there will be other effects invented in the future to further the possibilities of the clarinet.

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