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AN EXPANDED CONCEPT OF TIMBRE AND ITS STRUCTURAL SIGNIFICANCE, WITH A TIMBRAL ANALYSIS OF GEORGE CRUMB'S "NIGHT OF THE FOUR MOONS"

The University of Arizona

University Microfilms International 300 N. Zeeb Road, Ann Arbor, MI 48106

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by

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AN EXPANDED CONCEPT OF TIMBRE AND ITS STRUCTURAL SIGNIFICANCE, WITH A TIMBRAL ANALYSIS OF GEORGE CRUMB'S NIGHT OF THE FOUR MOONS

by

William James McGee

A Dissertation Submitted to the Faculty of the
SCHOOL OF MUSIC
In Partial Fulfillment of the Requirements For the Degree of
DOCTOR OF PHILOSOPHY
WITH A MAJOR IN MUSIC THEORY
In the Graduate College
THE UNIVERSITY OF ARIZONA

1982

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THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Final Examination Committee, we certify that we have read
the dissertation prepared by William James McGee
entitled An Expanded Concept of Timbre and Its Structural Significance,
With A Timbral Analysis of George Crumb's Night of the Four Moons

and recommend that it be accepted as fulfilling the dissertation requirement
for the Degree of Doctor of Philosophy.

Michael P. Rogers

Date: 5/12/82

L. Arntzen

Date: April 22, 1982

R. Kemper

Date: April 22, 1982

K. W. Kelly

Date: 4/23/82

Final approval and acceptance of this dissertation is contingent upon the
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Michael P. Rogers

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Date: 5/12/82
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SIGNED: William James McKee
ACKNOWLEDGMENTS

I wish to thank my dissertation committee for their assistance, support, and encouragement. I especially acknowledge the beneficial guidance of Dr. Michael Rogers, the dissertation director.

I also appreciate the help and encouragement of Dr. Robert Werner, who never lost faith, Dr. O. M. Hartsell, who knows precisely how to manage doctoral candidates, and Dr. John Boe, who carefully read the manuscript and offered numerous, valuable suggestions.

Two people not associated with The University of Arizona also had a significant influence upon this dissertation. Originally it was Dr. William Thomson who encouraged me to pursue the study of this topic. For this and many of his other conceptual inspirations, I will always be grateful. I also particularly appreciate the gracious assistance of George Crumb with some of the details of his biography and the musicography.

In a special sense, this dissertation belongs to my parents, Herb and Orpha McGee. Not having had the opportunity to reach their own educational goals, they insisted that their five children not experience the same deprivation. This present work is a monument to their vision, determination, and sacrifice.
No one more than my wife Elaine, however, has known and understood so well the nature of my own efforts to contend with the stress and toil associated with a doctoral program. Her total and steadfast patience, support, and encouragement defies rational explanation. I will forever be grateful. Special thanks also go to Janice and Shelly, my two energetic, blithesome daughters, who have helped me more then they could ever suspect.

I also gratefully acknowledge the moral support and financial assistance given by the administration of Pacific Union College. No employee could reasonably ask for or expect more.

Finally, I wish to thank Rita Mikula, who prepared the final copy of the manuscript. She is more than a typist; she is an indispensible collaborator and infallible consultant on just how things should be done.

Examples of George Crumb's *Night of the Four Moons* and the reproduction of the complete score in Appendix A are re-printed by permission of the publisher, C. F. Peters.
Throughout history music has undergone continual stylistic change. At certain times this process was compressed, and stylistic changes occurred more rapidly than usual. At such historical junctures, music was often written which was considered especially innovative or experimental, and which violated commonly held criteria for artistic acceptability. Such music, although frequently important in establishing the beginning of a new stylistic era, usually had to struggle to achieve recognition as an acknowledged part of the general musical expression of its time.

This dynamic of stylistic change and its attendant aesthetic reaction still obtains in the twentieth century. Indeed, such artistic skepticism may be as intense as ever. One contributing factor may be the extreme variety which confronts the modern ear, a variety which can be bewildering and confusing. For this reason, the less familiar musical styles are often ignored by teachers, students and performers.

It can be argued, however, that there is value in the study of even the most recent developments in music. But unless one has the opportunity to become acquainted with this music through activities such as listening and performing (if not
composing) in his musically formative years, there exists a fair chance that later contact may be unpleasant and unfruitful.

If such a person were to become a teacher, his students would probably miss the enrichment of studying this type of music. If he were to become a composer or performer, his music would tend toward a style amenable to the contented ear. If he were to become a theorist, musicologist, or critic, he could, by his own averse attitude, formulate conclusions which would reflect an understanding of and an appreciation for only the more stylistically conventional music.

The present writer's own early training primarily involved "common practice" music--great music clearly "began" with Bach and "ended" with Brahms, or perhaps with Debussy or Strauss. Later, when the sounds of twentieth century music became more familiar, there also arose the realization that many composers had a penchant for the unusual in sonorous effects. It became increasingly apparent, too, that some were constantly searching for new sounds and new compositional roles for these sounds.

By the time the music of George Crumb became known, it seemed to the present writer that music was moving toward a historical culmination of sound manipulation as an essential "meaning" of music. While it is true that this type of music often has structural integrity in such aspects as pitch, it is also true that it now places other parameters such as timbre on a high level of structural significance.
This increasing emphasis on timbre together with the scarcity of literature that deals with this particular subject influenced the choice of the topic of this study. Its purpose is to examine the nature and use of timbre: to summarize briefly its historical development as a concept and as an important aspect of music, to clarify and expand the definition of timbre, and to demonstrate through analysis that timbre can be exceedingly important to the full understanding of a particular musical composition--music which otherwise may seem bewildering and unattractive.
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ABSTRACT

Timbre is an important aspect of music, particularly in the twentieth century. Relatively little serious work on this subject has been published, however, either from a historical standpoint or from an analytical view. The purpose of this present study was to clarify the nature of timbre and to demonstrate the structural role it can have in music.

The development of the timbre concept was traced from as early as the fifteenth century to the present. From a very simple idea, timbre evolved into a complex phenomenon involving scientific, acoustical analysis and subjective, perceptual evaluation. It was found that currently timbre is not merely a physical manifestation, but also a function of aesthetic judgment and human response to stimuli.

A brief historical survey was made of the importance of timbre in music. It was shown that timbre has emerged as a significant musical element, forming the characteristic sound structure of a composition and (by extension) the distinctive sonorous style (Klangstil) of a composer. In developing to this point, the idea of timbre metamorphosed into a particular concept of "sound," a term that includes any sound quality that contributes to the character and structure of a composition.
A process of analysis was developed to determine musical sound structure. It was shown that the sound-related aspects of the parameters of pitch, dynamics, time, texture, and timbre can act and interact to construct formal shape through cohesion and differentiation.

It was established that the music of George Crumb shows a high regard for sound as a structural element. His Night of the Four Moons was analyzed, demonstrating the process of sound analysis. The analysis also showed that various qualities of sound itself are used as compositional material as well as for cohesion and differentiation. This aurally perceived, characteristic structure formed by or related to the action of sound was termed the "audiogenic image."
CHAPTER 1

INTRODUCTION

That present-day composers are attracted to the potential of timbre as musical expression is widely recognized. Actually, this is not a new development. A discussion of this subject could begin with the works of Giovanni Gabrieli or at least with those of Berlioz. It would seem natural, therefore, that there should exist a large body of critical and analytical material which deals directly with timbre as musical expression. There is, however, little organized, scientific, perceptive, in-depth work available in this area. As Robert Erickson pointed out, "No body of theory about musical timbre exists beyond the rules of thumb and the practical advice of textbooks of orchestration, even though much of the music of modern times is more about timbre than it is about pitch."¹

The Topic

The topic of this study, therefore, concerns timbre as an element of musical expression, its historical development as a concept to the point it can perform a significant role as a

structural element in a musical work. Not an acoustical examination of timbre from a technical point of view, this study primarily addresses such subjects as (1) the general historical understanding of the constitution and role of timbre, (2) the development of an expanded concept of timbre for use in contemporary music, (3) how timbre can be structural, and (4) a method for timbral analysis, based upon careful, analytical listening together with a study of the score.

The evidence for the need of such a study as this is abundant. George F. McKay, in his unique Creative Orchestration, recognized the severe lack of published research in this area:

Surprising little is said about timbre contrast in the literature of musical analysis. The unexplored world of percussion timbre has been especially neglected. There has not been a positive enough attempt to classify timbre according to the "attributes of tone" (the scientific term used by psychologists). Since timbre contrast is of such importance to the art of orchestration, perhaps the future will bring psychological clarification and a more positive terminology.2

More recently there have been serious attempts to deal with timbre and its analysis. Three particularly notable examples are those by Cogan and Escot, Erickson, and Nowalis.3


Although the last publication is not directly concerned with music of this century, it does contain methods and procedures which can be applied to all styles of music.

Another reason which prompted the choice of this particular study is that there is not clear, consistent use of the term "timbre." Some hold it to an extremely narrow acoustical application, while others apply it to all the aspects of sound which combine to make up the particular sonority of a composition. (Many of these are quoted and discussed throughout Chapters 1 and 2.) If a uniform understanding of the meaning and application of timbre did exist, however, it would greatly facilitate the process of analysis. While promoting the consistent use of terms related to sound analysis is not the primary purpose of this present study, a certain amount of attention is given to the problem in order to facilitate discussion of the topic.

Statements somewhat depreciatory of timbre by a few prominent composers and writers on music have also suggested the need to clarify the role of timbre in music and to demonstrate that it really does belong among the important members of the hierarchy of musical elements often thought to be dominated by pitch. Hindemith's view of the subject is a typical one: "Subordinate musical elements such as dynamics, tone-color, phrasing, etc., may also influence the aural impression of a musical form, but
they cannot modify its construction, since their power is merely decorative, not constructive."

Ernst Toch apparently agreed. For him, timbre does not find a place among the "shaping forces" of music. Ellis Kohs evidently concurred. In his book on the analysis of music form he presents a fairly detailed discussion of the concerto grosso and the rondo with almost no mention of texture and none at all of timbre or registral variety.

But to study the nature and importance of timbre without applying the results of that study to musical composition would be to accomplish only part of the task. For this reason—to provide an appropriate musical context—a composition by George Henry Crumb, one of the foremost colorist composers of today, was selected.

In 1967 George Crumb was awarded a National Institute of Arts and Letters grant in music "for his imaginative and colorful sound world, organized with great refinement and variety, and used for highly expressive ends." This evaluation reflects his

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great sensitivity to the expressive power of sheer sound. As Richard Steinitz observed, Crumb's music displays "probably the most resourceful and imaginative timbral language of any non-electronic composer"; the most compelling aspect of Crumb's style, he felt, "is the extraordinarily haunting and intoxicating magic of its sound."8

This sonorous quality is the result of Crumb's conviction as a composer that music must justify itself on the basis of its sound. As he himself has commented, "... the effect and understanding of music do not depend on the conscious recognition of its constructional basis. The emotional or expressive force of music exerts itself irrespective of theoretical or analytical considerations."9

For Crumb, then, a theoretical explanation alone cannot justify a musical composition. True, those who search for evidence of intellectual logic and organization in his music will find it. Nevertheless, a careful listening to his music and reading of the literature which deals with his style reveals that his music is not beholden to any system except that suggested by the music's own sonorous and dramatic necessity. Somehow, Crumb's music creates the impression that its beginning point is reached by moving directly through the cause to its musical


effect; then it moves carefully backward to justify theoretically the effect—that is, to rationalize the cause.

When the timbral imperative of Crumb's musical style is ignored, it is almost certain that any evaluation of his music will be incomplete or distorted. Robert Moevs in his review of Crumb's *Makrokosmos III* dealt with pitch structures, rhythmic formations, and extra-musical symbolism. Having completely missed the timbral essence of the work, he was driven to the evaluation one would expect:

The lack of musical substance, in turn, exposes the emptiness behind the assortment of symbol-expressionistic titles and descriptions not to be taken seriously (numerological, psychological, mythical, astrological, religious, philosophical, cosmological) that are added throughout and together create a panoply of a cavaliere inesistente.10

From the available works of George Crumb, *Night of the Four Moons* was selected for timbral analysis. The reasons for this choice are: (1) its instrumentation calls for a great variety of sounds, including the voice; (2) while not especially long (about 16 minutes), it contains several sections of contrasting style and sonorous character; (3) it is highly coloristic, and therefore compatible with timbral analysis; and (4) composed in 1969, it is located in the center of Crumb's output and therefore is representative of his mature style.

Procedures of the Study

As the theorist applies himself to the study of timbre in music, one of the foremost problems encountered is that of procedure. Again, the lack of serious timbral analysis on the structural level constitutes a hindrance in that there is no clear path to follow. At the same time, however, this very situation provides the opportunity for a creative solution to the problem.

It is important to this study to ascertain the role of timbre in music as recognized historically by writers and musicians. Besides providing a historical perspective, such an understanding can help trace the development of the concept of timbre and its emergence as a significant element in musical composition. It can also assist in the evaluation of much present-day music, thus influencing one's relationship and response to it.

Therefore, the views on this subject found in a number of selected sources are stated and discussed. These sources are English, French, and German encyclopedias and music dictionaries dating from the late 15th century to the present, numerous books and articles published since the early 18th century, and material extracted from record jacket comments.

From this, the concept of timbre is expanded to embrace the idea of "audiogenic image." This term, which means structure caused by or pertaining to sound, is dealt with more fully in Chapter 2, and is utilized extensively in the rest of this study. Involving as it does the total sound character of a musical work,
the audiogenic image describes the function of sound quality or timbre.

The general analytical procedure consists of a dual process. First, a descriptive analysis is made of each movement of Night of the Four Moons. Involved in this are five parameters of music (pitch, dynamics, time, texture, and timbre), their significance in the music, and their contribution to the sonorous interest and formal differentiation of the music.

The particular nature of George Crumb's musical scores necessitated a new procedure to prepare them for analysis. Since very few passages are metered, it was impossible to use measure numbers in any type of graphic treatment. Even if his music did contain bar lines throughout, however, such a method still would not yield admissible results, for the tempo variations and pauses are too varied and too long for such a process to provide a valid, accurate temporal perspective of musical events.

Consequently, the music was first synchronized directly with the passage of time in seconds. Each event was then recorded on master charts in such a manner that the character of the sound event itself, its duration, and its temporal relationships with all surrounding events could readily be seen. In addition, these times, expressed in seconds, were written on the score itself, a reproduction of which is included in Appendix A. Various graphic figures are used throughout the analysis at appropriate times to depict particularly important concepts or events.
The next step was to discover the relationships which exist between and among these various parts as they interact to provide organic growth and shape. Such elements as continuity/similarity and contrast/dissimilarity are shown to involve the timbral qualities of the music directly, thus emerging as sound-related formal determinants.

The Problematic Nature of a Study on Timbre

Many of the difficulties in dealing with musical timbre grow out of its dual character: it is part science, part art; part objective, part subjective. This essential ambiguity is not commonly understood, nor its role in music recognized. Although composers and theorists are beginning to appreciate the significance of timbre, many are often hesitant to give it much prominence in their discussions, perhaps fearing they will not be taken seriously.

This wide divergence of ideas as to the specific nature and province of timbre gives rise to a large number of differing definitions and applications. Many of these are encumbered with historical restrictions which render them misleading and inadequate for today's musician. Some are too subjective or inclusive to be effective. Others move toward the opposite extreme, being too objective and precise, too "scientific" to be musically useful and practical.

Perhaps at least partly due to this undisciplined confusion is the prevailing resistance to admit timbre to full musical
statehood in the federation of musical parameters.\textsuperscript{11} Leonard Meyer, however, approached this recognition when he admitted that "Timbre plays a very significant role in defining relationships in Webern's music, but only a minor role in the music of Bach."\textsuperscript{12} He later suggested that "timbre and register [may] serve as substitutes for tonal tension."\textsuperscript{13} His basic attitude toward timbre, then, is one that just stops short of granting it full status as one of the primary, legitimate characteristics of music. Along with dynamics and texture, he felt, timbre functions as a "secondary" parameter.

Wallace Berry in his relatively detailed and comprehensive Structural Functions in Music omitted a formal discussion of timbre. As the reason for this action, he wrote that "it should

\textsuperscript{11}The use of the term parameter in musical analysis is well established, regardless of the semantic and practical difficulties which argue against it. Discussions of this matter range from the highly abstruse by Boge to the deceptively simple by Westrup; see "'Parameter' in Music and Musical Analysis," In Theory Only, 3 (July, 1977), 14-24; and "Parodies and Parameters," Proceedings of the Royal Musical Association, 100 (1973-1974), 19-31, respectively. What is perhaps the "classical" definition as it is perceived by most writers who use the term is suggested by James Tenney. He wrote that in a musical context, parameter may be defined as "any [general] distinctive attribute of sound, in terms of which one (elementary) sound or sound-configuration may be distinguished from another; see Meta (+) Hadot: A Phenomenology of Twentieth-Century Musical Materials and an Approach to the Study of Form (New Orleans: Inter-American Institute for Musical Research, 1964), p. 74.


\textsuperscript{13}Ibid., p. 139.
be said again that literature involved with the study of musical elements other than tonality and harmony . . . leave much yet to be done. Texture and color (timbre, articulation, dynamic intensity, registral coloration, etc.) have been much too little explored in their structural implications.\textsuperscript{14}

Another reason why tone color has had late acceptance as an authentic structural element of music is that historically there has been an overriding concern with pitch and duration in stylistic and critical analysis. This is readily understandable, for the various aspects of these two elements lend themselves fairly easily to quantification.

In contrast, timbre is difficult to measure, tending as it does toward the subjective and qualitative. Even though some of the acoustical properties of sound \textit{can} be scientifically measured, the results of a mechanistic treatment are neither consistently predictable nor always understood properly.

That machines cannot be depended upon to duplicate the response of the perceptive, analytical musical ear has been understood for some time. In his seminal \textit{Psychology of Music}, Carl E. Seashore noted that "we cannot separate the timbre or the pitch or the intensity in one wave from that in the next wave by hearing. The result is that they fuse and for a given period of time . . . we hear a resultant pitch, intensity, or timbre which

tends to be an average for what is represented in the series of waves . . . . "\(^{15}\)

According to a more recent author, Fritz Winckel, there is another side to the aural coin. Since the ear does not respond in a linear fashion to physical excitation, "the amplitudes and frequencies of a single partials of a sound spectrum can be changed greatly before a distortion of the tone color is noticed."\(^{16}\) In fact, the amplitude can be altered an almost unbelievable amount before it is detected. "The insensitivity of the ear to change of amplitude of such overtones is so significant that the erasing of an entire partial, as long as it is not a formant, is not noticed by the untrained ear."\(^{17}\) This hearing insensitivity is apparently variable, depending upon where it occurs in the audible frequency range. Winckel went on to say that "In music reproduction, the middle and high areas of the spectrum can be reduced in amplitude up to four db before it is noticeable. In fact, in the low octaves such a 'linear distortion' is perceived only at 10 db reduction."\(^{18}\)


\(^{17}\) Ibid.

\(^{18}\) Ibid., p. 114.
To further complicate the matter, the ear can actually produce its own "timbre." It accomplishes this, Olson maintained, in that it

... produces new overtones or alters the existing ones. For example, when a pure tone of suitable intensity is impressed upon the ear, a series of harmonics or overtones of the original frequency is heard. Furthermore, when two loud tones are sounded together, a group of tones is heard, consisting of the sums and differences of the two primary tones and their harmonics. 19

It can be seen, then, that a purely mathematical, mechanistic approach to timbre analysis is unsatisfactory; as yet there is no substitute for the experienced, perceptive ear. Winckel clearly indicated this on the first page of his book where he wrote, "We have become far too accustomed to compute isolated partial functions schematically and to assume a corresponding validity for the whole, without continuous listening, which would test the results." 20

Even if every musical event which contributes to the sonorous character of a sound could be measured exactly as heard, there would yet remain the factor of personal interpretation, which is an undeniable part of human perception. One could not possibly expect that two theorists, given identical data, would arrive at identical conclusions every time. In some scientific realms this may occur. Considering the subjective nature of the


art of music, however, the intangible qualities of its timbre, and the high probability that different people listening to the same music will respond differently to it—all this will unavoidably result in dissimilar evaluations and responses.

As a simple but telling example, one need only compare the descriptions of flute tone given by two well-known experts on orchestration. Kent Kennan characterized the sound of the lower part of this instrument's range as "weak and somewhat breathy, but it has a velvety, sensuous charm . . . ."\(^2\) To Nikolay Rimsky-Korsakow, however, the tone in the same range is "dull, whistling."\(^2\) Surely the tone of the flute has not changed that much! What can be seen here, instead, are the factors of taste and preference at work in the apprehension of tone as well as in performance skill.

The other end of the flute range is often described as brilliant and penetrating, and usually thought of (and presented thus in orchestration books) as functioning dynamically at least on the level of forte. Yet the present writer once heard an advanced student perform in this range up to the high C with a tone that was clearly piano, and with almost no breath noise.

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It is evident, therefore, that the theorist cannot trust the time-worn catalogue of tonal characteristics of instrumental sounds in any description of the timbre of a work. There exist too many real and perceptual complications.

This matter of human perception is a complex one, but it must be considered. In many publications on tone quality this is not done; the stimulus alone is treated and the human component ignored. That such a practice disregards what is an important dimension in the process of understanding a particular phenomenon can be seen in James Chaplin's brief discussion of perception, a portion of which is quoted here:

In contemporary psychology, perception is commonly treated as an intervening variable dependent upon stimulus factors, learning, sets, moods, and emotional and motivational factors. Thus, the meaning of an object or objective event is determined both by stimulus conditions and by organism factors. For this reason, perception of the world by different persons is different, since each individual perceives in terms of those aspects of the situation which have special significance for him.23

Obviously, any useful treatment of timbre in music must necessarily take into account the subjective and unique input supplied by the respondent, the listener, the theorist.

The number of terms used in subjective descriptions of musical timbre is large and varied, disorderly and confusing. However, they generally fall into a relatively few basic categories as can be seen in the arrangement given below. If these

words were always used with an awareness of their placement within these groups, tone color descriptions could be clearer and more useful.

The meanings of the great majority of these words are not directly related to the sense of hearing. This may be related to the difficulty that accompanies attempts to verbalize sense-related experiences. Whatever the reason, synesthetic assistance is heavily relied upon.

The great master of orchestral technique and coloration Rimsky-Korsakow was keenly aware of this. In his *Principles of Orchestration* he wrote, "It is a difficult matter to define tone quality in words; we must encroach upon the domain of sight, feeling, and even taste." He did maintain, however, that such comparisons are appropriate, that they do actually tell us something about the qualities of the music being discussed.

These expressions are arranged below in the following manner: the sense of hearing first, as this seems appropriate considering the subject; then the remaining four senses (with taste and smell considered together) in approximately the order of their use; lastly, two "senses" were added out of the necessity created by the terms themselves.

Within each of these categories, the words are arranged alphabetically. However, they are presented here in the same form as they were encountered; there has been no attempt to

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render them grammatically consistent. Finally, since some terms are ambiguous as to which sense they relate, they were listed more than once.

1. **The aural sense**--boomy, breathy, buzzing, chattering, clear, creaking, dry, dull, grating, harsh, hoarse, mellow, murmuring, nasal, percussive, rasping, rich, ringing, shrill, sonorous, strident, wailing, whistling.

2. **The visual sense**: observed light- and color-related qualities--atmospheric, blurred, brilliant, bright, brown (rich), clear, cool, dark, dull, harsh, light, mellow, muddy, opaque, pale, scarlet, silvery, somber, stark, transparent, vivid, warm.

3. **The visual sense**: observed shape--angular, jagged, lacy, round, rounded, square.

4. **The visual sense**: observed action, non-action--chattering, neutral, penetrating, protrusive, sluggish.

5. **The sense of touch**--coarse, cold, cool, even, hard, harsh, hot, rough, smooth, soft, velvety, warm.

6. **The sense of taste-smell**--biting, bitter, bland, harsh, mellow, mild, pungent, rich, sharp, sour, sweet.

7. **The sense of substance and physical structure**--angular, atmospheric, attenuated, body (having), brittle, bulky, coarse, coherent, compact, crisp, delicate, dense, elastic, empty, ethereal, fine, flabby, flexible, full, hard, heavy, illusive, light, liquid, metallic, pinched, plastic, pointed, rounded, sharp, soft, solid, strong,
substantial, tenuous, thick, thin, tight, volume, weak, wooden.

8. The sense of human-ness—calm, chattering, dramatic, expressive, intense, lyric, mild, positive, provocative, relaxed, restless, sensuous, somber, tense, vehement, vulgar.

No doubt there exist many more of these sense-descriptive words. In the interest of meaningful communication, however, it would seem that the more a description of an aural experience employs words which are explicitly sound-related, the clearer and more accurate that description would be.

An additional difficulty in the study of musical timbre can be found in the traditional form of our music notation. Timbre does not lend itself to abstract figures on paper. Cogan and Escot recognized this problem as a severe one. Not only has tone color not been analyzed in the past, they pointed out, but "it has not really been notated either. Rather than notate a tone color, musicians have notated the instrumental means by which it is produced."\(^{25}\) And as Cogan mentioned in an earlier publication, this notational practice removes the actual aural realization of the timbre of a work an additional step beyond what notation does for the elements of pitch and rhythm.\(^{26}\)

\(^{25}\)Cogan and Escot, op. cit., p. 328.

\(^{26}\)Robert Cogan, "Toward a Theory of Timbre: Verbal Timbre and Musical Line in Purcell, Sessions, and Stravinsky," \textit{Perspectives of New Music}, 8 (Fall-Winter, 1969), 75.
Hence, the timbral theorist must work with a live performance, or more probably, with a recorded representation of one. This necessarily introduces a number of inconveniences and artificialties. What is the physical acuity of the listener's hearing? What is the quality of perceptual and analytical expertise being brought to bear on the problem? What is the quality of the sound equipment being used? What are the acoustical characteristics of the room in which the music is played? Conclusions arrived at under any given set of conditions will unavoidably reflect those conditions.

Further exacerbating the problem is the nature of the expository writing style itself in some of the sources which do deal with sound color, a style which often wanders in a poorly organized manner or contains bewildering, unnecessary jargon. Even the best writing occasionally employs extensive use of metaphor, simile, and analogy--perhaps prompted by the difficulty of verbalizing the non-verbal.

Since timbre does not lend itself easily to objective description, it follows that the construction of graphs and other visual representations of the nature and function of timbre is also very difficult. In addition to this problem of attempting to quantify a quality, there are other, related ones. To account for all the aural characteristics of a sound structure, for example, and to indicate all their interrelationships would render such a figure impossibly complex. Even if a graph were severely limited in what it should depict, the fact remains that the eye
still does not hear as well as the ear. That is, the ear can perceive sound quality far more acutely than the eye can visually "auralize" a physical representation of that sound. Nevertheless, such methods of presenting data can be effective wherever it is possible to construct them.

Two unique attempts to graphically represent what the ear hears should be mentioned. In an excellent volume dealing with musical acoustics entitled Sounds of Music, Charles Taylor portrayed a black-and-white continuous printout of an oscillograph trace of the varying pressures caused by a musical performance.27 The second example is found in an unpublished master's thesis by Terry Lee Zipay in which timbre is presented as a three-dimensional geometric model.28

Another more conventional example is provided by H. H. Stuckenschmidt in his Twentieth Century Music.29 Here, timbre is translated into a figure using a horizontal bar graph showing instrumental sonority characteristics (employing a variety of colors), and a line graph for dynamics. No explicit demonstration of formal relationships is made, however; this the reader is left to infer for himself.


As we have seen, dealing with perceived sound quality and relating it to music is an extremely complex endeavor. Perhaps the attempt to formulate a comprehensive theory of timbre could be compared to an attempt to arrive at a similar theory for variegated, multi-textured sculpture. True, a number of generalizations can be made about commonly held principles of artistic expression. But to account for all the elements of the interplay between the physical medium and the intangible creative workings of genius would be extremely difficult.

John White seems to acknowledge this when he stated, "The element of sound is perhaps more difficult to deal with than any other category in style analysis." He reminded us once again that even though there exists a great array of terms and analytical methods useful in dealing with the other elements of music, "a codified body of knowledge for the analysis of sound is virtually non-existent."

**Synopsis of the Remaining Material in This Study**

In Chapter 2, the concept of timbre and its relation to musical sound (as seen in published literature) is considered from a theoretical-historical point of view from the early ideas about its nature and constitution, to the present understanding.

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31 Ibid.
of the phenomenon. The "audiogenic image" concept is also presented—an expanded view of timbre especially developed to assist in sound-color analysis. Chapter 3 concerns timbral treatment in the music of composers who consider the element of sound color an important part of their musical expression. In this context, the music of George Crumb is presented, along with a brief sketch of his life and works and a somewhat longer examination of statements regarding his timbral style which have been made by writers on that subject (including Crumb himself). Ending this chapter is an outline of the analytical system that was developed for use in the analysis of Crumb's music.

Chapters 4 through 7 consist of sound analyses of the four movements of Night of the Four Moons by George Crumb. A summary, the conclusions, and some suggestions for further research are contained in Chapter 8.

There are three appendices. Appendix A is a reproduction of the score of Night of the Four Moons on which are written the times (in seconds) of the musical events as they occur in a sound recording of that work. This material will assist the understanding of the analysis by providing the complete musical context for the more specific events referred to in the text.

Appendix B contains a biographical sketch of George Crumb. Appendix C is a musicography of all the works of Crumb available up to this time, listing for each such details as the circumstances of its composition, publication data, when and where it was premiered and by whom, for whom it was written, by
whom it was commissioned, information about sound recordings, and other miscellaneous facts.

A selected bibliography concludes this work.
CHAPTER 2

DEFINITIONS AND CONCEPTS OF TIMBRE:
A HISTORICAL DEVELOPMENT

This chapter comprises an attempt to give a brief résumé of a number of writings on the subject of sound quality. The purpose is to demonstrate the development of a concept, not to provide a thorough historical study. Selected for this investigation are some encyclopedias and music dictionaries generally recognized as standard works in their fields. Also included are books and articles containing material on sound analysis published mostly within the last hundred years by a wide range of authors. Generally, the order in which timbral concepts are presented is chronological, beginning with the earliest publications and ending with the most recent.¹

In sources dated up to about the first part of the nineteenth century, the discussions of sound often show the tentative

¹If the books of a multivolume work were released periodically, the publication date of the first volume determines when it is discussed. Occasionally, however, a particular idea may be pursued through several sources even if the chronological progression is violated. At the end of that particular operation, however, the chronological thread will be resumed. Instead of including direct quotations from foreign language sources or making extensive, precise translations, such material is for the most part paraphrased in English.
beginnings of a division between sounds related to an experimental, demonstrable science, and sound related to human perception to be viewed primarily in aesthetic or psychological terms. For this reason, each of these two approaches are dealt with separately up to the time the contributions of Sauveur and Mersenne begin to show considerable influence in subsequent discussions of sound--about the middle of the nineteenth century.

Timbre in Published Literature

Published about 500 years ago, the Tinctoris dictionary reveals no concern for the particular quality of sound. For Tinctoris, "Sound is whatever is perceived, properly and by itself, by hearing." While this definition could be cited as an early prototype of a modern, expanded concept of timbre, it is apparent that no such meaning is intended. The word timbre itself does not appear, of course, nor does any other word which may be synonymous. Even the term tone does not have a qualitative cast; it refers to a melodic interval, a dissonance, the intonation of a chant, or a mode.

Two hundred years later, however, Antoine Furetière's Dictionnaire universel defined sound within a musical context that implied a stated quality, such as shrillness, harshness,

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3 Ibid., p. 65.
or clarity. In addition, different instruments—the trumpet, flute, horn, violin—possess "sound" which makes each distinct from the other. By this time, then, the concept of timbre had currency, although it is still not referred to by that particular term.

Nevertheless, the word timbre does indeed appear in this dictionary, but not at all in its modern sense. Instead, timbre is said to describe the sound of a variety of clock bells. Tone, on the other hand, is given the connotation of timbre as presently understood (in addition to pitch and intervallic connotations), since it is said to apply to the human voice as it demonstrates the various passions by adopting different tone qualities.

Sébastien de Brossard did not include the word timbre in his Dictionnaire de musique. Even the French Ton is treated fairly briefly. In the section dealing with Italian terms, however, considerable attention is given to Tuono. When it is applied to sound quality, tuono characterizes instrumental tone in

4Antoine Furetière, Dictionnaire universel (The Hague: Arnout and Leers, 1690) reprinted as Le dictionnaire universel d'Antoine Furetière (Paris: Le Robert, 1978). The pages are not numbered in this work; the terms in this paragraph and the next are found in their alphabetical arrangement under Son, Timbre, and Ton.

5Sébastien de Brossard, Dictionnaire de musique (Paris: Christophe Ballard, 1703) reprint of the original edition (Amsterdam: Antiqua, 1964). As in the Furetière, the pages of this work are not numbered. The terms are found in their alphabetical arrangement under Suono and Tuono in the section for Italian terms.
two ways. One is similar to the treatment mentioned above in Furetière's *Dictionnaire*—to distinguish, for example, the tone of a flute or a bell. The second way is new in that it suggests a certain esthetic judgment of quality related to a listener's response: the sound of an instrument is beautiful, melodious, harmonious. This concept is transferred to the discussion of *Suono* as well, where it is pointed out that not only is it the business of music to deal with sounds, but those sounds must also be pleasing to hear.

It seems that Jean-Phillipe Rameau was not as interested in defining music in terms of timbre as he was in dealing with the mathematical relationships of pitches and their applications to music composition. Nevertheless, he may at least have been acquainted with the idea of *Suono* as expressed by Brossard, for the very first statement of his *Traité de l'harmonie* of 1722 is this: "Music is the science of sounds; therefore sound is the principal subject of music."  

The English music dictionary compiled by James Grassineau contains much the same material as do the earlier French sources, especially the Brossard work. Sounds can be "smooth and even, or rough and harsh, also clear and hoarse," while the term

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Tuono (note the Italian spelling) connotes such qualities as whether a sound is melodious, sweet, or disagreeable. 8

Although Sir John Hawkins' *A General History of the Science and Practice of Music* contains no discussion of timbre, it does relate color to music, perhaps for the first time. Curiously, Sir John cited Sir Isaac Newton's observations on the color spectrum of light and excitedly proclaimed this as scientific proof of "the principles of harmony." 9 He drew no direct parallels between the two phenomena, however, and he gave no indication that Newton ever intended any to be drawn.

By the middle of the eighteenth century the term timbre in some dictionaries seems to be fairly well established as meaning roughly what it does today. That is, it is frequently used not merely to identify the sound of an instrument or to distinguish between sound sources, but to carry with it a certain acoustical-aesthetic character. The *Dictionnaire de Trévoux* seems quite clear on this meaning when it indicates that the word timbre is sometimes used for the sound which expresses or conveys the timbre of a sound. 10 In this sense, one says that the timbre

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8 Ibid., p. 311.


is shrill, not merely that the timbre of a sound is shrill. This
is a subtle but significant shift of semantic emphasis, but one
which indicates an increasing sophistication in the meaning and
application of the term.

Considered in a historical context, the treatment of
sound quality in the great Encyclopédie of Diderot and d'Alembert
is rather conservative. Sound consists of three aspects: pitch,
loudness, and the quality of timbre in terms of comparisons of
dull to bright, shrill to soft or mellow. Tone is not pre-
sented in a timbral sense, which seems to indicate that the mean­
ings of these terms are becoming clearer as they become more
specific. But the treatment of timbre as listed under its own
entry is surprisingly brief and old-fashioned: that is, it func­
tions to differentiate types of sound sources.

It is to be expected that Rousseau's own music dictionary
would contain the definitions and terminological organization
found in the Diderot, since it was Rousseau who was responsible
for many of the music sections of the Encyclopédie. While this
is indeed the case, there is one significant difference: sound
quality has its own entry (Timbre), and the discussion of it is
relatively extensive. Not only did he give the expected

\[11\] Encyclopédie ou dictionnaire raisonné des sciences, des
arts et des métiers, eds. M. Diderot and M. D'Alembert (Luccques:
Vincent Giuntini, 1758-1771), Vol. 15, p. 293.

\[12\] Ibid., Vol. 16, p. 285.
descriptive adjectives for the different types of timbre (shrill, soft, dull, bright), but he illustrated by applying these qualities to instruments. In the soft or mellow sound category he placed the flute and the lute, while in the shrill or harsh category he placed the "vielle" and the oboe. The best type of sound for Rousseau is a combination of the soft, sweet sound and the bright, typified by the violin.\textsuperscript{13}

The current German term for timbre is \textit{Klangfarbe}. Even by the middle of the nineteenth century, however, tone color must still have been considered French "territory." This is suggested by the way these terms are listed in German music reference works of the time, such as the extensive \textit{Encyclopädie der gesammt den musikalischen Wissenshaften}. For while it contains an entry for \textit{Klangfarbe}, it merely refers the reader to \textit{Timbre}. The discussion under the French term\textsuperscript{14} seems to show an acquaintance with the earlier French sources, for it applies timbre to the various qualities of the voice, as is done in the Furetière work of 1690. What appears here that is not present in the earlier sources, however, is an association of timbre with what is

\footnotesize
\begin{itemize}
  \item \textsuperscript{13}Jean Jacques Rousseau, \textit{Dictionnaire de musique} (Paris: Veuve Duchesne, 1778), p. 528.
\end{itemize}
referred to as color—not in the sense of hue, but in such terms as bright, dull, rough, hard, and full.\textsuperscript{15}

Contemporaneous scientific experimentation and research now begin to influence the discussions in reference works and other writings being published around this time. This is not to say that earlier works do not refer to science in their discussions of sound. But until direct evidence elicited from demonstrable scientific experiments could be brought to bear upon the subject, treatments of this topic are largely speculative.

The spirit of empiricism which so typified the strides of science during the time of Kepler, Galileo, and others could not but influence the study of sound. Indeed, it was apparently Galileo himself who did the first serious, scientific study of the vibrating string.\textsuperscript{16} According to Claude Palisca, however, it was not until 1623 that the actual observation of overtones was first published. This report was contained in \textit{Quaestiones celeberrimae in Genesim}, by Marin Mersenne. Fifty-four years later, John Wallis explained their physical origin.\textsuperscript{17}

Joseph Sauveur, known as the father of modern acoustics, provided the first experimental evidence proving the existence of the overtone series. This scientific breakthrough he

\begin{itemize}
\item \textsuperscript{15}Ibid., Vol. 6, p. 647.
\item \textsuperscript{17}Ibid., Vol. 18, p. 757.
\end{itemize}
presented to the acoustical world in a paper of 1700-1701 published as "Principes d'acoustique et de musique." It was probably from this publication that Rameau derived the scientific, physical support for his ideas on harmony which he used in the *Nouveau système de musique théorique* of 1726. In 1704, Sauveur published another paper, "Système général des intervalles des sons," a work in which he first "introduced the terms fundamental sound and harmonic sound for the fundamental tone and the harmonics or overtones of a vibrating string."20

From the statements made in many of these sources it seems apparent that there was a general understanding that the pitch of a tone was related to the frequency of the vibrations of the source of the sound. About the middle of the eighteenth century, for example, Grassineau observed that one of the characteristics of sound is that it may be acute or grave (pitched high or low) and wrote that "the cause of this difference appears to be no other than the different velocity of the vibrations of the sounding body."21 This is not a new idea; just a restatement of what many other, earlier authors had written.

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18 Joseph Sauveur in Rameau, op. cit., p. xii.
21 Grassineau, op. cit., p. 233.
Hawkins cited Alexander Malcolm's *A Treatise of Music, Speculative, Practical, and Historical* of 1721 in his discussion of the pitch of sounds. Malcolm admitted that although reason and experience show that a pitch ("tune") is related to "the numbers of vibrations in a given time," this still has not been experimentally proven.\(^{22}\) Apparently the works of Sauveur and Mersenne were not well known in Britain.

By the middle of the next century the science of acoustics had advanced to the point where Schilling's *Encyclopädie* contains a separate discussion for acoustics and a special term (*Klang*) for a particular type of sound. *Klang* is not just any sound; the vibrations of a sound to which that term refers must be regular. The type of sound produced by striking a board is not a *Klang*.\(^{23}\)

From this time onward, writers generally discussed sound quality from the scientific or physical point of view as well as from the aesthetic or psychological. For that reason, both of these approaches will be followed together in the remaining sources.

It was during this time that Hermann Helmholtz began his scientific studies on tone quality.\(^{24}\) First published in 1862, his *On the Sensations of Tone* went through a number of editions

\(^{22}\)Hawkins, op. cit., p. 839.

\(^{23}\)Encyclopädie der gesammten, op. cit., pp. 113-114.

\(^{24}\)Cogan, op. cit., pp. 75-76.
during his lifetime. This work represents a great contribution to the understanding of musical tone and is still a rich source of information and ideas for researchers and scholars.

According to Helmholtz, Klangfarbe depends primarily upon the sound spectrum. He did recognize, however, that the quality of tone is not determined only by the complex waveform of any given moment. He pointed out that "very slight consideration will suffice to show that many of these peculiarities of musical tones depend upon the way in which they begin and end."25

He was also aware that there are additional sounds present in a musical tone that are created by the process of making the instrument speak: wind noise, bow noise, and so on.26 But for purposes of scientific investigation, he purposely eliminated these sounds from consideration. Nevertheless, what he accomplished in the field of acoustics and timbre is remarkable, even today.

In Hugo Riemann's Encyclopaedic Dictionary of Music (an English translation published in this country at the end of the nineteenth century), the definitions become more subtle. Clang, or sound, refers to the "audible vibrations of elastic bodies."27


26 Ibid., p. 67.

Or, in more common language, clang is "tone." Clang color, or timbre, refers to the different types of tones (clangs) of musical instruments which mainly result from "the varied composition of the sounds or clangs." Under the heading of "Timbre" Riemann stated that although timbre is "according to common parlance, [the] same as clang-colour," the term also has a narrower application. In this sense, timbre is "the clang-colour resulting from the difference of the resonant material, as opposed to that resulting from clang [sic] composed of partial tones." Finally, "Tone" is defined as "a musical sound or Klang," although "only clangs with regular vibrations are tones."

From the above, it appears that the German Klang now refers to two kinds of sound. If a sound is composed of regular (harmonic?) vibrations, it is considered a tone; if not, it is regarded as something else. Apparently the latter type of sound is considered at least in part, noise. Timbre (clang-color), on the other hand, still refers primarily to the differences in sounds created by their sources, mostly musical instruments. That is, timbre refers especially to differences in sounds which result from the material of the sounding bodies, instead of merely the dissimilarity in the overtone structure of the tones. By presenting these terms in this manner, Riemann may be

28 Ibid., p. 145.
29 Ibid., p. 793.
30 Ibid., p. 796.
attempting to differentiate between sound which results when only the primary body itself (such as a string) is vibrating, and sound modified by the addition of a secondary source or resonating body (such as the violin body, piano case or sounding board).

By the time the second edition of Riemann's dictionary appeared a few years later, the terminology seems to have clarified even further. In this work the discussion of sound quality is still placed under the French term, although the German translation Klangfarbe is immediately given. What appears here is the now familiar definition which states that timbre is the quality which differentiates two sounds of the same pitch and the same intensity. This edition also states that, although tone color results primarily from the structure of the complex sound itself, timbre as used by German acousticians refers to the sound differences provided by the material of the sounding body. For differences of quality provided by the tone structure itself, the term Klang is used.\footnote{Hugo Riemann, Dictionnaire de musique, 2nd French edition, revised and enlarged by Georges Humbert (Paris: Perrin and Cie, 1913), p. 1028.}

Another source of material on the nature of sound and how it is perceived is Seashore's Psychology of Music. In that work timbre is a very restricted phenomenon. Using the action of a motion picture as an analogy, Seashore wrote that "The timbre of a tone corresponds to the single instantaneous
picture; sonance corresponds to the picture progression."\(^{32}\) It seems apparent that he made this distinction between timbre and sonance the more precisely to monitor human response and to facilitate scientific measurement. Certainly he did not do it because he had simplistic notions of what constitutes tone quality. He explained that "The term 'sonance' was coined in our music laboratory in order to provide a specific name for the successive changes and fusions which take place within a tone from moment to moment."\(^{33}\) Later he defined sonance as "that aspect of tone quality which results from fluctuations in pitch, intensity, time, and timbre within a tone."\(^{34}\)

Thus, since timbre is constantly changing, sonance gives a certain stability and continuity to the sound experience as perceived by the ear. During this process of perception, the ear itself tends to average out small modifications in such elements as pitch, intensity, and timbre so that the actual physical changes are not perceived to be as acute as they really are.\(^{35}\)

As for Seashore's definition of timbre, it seems clear enough:

In general, we may say that, aside from accessory noises and inharmonic elements, the timbre of a tone ...
depends upon (1) the number of harmonic partials present, (2) the relative location or locations of these partials in the range from the lowest to the highest, and (3) the relative strength or dominance of each partial. 36

We see, therefore, that tone quality consists of two main sub-qualities as far as Seashore was concerned: timbre (the instantaneous aural character of a sound) and sonance (that continuous sound quality which the ear perceives as the "average" of the multitudinous slices of timbre proceeding rapidly through time). And like the great German scientist Helmholtz, who preceded him in the previous century, Seashore also recognized the existence of inharmonic partials and other "noise," but did not include these in his definition or his study of timbre. 37

One looks in vain for Klang, Klangfarbe, or Timbre in the massive MGG. There are, however, extensive articles about these and other subjects under the heading of Ton. In the first main division of this article, entitled Systematik, Fritz Winckel pointed out that instruments have different acoustical characteristics (tone color) in different parts of their ranges, generally losing overtones as the pitch ascends. 38 This recognition that one instrument can have a variety of tone colors is important to consider in any timbral analysis.

36 Ibid., pp. 96-97.
37 Ibid., p. 97.
The specific meanings of terms which previously have been somewhat ambiguous are now clear. Ton refers to a sound event composed of a periodic sine wave, for example, A 440. In contrast, a Klang is composed of harmonic partials, while a Tongemisch is a sound made up of many different frequencies and thus can be also called a Geräusch (noise).³⁹

The 1954 edition of Grove's Dictionary of Music and Musicians actually does have an entry for timbre, although the contents of the article are sketchy and incomplete. Timbre, it states, is equivalent to Klangfarbe, "an expression for quality of sound, especially in orchestration."⁴⁰

The Encyclopédie de la musique omits the term Klangfarbe as an entry, but it does have an article under the term Timbre which is written by Jean Matras.⁴¹ What is unusual is that there is some emphasis on perception in that timbre is defined as a subjective quality of sound which makes that sound seem pleasant or unpleasant to the ear. It is perhaps fitting that this modern French work should continue the tradition begun two and one-half centuries before by Brossard who, as was quoted

³⁹Ibid., Cols. 488-489.


earlier, stated that the sounds of music must be pleasing to hear. Matras continued in a more scientific vein, however, and pointed out on the same page that timbre is dependent on harmonics as well as the nature of the attack and any formants which may be present.

It is somewhat surprising that Vincent Persichetti did not isolate timbre in his volume Twentieth-Century Harmony. Nevertheless, he frequently used such terms as "vivid harmonic fabric," "melodic color," "instrumental timbre," "dissonance" as related to "resonance," "orchestral color," "texture" as related to "sound quality," "colors and weights" by spacing and doubling. At first, this may seem like a liberal application of the concept of timbre. The problem, however, is that the author has not defined timbre for his purposes. Consequently one can never be sure whether he is actually referring to timbre or to texture, dissonance, spacing, instrumentation and orchestration, or to some other abstract concept (vivid harmonic fabric).

An effort to correlate subjective descriptions of tone with their acoustical derivation was attempted by Leo Beranek in his Music, Acoustics and Architecture. "Warmth in music, he suggested, "is defined as liveness of the bass, or fullness of

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the bass tone relative to that of the mid-frequency tone."\textsuperscript{43} His description of brilliance on the following page, however, is not consistent. "Brilliance is defined as bright, clear, ringing sound, rich in harmonics."\textsuperscript{44} The problem here is that within his definition of one subjective term he included several other terms of the same type, something he did not do in his definition of warmth.

Beranek's definition of timbre, however, is the classical one but with acoustical underpinnings: timbre is "the quality of sound that distinguishes one instrument from another, one voice from another. It derives from the particular combination and relative strengths of the harmonic overtones."\textsuperscript{45} Although it is clear, it unfortunately does not include the many other elements of sound which make up its quality.

But for Beranek timbre is not equivalent to tone color--a distinction which can be confusing and not at all as useful as Seashore's "sonance." According to the author, "Tone color is the effect produced by a combination of timbres--of voices and instruments in the performance of a musical composition."\textsuperscript{46} One

\textsuperscript{44}Ibid., p. 66.
\textsuperscript{45}Ibid., pp. 41-42.
\textsuperscript{46}Ibid., p. 42.
must ask here why an ensemble performing a musical composition cannot have a timbre.

William Austin's treatment of timbre in Music in the 20th Century is unusually brief, with only two main references. Concerning Schoenberg's Five Orchestral Pieces, Op. 16, No. 3 ("Summer Morning by a Lake"), he wrote, "The first three measures . . . are composed of smooth changes of color playing over a single, sustained chord. This is the essential idea of the whole piece." Aside from the fact that there is very little movement of color in the first three measures, it is disappointing that no timbral analysis accompanies the statement.

The second reference concerns Varèse. Here he utilized Odile Vivier's term "transmutation," which describes "the change of color by imperceptible degrees over a wide range . . . ."

Psychologist Robert Lundin separated sound into two main divisions, the objective and the subjective, which he presented thus:

As a stimulus, sound has two aspects or sets of qualities, the vibrational or physical, and the tonal, often referred to as the psychological . . . . Objective psychologists prefer to consider what have been formerly called the physical and psychological aspects of the sound stimulus as the vibrational and the tonal. Both

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48 Ibid., p. 377.
of these attributes characterize the same stimulus object, sound. 49

Under the heading vibrational, he included frequency, intensity, duration, and form (of the sound wave). The tonal elements of sound quality are pitch, loudness, timbre, time, and density (volume).

This is a useful distinction, for it will be observed that the vibrational aspects are quantitative and are therefore easily measured with scientific apparatus. However, the tonal aspects lean heavily toward the qualitative and must be perceived to be measured. These latter attributes are decidedly useful to the music theorist. Unfortunately, Lundin's definition of timbre as "that aspect of a tone that gives it its richness" 50 is anticlimactic. One is further disappointed that he equated timbre with "tone quality," a term he used in a generic sense up to that point--the former being contained within the latter. Such inconsistent treatment causes needless confusion.

In her doctoral dissertation, "Parametric Analysis of Contemporary Musical Form," Mary Wennerstrom defined timbre as subsuming "instrumental sounds and effects; registers; various combinations of sounds (orchestration); methods of attack (touch, touch, touch...


50 Ibid., p. 52.
styles of playing). This constitutes a desirable expansion of the concept of timbre for purposes of musical analysis. Moreover, these manifestations of timbre can be useful from a theoretical standpoint even if not always quantified scientifically.

The Harvard Dictionary of Music contains a rather conservative definition of timbre and no reference to its used by composers. Entered under "Tone color," it is defined as "The quality (‘color’) of a tone as produced on a specific instrument, as distinct from the different quality of the same tone if played on some other instrument."

This particular definition appears in a number of sources, as we have seen, occasionally with some slight modification. Unfortunately, such a definition limits timbre to instruments, and opens the door to a certain amount of criticism. Could not two instruments be differentiated in ways other than by this particular concept of timbre? One could be far, the other near; one could be loud, the other soft; one could sound a long note, the other a short note or even play repeated notes; one could have vibrato, the other none. Timbre as it is frequently defined seems to ignore these additional ways of differentiating instruments.

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Another publication of 1969, Creative Orchestration, by George F. McKay, has a practical approach to timbre—one particularly useful to the orchestrator who has an ear for subtle timbral shaping. Beginning with page 198 and continuing for nearly 100 pages, he listed and explained numerous procedures which he called "fundamental processes" of creating timbre interest.53 These "Principles of Tonal Interest" (the title of Chapter 3) effectively function to create musical interest and growth. Anything which directs interest to the sound quality of music as distinct from the character of its melody, harmonic vocabulary, and so on, can fall within this category: sudden changes of color and register, doubling, mixing timbres, extreme registers, contrasting articulation, tonal overlapping, pointillism, a melodic line cutting through a mass of sound, antiphonal organization—to name a few. This expansion of the idea of tone quality (timbre) is most direct and practical, utilizing the trained ear of a perceptive musician.

Percy A. Scholes appealed to synesthesia to define timbre. Timbre, he wrote, is "tone quality--coarse or smooth, ringing or more subtly penetrating, 'scarlet' like that of the trumpet, 'rich brown' like that of the cello, or 'silver' like that of the flute."54


It is interesting to speculate where he derived his colors. Could the scarlet of the trumpet be associated with the royal procession, the brown of the cello with its wood, and the silver of the flute with its metal? If this could be extended toward a comprehensive theory of timbre, it would represent a breakthrough for the acoustician as well as the theorist. Later on the same page the author removed that as a possibility, however, by affirming that "The one and only factor in sound production which conditions timbre is the presence or absence, or relative strength or weakness, of overtones." Aside from the fact that this definition of timbre is incomplete, one wonders if the omission of the fundamental were intentional.

The defining of timbre as the sonorous distinction of one sound from the other results in spurious definitions. Instead of actually identifying the term for what it is, such definitions merely designate one of the uses to which it can be put, a procedure which is not unlike defining an elephant as a means of locomotion when hunting tigers. The object itself remains undefined.

Perhaps because timbre is so often associated with this easy, "throw-away" definition, Dixon Ward remarked that it is frequently "used as a wastebasket category; if two sounds are 'different' though having the same pitch and loudness, then they

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Ibid.
must differ in timbre."\(^{56}\) Instead, Dixon suggested that timbre should more properly be thought of as "a function of the harmonic content of the sound . . ."; nevertheless, as far as he is concerned, a description of timbre in terminology not of a scientific nature is valid. "Actually, sounds can be rated or scaled in terms of nearly any adjective that one wants to apply . . . ."\(^{57}\) Such descriptions by musicians of tones as being "dark," or "liquid," or "round," are indeed attributes of tone that "are linked fairly closely to timbre, and need not be considered further."\(^{58}\)

One of Jan LaRue's style-analytical categories is "Sound," which consists of timbre, dynamics, and texture-fabric. As he applied timbre to musical style, it consists of "the vocal, instrumental, and other colors chosen by the composer."\(^{59}\) A formal definition soon follows: "Timbre refers to acoustical tone-quality, the character of the sound wave produced by various


\(^{57}\) Ibid.

\(^{58}\) Ibid.

\(^{59}\) Jan LaRue, Guidelines for Style Analysis (New York: W. W. Norton, 1970), p. 23. ("Sound" is derived from LaRue's SHMR--Sound, Harmony, Melody, Rhythm--which are four categories for style analysis of a musical composition. A companion of these is Growth, a combining element which is related to the formal process).
frequencies in single or combined sources of sound. The timbral choices a composer can make relates to the selection of instruments or other sound sources (e.g., voice), the pitch range, timbral contrasts, and the method of performance (such as pizzicato, double tonguing, and the like).

LaRue's view of timbre and his extended concept of "Sound" characterize the more recent thinking on the relation of that parameter to music. It forms a close kinship to McKay's tonal interest, and paves the way for a better understanding of timbre's structural role in music. The other aspects of "Sound" (dynamics and texture) also have a close connection with timbre, and are frequently involved in the discussions on this topic by many other writers.

Although the Dictionnaire de la musique includes the "wastebasket" description of timbre, it also includes a fairly complete catalogue of the components of the harmonic content of sound which create its timbre: the harmonic spectrum, which partials are present or absent, their relative intensities, the pattern which those that are present form (all odd or all even, for example). In addition, this dictionary affirms the importance of the attack and the decay to the recognition of the sound. If the formant phenomenon had also been mentioned, a more

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60 Ibid., pp. 23-24.
A comprehensive yet concise description of timbre would be difficult to find.

There is statistical support for accepting verbal descriptions of timbre as a valid method of describing tone color, and hence, as a basis for timbral analysis. G. von Bismark has done this type of experimentation the results of which form the basis of his doctoral dissertation in Munich, Germany. He found that when specific types of sound are played for trained musicians to evaluate, they choose descriptive adjectives (from a supplied list) which result in a high correlation with the spectral character of the sounds. Once again the efficacy of the sensitive, perceptive ear is demonstrated.

The year 1975 marks the beginning point of a particularly productive period in which appear several significant publications on the nature of sound and its relationship to the perception of music. One of these is Sound Structure in Music, by Robert Erickson. Written especially for the composer, it concerns itself with "the role of timbre in music" as well as with constructing a theory of timbre.

It is in this book that the definition of timbre adopted by the American Standards Association is presented. This is yet

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another version of the one so frequently used. Timbre, according to Erickson who is quoting the Association's latest publication on this subject, is

that attribute of sensation in terms of which a listener can judge that two sounds having the same loudness and pitch are dissimilar . . . . A note to the definition adds: "timbre depends primarily upon the spectrum of the stimulus, but it also depends upon the waveform, the sound pressure, the frequency location of the spectrum, and the temporal characteristics of the stimulus."64 This constitutes an official expansion of the concept of timbre, a desirable development indeed.

Erickson proposed "a set of music-oriented concepts for thinking about timbre" which correlate the "subjective experience" with the associated "physical phenomena."65 Those subjective attributes of timbre are: (1) the tonal character which occupies the range from noise to clear pitch, (2) tone color, (3) the beginning and ending in terms of time, (4) changes in color and pitch (including vibrato), and (5) the attack sound (which may be rather different from that which continues immediately afterward) and ending sound (e.g., a harp string which is left to dissipate its vibrations naturally as opposed to being stopped).

The correlative physical properties of these subjective attributes are: (1) periodic sound or vibrational frequency at

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64 Ibid., p. 4.
65 Ibid., p. 6.
one end of the continuum and random pulses at the other, (2) the spectral envelope in terms of partials (harmonic or inharmonic), (3) the spectral envelope in terms of physical rise, duration, and decay time, (4) changes within the spectral envelope (partials and their distribution) and frequency rate, and (5) the prefix and suffix.

Here the perception of timbral attributes of sound are again interrelated with their physical derivations. The theorist may utilize these subjective responses in his analyses even though he may not simultaneously corroborate them with scientific data.

Another work of a similar nature is Sonic Design: The Nature of Sound and Music. This, too, is a rather detailed treatment of the subject. One of the ideas it emphasizes is the spectral envelope concept of timbre. "An instrumental tone color is not one characteristic but rather a bundle of characteristics, which has come to be called . . . the sound envelope." This consists of onset (attack and growth), body (which may change with time), and release (decay, damping, after-ring). These are all characteristics which "color" the sound of a source and among which composers make conscious choices.

One of these choices involves the selection of where within the pitch spectrum to place the general range of a

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composition. That this is a crucial variable can be demonstrated by performing a work such as Schubert's "Die Forelle" a fifth lower than its original placement. The resulting timbre and the desired "effect" would be obviously mismatched. Thus the authors properly included this element of sound within the domain of timbre by stating that "The specific placement of a musical work within the total audible range creates, among other elements, the color of its sound."\textsuperscript{67}

This book contains an important contribution to tone color theory through technical acoustical analysis and through the application of the resulting data to musical compositions. Nevertheless, despite the necessity of precise scientific measurement for the development of a "scientific" theory of sonority based upon the sound characteristics of a musical work, the ear is the final arbiter of the effectiveness of any such theory. Indeed, much more can be done than has been done in elevating timbre to its rightful compositional importance--even through the method of careful listening alone. The authors tacitly admit this by remarking frequently that the results of their scientific investigations could be corroborated by the ear.

Wallace Berry makes a broad application of timbre to his analytical process. For him the quality of timbre involves

\textsuperscript{67}Ibid., p. 4.
"coloration, dynamic level, registral change, articulation."  

One cannot be sure, however, precisely what is implied by his term "coloration," for later the author stated that both timbre and dynamics are contained within coloration, despite the fact that in the above quotation, coloration is listed along with dynamics as a part of timbre.  

Subsequent appearances of the term coloration serve to obscure its meaning even further. For example, it is also purported to be related to textural density. To illustrate this relationship, Berry wrote that "two simultaneous pitches sounding in tight compression (say, a major second apart) will project varying degrees of intensity depending on relative homogeneity of coloration (e.g., two clarinets, **forte**) as opposed to dissimilar coloration . . . ."  

In a slightly different context, the term appears again as a function of sonority. "**Sonority** may be defined as the overall sonorous character determined by texture (including doublings) and coloration (including articulation and intensity of dynamics)." Unfortunately, the author's concept of timbre and coloration does not seem to be well focused.

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69 Ibid., p. 20.
70 Ibid., p. 184.
71 Ibid., p. 192.
Perhaps it would be beneficial to attempt to describe what Berry meant. Sonority could be thought of as the general, all-inclusive sound character of a musical work. Contained within sonority are such elements as coloration (timbre, articulation, dynamics, registral placement) and texture (spacing, doubling, number of parts). Timbre itself remains unclarified, an ambiguous phenomenon which seems to mean whatever aspect of sound quality that is convenient or necessary for Berry at that moment.

This would constitute a workable solution to the problem, and is actually achieved rather easily—merely by transposing the two terms "timbre" and "coloration" where they appear associated for the first time.\textsuperscript{72} Then the author's statements quoted make more sense, and the system becomes somewhat more useful as a tool for the theorist.

For a reference work, the \textit{Brockhaus Riemann Musiklexikon} reflects an up-to-date, comprehensive treatment of timbre under \textit{Klangfarbe}. What is even more impressive is the connection it makes between the technical aspects of timbre and the musical. For example, it includes the term \textit{Klangstil}, the characteristic sound of a composer's individual expression. This is a highly perceptive statement, and represents the most recent thinking among theorists, composers, and other musicians with regard to timbre. It is further pointed out that tone color can function

\textsuperscript{72} Ibid., p. 11.
to clarify and color a phrase, that composers use it in the formal process. 73

The Brockhaus makes further refinements involving the subjective descriptions of tone. Tone has such fundamental properties as pitch, duration, intensity, and tone color. It also has secondary qualities, such as brightness, roughness, pointedness or sharpness, density, and volume. 74 This source, then, distinguishes between tone color or Klangfarbe (which is essentially the sound spectrum of a tone) as a fundamental property of tone, and what is also commonly considered to be part of timbre (which is the subjective, adjectival description which results from the aural perception of that fundamental, physical property termed Klangfarbe).

The New Grove Dictionary of Music and Musicians has a respectable discussion of timbre under its own heading. The article on "Sound," however, is particularly fine. Some significant information about formants is pointed out, for example. The formant or formants which exist in the vibrating body of an instrument are not the only ones. In fact, there are many. They exist in the amplifier, the room, the microphone, the transmitting apparatus, our ears, and even in the hearing mechanism of the brain. The author concluded that "The result of all this is,

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74 Ibid., Vol. 2, p. 599.
of course, that the wave that is finally perceived by the brain may be very different from the one that started out from the basic vibrator." It seems clear that this is yet another reason why man cannot rely on scientific measurement alone either to quantify or to interpret his perception.

It is disappointing, however, that the subject of timbral analysis of music is not addressed. As Claude Palisca pointed out in the article "Theory" in The New Grove Dictionary, "The most formidable challenge that music theory has had to confront is to explain aleatory, electronic and colouristic music that exploits broad sound gestures rather than formal devices." Actually, theory has not yet come to terms with music which uses these broad sound gestures as formal devices, either. There is, however, some movement in this direction.

It has been shown in the foregoing discussion that the idea of timbre has developed slowly over a long period of time from a simple concept to a more complex one. During Tinctoris' time there is no evidence that a concern for a theoretical study of tone quality existed. By the late seventeenth and the eighteenth centuries, however, Furetière, Brossard, Rousseau and others had an active interest in the quality of sound. During this time attention was placed primarily upon two areas:

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76 Ibid., Vol. 18, p. 760.
instrumental differentiation, and subjective evaluation in terms of pleasantness or aesthetic quality.

In the seventeenth and very early eighteenth centuries, Mersenne and Sauveur initiated significant scientific experiments with the physical nature of tone which yielded proof for such phenomena as fundamentals and overtones. Modern acoustics begins.

In the nineteenth century the scientific investigation of timbre took a great step forward with Helmholtz's extensive examination of Klangfarbe. During the first part of the twentieth century the understanding of the nature of tonal perception continued to develop with the efforts of such researchers as Seashore, who introduced the concept of sonance.

Among current authors there exists a rich variety of views, definitions, concepts, and opinions. Whereas some writers present timbre as essentially a physical phenomenon that can be adequately described in acoustical terms, others suggest that it subsumes the whole area of sound-related characteristics perceived in a musical composition. For Wennerstrom, timbre properly includes all instrumental sounds and effects, including register placement. For McKay, timbre outgrows its former limitations and becomes tonal interest, including any orchestral procedure or sound quality that directs the listener's interest to the sound qua sound of a work.

Jan LaRue extends timbre into "Sound" (timbre, dynamics, texture, and fabric) and develops an analytical system which can treat this aspect of music as being potentially as significant as
any other—even to the point of recognizing that it may constitute the primary structural element. Bišmark contributes statistical support for the subjective analysis of tone quality through the use of timbre-related adjectives.

Wallace Berry offers coloration and sonority, and assumes analysis has reached the place where it can consider any sound-related aspect as a structural element. Finally, Erickson as well as Cogan and Escot places the responses of the musician's sensitive ear in the position of not only corroborating scientific sound analysis, but being corroborated by it. The ear is the final arbiter and judge as well as an analytical tool par excellence.

**The Audiogenic Image**

All of these sound-related events may be synthesized into and be implied by the term "audiogenic image." This concept may be defined as the musical sound-structure which emerges within a listener's aural awareness as music progresses. It is that immanent, inherent, essential shape perceived as a sonorous representation of the actual music, an image which develops from the aural perception of a musical experience.

As the musician listens to music, he becomes aware of the broad sound-shape of the work as it progresses. At first he may perceive it primarily in general, sonorous terms: it may be loud, low on the register scale, very dense of texture, have no one musical element conspicuous, include no silences, be made up
of notes which occur so rapidly that they cannot be distinguished as disparate pitches, contain special instrumental effects. The more he focuses upon the sound and the more familiar it becomes, the more he may notice additional details, variations, subtle effects. The sonic form of the work (its sonorous design) begins to take shape in his consciousness--based upon the sounds he hears, events which move beyond mere melodic motive, tonal progression, harmonic vocabulary.

It is this image which confronts the modern theorist. It is this image, too, which is evidence of the structural nature of timbre-related musical phenomena. It is the same image that can by itself constitute the musical essence of a composition or assist in the articulation of its form.
CHAPTER 3

THE EMERGENCE OF TIMBRE AS STRUCTURE
IN MUSIC UP TO GEORGE CRUMB: WITH
AN ANALYTICAL PARADIGM

The particular topic of this chapter has to do with the emergence of timbre as a stylistic, sonorous imperative in actual musical composition—its development into a parameter as significant as any other. Of course any composer has the freedom to choose what aspects of music are to be emphasized in his music. For some, timbre has greater importance; for others, less.

Selected examples of music or musical styles from the Renaissance to the present are cited, examples which demonstrate that composers over a long period of time have been concerned about the nature of the sonorous quality of their music. Not intended as a detailed historical investigation, the following discussion is an attempt to provide a brief résumé of the appearance of timbre in music and its importance to the total sound.

The Historical Development of Timbre as Music

The view is occasionally stated that a sensitivity to the color of sound did not really exist before the romantic era. John White perhaps unintentionally contributes to this
misconception when he wrote, "It should be remembered that, in a sense, tight control of timbre was not an important element of the craft of composition prior to the nineteenth century."¹

Despite the modifiers in that sentence, the author seemed to imply that a serious concern with sound quality really did not begin until the nineteenth century. He reinforced this interpretation by continuing, "The highly expressive use of timbre and dynamics was the major contribution of the romantic period."²

A somewhat different opinion is held by H. H. Eggebrecht who concluded that "from the end of the ars nova around 1420 up to the appearance of 'atonal' music after 1900, the dominance of the tone as signal declines in favor of color of the tone, finally becoming completely lost."³ This again constitutes a generalization that can be misleading, presenting as it does a neat historical "progression" typically simplified to make a point.

Stuckenschmidt also is willing to push the timbral frontiers a little farther back than is White. In his Twentieth Century Music he stated that "Only since the eighteenth century has timbre assumed an important role in composition."⁴

²Ibid., p. 159.
The different opinions regarding the importance or non-importance of timbre as represented by the three authors above can be misleading, especially when considered from the standpoint of the audiogenic image. Sound is the very substance which a composer in any era creates, shapes, molds, and modifies until the result satisfies his ear. It sounds right. Not usually does he compose to satisfy a pedantic theorist or to please a rich patron alone. Rather, he must satisfy that inner demand which insists on a certain sonority. That sonorous imperative no doubt existed long before the so-called romantic period, although the particular character of that imperative changes from century to century.

This change in the quality of the desired sound reflects the changing taste and imagination of composers as time progresses. This does not necessarily imply that concern with sound occupies a much greater or lesser degree of importance from time to time. What it most likely does indicate, however, is that the sound image changes in character. To ears accustomed to the monophony of Gregorian chant, for example, the first hearing of parallel organum must have been a breathtaking experience. Even today, to listen to this exquisitely subtle sound only in the context of interval structure and \textit{vox-\textit{principalis}} or \textit{vox-\textit{organalis}} is to miss the unusual, predominating "sound" of that music.

Palestrina's music sounds different from parallel organum. Yet he, too, was most careful to achieve that certain
sonorous shape which so typifies his vocal sound: the controlled melodic contours; the modal, imitative, contrapuntal texture; the particularly careful treatment of dissonance; the linear overlapping within interior cadential areas.

Giovanni Gabrieli explicitly designated performance directions to achieve the special sound he sought. The "Sonata pian' e forte," for example, contains indications for the instrumentation of each part as well as dynamic instructions. Gabrieli demonstrated here that choosing a sonorous character is a function of composing.

The whole genre of opera is an inexhaustible source of examples that demonstrate a high awareness of sound quality—from recitative to aria, from overture to interlude to dance music, from love music to death music. Other examples of sound manipulation are the concerto grosso and concertante styles.

French baroque organ composers had the practice of specifying the registration for their music. Works by Louis Couperin, Guillaume Nivers, François Couperin and others often contain as part of their titles registration indications as tierce en taille, or récit de voix humaine. This custom resulted in a standardized sound quality for organ music of this style.

The style of the French clavecin school has its own characteristic sound. To a significant degree, that sound consists of ubiquitous and vital ornamentation. If the music of François Couperin, for example, were to be performed with all the ornaments excised, the result would be a sound nearly
unrecognizable as his. Indeed, it would not be his, for the consequence would be essentially different from that which ensues when his music is played normally.

J. S. Bach provided some distinctive sounds. An example is the alto solo "Ach Golgatha" from the St. Matthew Passion. The accompaniment is an outstanding example of artistic sound: its oboe da caccia duet intoning an implacable repetitive motive, the attendant pizzicato cello, and the organ continuo. It is not the harmonic vocabulary which remains most vividly in the memory, or even the melody. Instead, it is that peculiar sonorous character which impresses the ear as a unique, integrated, interesting sound.

For Haydn, to vary the sound was often more important than to change the theme. Often he differentiated the structural function of a theme through alterations in dynamics, texture, instrumentation, and registral placement. An example of this structural treatment of timbre is the final movement of the Symphony No. 103 in E-flat major. Its form can with some accuracy be considered a monothematic timbral rondo.

The music of the nineteenth century does, of course, demonstrate a conscious development of orchestral tone color. This is well known, and will not be considered at length here. There is a telling statement by Berlioz, however, that is appropriate. In his A Treatise on Modern Instrumentation and Orchestration he pointed out that the art of instrumentation concerns "The employment of these various [instrumental] sonorous
elements, and their application--either for colouring the melody, harmony, and rhythm, or for producing peculiar impressions .. . . ."⁵ It should be noted that for him a melody, a harmony, or even a rhythm can be "colored," that is, be given to its own color quality.

For Rimsky-Korsakow the process of choosing instrumentation was identical to the process of creating the music in the first place. "It is a great mistake," he wrote, "to say: this composer scores well, or, that composition is "well orchestrated, for orchestration is part of the very soul of the work."⁶ Thus, a composer not only deals with pitches as he creates his art, but with tone color as well--for expressive, contrasting, unifying purposes. It is integral to the composition; one cannot talk about the piece comprehensively and yet ignore the aspect of timbre.

Claude Debussy contributed significantly to the development of timbre as musical expression. As impressionists used color to achieve brillance and effects of light, so Debussy employed sound color as a prominent component of his style. Examples of these sonorous characteristics include, among other

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elements, the rich and rather exotic orchestration of *Prelude à l'après-midi d'un faune*, the special effect of an offstage flute in *Syrinx*, and the haunting sound of a wordless female choir in *Sirenes*. These and other sound structures of Debussy involve instrumentation and sound shaping as much as anything else. As Jacobs put it, "Debussy evolved an extraordinary vocabulary of timbre, which assumes a structural importance often equal to that of the pitch components in a given work."\(^7\)

Igor Stravinsky had a very sensitive ear for specific, coloristic effects. In his study of the use that Stravinsky made of timbre, Timothy Banks pointed out that in the *Octet* the clarinet is "constantly used in its extreme outer registers, but seldom in its middle range . . . ."\(^8\) In the *Mass* much of the sonorous interest results from "The ingenious juxtaposition of contrasting and similar sounds in the two wind quintets . . . ."\(^9\) Other important roles are filled by Stravinsky's "selective use of double-reeds, imitation or contrast of the double-reeds, by the brasses, and the stressing of bright syllables in the vocal parts . . . ."\(^10\) To this list could be added the early example


\(^9\)Ibid., pp. 33-34.

\(^10\)Ibid., p. 36.
of the colorful bassoon solo in the beginning of Le Sacre du Printemps

Schoenberg's view of Klangfarbenmelodie first appeared in his Harmonielehre of 1911. This term designates the concept of timbral progression much like a progression of melody or harmony. Two compositions illustrating this idea are "Summer Morning by a Lake" from Five Pieces for Orchestra, Op. 16, and Webern's Five Pieces, Op. 10. The third piece of the Webern work, according to Stuckenschmidt, contains a use of timbre that actually determines the form of the work.11

These and other recent composers experimented with tone color to the point where the "sounds and colours associated with the individual groups of pitches began to assume an artistic import in their own right, soon superceding that of the pitches themselves," noted Roland Jackson. Nevertheless, "It was Varèse who shifted the balance towards colour, especially in his startling original works of the '20s and '30s."12

Varèse emphasized the importance of sonorous manipulation in a lecture given at Mary Austin House, Santa Fe, New Mexico, in 1936. He stated that with current technology, musical differentiation can

11Stuckenschmidt, op. cit., pp. 57, 60.

be made discernible to the listener by means of certain acoustical arrangements . . . [which] would permit the delimitation of what I call "zones of intensities." These zones would be differentiated by various timbres or colors and different loudnesses . . . . The role of color or timbre would be completely changed from being incidental, anecdotal, sensual or picturesque; it would become an agent of delineation . . . and an integral part of form.13

Among other compositions of his which illustrate the importance of his color concepts are Integrales for woodwinds, brass, and percussion, and Ionisation for 13 percussion instruments.

Messiaen describes his Chronochromie as "The blending of sounds and colours . . . ."14 Concerning Penderecki's Anaklasis, Stuckenschmidt quoted from the composer's own program notes written for the 1960 Donaueschingen premiere: "The chief principle of organisation . . . is the division of the instruments into what might be called colour groups and--somewhat as in the concerto grosso--the bringing out of given instruments within some of these groups."15

Twentieth-century American composers have also contributed to the emphasis on sonority. Only a brief mention will be


15Stuckenschmidt, op. cit., p. 241.
made of some selected examples: Ives' *The Unanswered Question*, with its clustered, independent groups; the experimentation of Cowell and Cage in their exploration of new sounds and ways to produce them; and the less experimental composers such as Carter for his notably coloristic writing such as the third and seventh pieces in *Eight Etudes and a Fantasy*.

The foregoing brief historical survey indicates that composers have been concerned about achieving a certain sound quality, a particular audiogenic image, in their own time. In *The New Music: The Avant-Garde Since 1945*, Reginald Smith Brindle summed it up this way:

> While previous developments in instrumental usages were comparatively slow, in this century they have surged ahead at an accelerating pace. This increasingly frenetic search for novel instrumental possibilities has been due primarily to a need for colour contrasts . . . . Contrasts in timbre have long contributed to the beauty of music, especially in the Romantic period, but as modern composers have gradually discarded the more conventional elements of music--melody, harmony, metre, etc.--tone colours have become one of the main weapons in the composer's armoury.\(^\text{16}\)

Experimentation brings in its own wake a new ethic, a new norm, a new stability. Perhaps we are now in such an era.

Gunther Schuller thought this is the case, for he wrote: "Perhaps we are moving into a period when the innovations of the recent past will be assessed, weighed for their real value and

long-term durability, and then, hopefully, the residue will be assimilated into the mainstream of compositional creativity."17

George Crumb: A Brief Survey of His Life, His Works, and His Musical Style

Within the historical movement toward timbral emphasis in composition, George Crumb appears as one of the foremost among colorists, ready to synthesize what has preceded and to create from this and from his own inner necessity his own Klangstil. Born in 1929 in Charleston, West Virginia, Crumb graduated from Mason College of Music and Fine Arts in 1950 with the Bachelor of Music degree. In 1952 he received the Master of Music degree from the University of Illinois (Urbana), and in 1959 he completed work for the D.M.A., degree in composition at the University of Michigan (Ann Arbor). He studied with Ross Lee Finney in Michigan and with Boris Blacher at the Berkshire Music Center in Massachusetts and in Berlin, Germany. He has taught in a number of schools among which are Hollins College (Virginia), the University of Colorado (Boulder), and the University of Pennsylvania (Philadelphia), where he is currently professor of composition.18

Crumb has received a large number of commissions, prizes, and other forms of recognition, such as the Pulitzer Prize for

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18 A more detailed biography is contained in Appendix B, and a descriptive catalogue of his works is contained in Appendix C.
Echoes of Time and the River in 1968. His works are widely performed, and many are currently available on sound recordings.

The earliest composition that is currently available in score is the Sonata for Violoncello Solo (1954)\(^\text{19}\) which he wrote while at Ann Arbor and Berlin. For his doctoral project he submitted Variazioni: For Large Orchestra (1959). With the theme based on a 12-tone row, the Variazioni shows a number of Crumb's compositional preferences, such as unusual performance procedures and a "reluctance" for the music to end as the sound gradually fades to nothing.

After completing a number of successful compositions, Crumb wrote Echoes of Time and the River (1967), which was premiered by the Chicago Symphony Orchestra. An imaginative work with processions and aleatory passages, Echoes won the Pulitzer Prize in 1968.

The following year saw the appearance of Night of the Four Moons, written during the Apollo 11 flight to the moon. This work is especially appealing to the ear, with carefully shaped vocal and instrumental timbres that are particularly successful. As do a number of his other works (Night Music I being the first), Night of the Four Moons employs the poetry of Federico García Lorca.

\(^\text{19}\) The year in which a composition was finished is shown in parentheses.
Two highly acclaimed works were written in 1970: Black Angels for electrically amplified string quartet, and Ancient Voices of Children for soprano, boy soprano, and other instruments. Voices includes, as do some other of Crumb's pieces, onstage music, dramatic onstage movement by the performers, and musical quotation.

In 1972 Crumb began the series of four Makrokosmos volumes, featuring the piano in music related to celestial symbols. In marked contrast to these, Star-Child requires four conductors and a huge assembly of musicians. It was premiered by Pierre Boulez and the New York Philharmonic Orchestra and additional performers on May 5, 1977.

Crumb's most recent compositions require smaller forces. Celestial Mechanics (1979), the fourth of the Makrokosmos series, is scored for piano, four hands; his latest work, A Little Suite for Christmas (1980), is for solo, unamplified piano.

The musical style of George Crumb demonstrates an uncommon emphasis upon the play and counterplay of subtle sounds that mold and shape the aural content and form. Nearly every discussion of his music which the present writer has read, whether a brief record review or an extended musical analysis, mentions this element as important to his style.

The sonorous quality of Crumb's music has been noted in a few recent books. Regarding some of Crumb's works, H. Wiley Hitchcock remarked that "All of these reveal an extraordinarily subtle and adventuresome tonal imagination, a unique 'ear,'
especially for tiny and delicate shades of timbre." 20 Another writer on twentieth century music, Peter S. Hansen, stated flatly that "Crumb is one of the most imaginative and inventive composers of his generation." 21

If the amount of available literature which involves serious timbral analysis of contemporary music is scarce, it is virtually non-existent in discussions of Crumb's music. In the few examples that do deal with his works, statements about sound quality are primarily limited to descriptions of instrumentation (including voice) and unusual methods of performance. This is of limited value for a thorough examination of the nature of timbre and its role as a formal determinant in its own right.

Most of the statements referred to below are found in relatively brief discussions in books, journal articles, and in reviews of records, scores, and performances. A full representation of comments on record jackets is not found here, although some are unusually fine and have been included. There is,


however, a slowly growing catalogue of longer discussions about various aspects of the composer and his works.\textsuperscript{22}

There exist conflicting opinions regarding whether Crumb should be characterized as avant-garde. According to the criteria of David H. Cope, he should not. Avant-garde composers, wrote Cope, necessarily must "display the newest technique (often anti-technique, i.e., chance music) or sound (often lack of sound, i.e., silence)" for their medium of expression.\textsuperscript{23} Thus, contrary to what seemingly should be the case, the avant-garde composer does not have at his disposal the rich repertoire of the past.


\textsuperscript{23}David H. Cope, "A Post Avant-Garde," The Composer, 3 (Spring, 1972), 61.
musical sounds and procedures as he develops his own musical vocabulary. Instead, he must, as Cope continued, ignore the past, and "work within a multitude of limitations often surpassing those of the strictest of traditional contrapuntalists."24 Hence, "anything goes" cannot be his motto; he must avoid most of it.

But for the post avant-garde composer, the field is clear; anything, indeed, does go. Since such a composer is "non-prejudiced toward sound," Cope concluded, "Bach is no longer an enemy; the major triad, tonality, need no longer be avoided; dissonance need not be a requirement to be contemporary."25

Crumb's works clearly fit the description of the post avant-garde given by Cope. Indeed, they do nothing if they do not evoke, albeit in intensely modern idiom, the images of the past. Some of the modes of expression contributed by the avant-garde (if taken as a historical style with a specific chronological placement within this century) are found assimilated, incorporated with eminent integrity into the whole fabric of his musical expression. But this is not the result of experimentation; that is, it is not the mere creation of effects primarily for their spectacular, unusual properties that fade as they become familiar. Crumb's music projects instead the sense of

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24 Ibid.
25 Ibid.
"having arrived," a maturity which has finally emerged from the artistic turmoil of the recent past.

Anthony Iannaccone in his article in Asterisk/A Journal of New Music felt that there is not a new "common practice" in contemporary music, but a "new common interest" of fusing "disparate ends of the style spectrum . . . ." Thus, a composer may organize pitches serially, but choose to present the aspects of rhythm and "even elements of diatonicism" as one would expect of a neoclassicist, and at the same time add timbral and spatial elements originating from the avant-garde.

Music moving toward some sort of a consensus was also the view of Reginald Smith Brindle who asked:

Where do we go next? It would be presumptuous to hazard a guess. Perhaps from now on the pace will be much slower, with a broader exploration of existing idioms . . . . It could well be that our years of obsession with innovation may pass into an era, not of stagnation, but of quiet assimilation and fruitful creation. Looking back, we can see that some of man's greatest music was by no means wildly new, that in fact it was sometimes distinctly conservative.

For Donal Henahan, a "new school" began emerging in the latter part of the 1960s, one of a particular stylistic character. It is possible, he said, "to discern in much new music a sharp division developing between composers content to go on working within the bounds of serialism and absolute music (the

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27 Brindle, op. cit., p. 187.
Academy's hard line for the last 20 years) and those who seem to be struggling to break out of straitjackets imposed by this recent past. 28 Thus occurs a stylistic split. Composers in the second category appear to Henahan as incorporating into their music a considerable amount of extra-musical suggestion. This group "increasingly admits philosophical, literary, and theatrical concepts into its works, a ghost that the academicians hoped was laid forever [sic] with the passing of Richard Strauss. 29

These are accurate assessments as far as the style of Crumb is concerned, for the bulk of Crumb's output evokes attachment to the nostalgic past as well as to images of the present. As Hansen phrased it in An Introduction to Twentieth Century Music, Crumb shows "himself to be an unashamed romantic. His medium is evocative sound, and his principal areas of expression are nostalgia, the dream world, and the mysteries of the universe." 30

Eric Salzman, however, had a different view. In his opinion, Crumb is an avant-garde composer who is no longer loyal to that ethic. Instead of continuing the movement in the direction of "experimentation, ferment, and reaching out," Crumb


29 Ibid.

30 Hansen, op. cit., p. 404.
has become a leader of those who would move "toward a very conservative, inward-looking art." However accurate or inaccurate Salzman's evaluation may be, it appears to be a minority report.

William Thomson, prior to his discussion of Ancient Voices of Children, preferred to describe musical style instead of musical schools. In his view, the works of Crumb occupy a prominent position within the music of the last half of this century, particularly in regard to the common concern for the importance of sound. "If any generalization can be made with authority about music composed since 1950," he wrote, "it would be that composers have become fascinated with sound for its own sake. Regardless of what rhythmic, melodic, or harmonic function they might serve, recent composers saturate their works with unique and compelling timbres." 

Ancient Voices is an excellent example of Crumb's highly imaginative use of timbre, especially as it involves unusual sounds originating with the human voice—syllables are shouted as well as sung, whispers are projected through instruments, plosive consonances are violently articulated, and tongue clicks are frequently made. According to Carol Sams, Luciano Berio was a pioneer in creating and utilizing a whole range of new vocal sounds,

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31 Eric Salzman, Review of Lux Aeterna, Four Nocturnes (Night Music II) and Dream Sequence (Images II), by George Crumb, Stereo Review (August, 1979), 110.

32 Thomson, op. cit., p. 264.
such as found in his Circles.\textsuperscript{33} It is her opinión, however, that Crumb has been even more progressive in this area and has extended the idea in his works to a far greater degree.\textsuperscript{34}

Many of these sounds, both voiced and unvoiced, may be considered by some to be unmusical noises. The creative use of noise, however, has become a trademark of modern music. One of the first to work for its acceptance as a legitimate manifestation of music was Henry Cowell who wrote an article on the subject of noise in 1929 entitled, "The Joys of Noise." After revealing that the villain of noise is present in works widely thought to contain only music, he observed: "Since the 'disease' of noise permeates all music, the only hopeful course is to consider that the noise-germ, like the bacteria of cheese, is a good microbe, which may provide previously hidden delights to the listener, instead of producing musical oblivion."\textsuperscript{35} Fifty years ago, the crusade for noise in music must have sounded especially clamorous. One wonders how his subsequent analogy fell upon the ears of 1929: "Although existing in all music, the noise-element has been to music as sex to humanity, essential to its existence, but impolite to mention . . . .\textsuperscript{36}

\textsuperscript{33}Sams, op. cit., p. 9.
\textsuperscript{34}Ibid., p. 17.
\textsuperscript{36}Ibid.
Another aspect of Crumb's music is silence—quite the opposite of noise. Unlike Cage, Crumb does not construct a complete work with silence. He does, however, carefully pace the musical events of many of his compositions with specific instructions regarding how many seconds should elapse before the next sound should be heard. Often it seems the composer's purpose to extend the effect of sound beyond the actual duration of the sound itself. Another type of use of silence, related but not identical, is what may be called boundary silences. Serving to assist in the articulation of form, these brief silences are described by Thomson as providing "solid partitions between sections."\(^{37}\)

Actually, it is what occurs between these silences that is of interest to most writers about Crumb. The instruments he uses, for example, and the particularly novel ways in which they are played are frequently mentioned. Lusk in his review of Makrokosmos III pointed out that "The rich atmospheric quality in Crumb's music is partially attributable to the fantastic array of sounds he derives not only from the more exotic instruments, but from the unusual sound he extracts from the more common instruments."\(^{38}\) One of these instruments, the piano, is the subject of an extensive repertoire of performance practices. "The three

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\(^{37}\)Thomson, op. cit., p. 270.

\(^{38}\)Larry Lusk, "George Crumb: Music for a Summer Evening (Makrokosmos III)," Notes, 32 (December, 1975), 393-394.
volumes of the 'Makrokosmos' are virtually a catalog of twentieth-century techniques in piano playing," such as plucking and strumming the strings, producing harmonics, and striking the piano frame.39

There are other unusual treatments of instruments. Some of these are the electrically amplified string quartet of Black Angels in which the instruments are played in a large number of different ways; the water-gong glissando in Night Music I ("La Luna Asoma"); and the unusual combinations of instruments in Dream Sequence.

According to Larry Lusk, some aspects of the sonority of Crumb's music have roots in the works of another composer who was also much concerned with the sonorous aspect of his music: Debussy. Concerning Makrokosmos III, Lusk maintained that in the "many very soft (pppp) and delicate sounds of rare coloration and the somewhat poetic directions for performance (ecstatic, joyous, gently wafting), the influence of Debussy seems obvious."40

The image of that impressionist seems to hover near whenever lists of influences on Crumb are compiled. Another example is found in Steinitz: "Debussian instances, the fragment of the Marseillaise in Feu d'artifice, for example, are not unlike Crumb's imitation of 'a distant mandoline' in Eleven Echoes.

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39 Ibid., p. 394.
40 Ibid.
of Autumn or of a Renaissance sarabanda in Black Angels.\textsuperscript{41} Another example is music to be performed offstage, found both in Debussy's Syrinx for solo flute and in Crumb's Night of the Four Moons.

There are additional comparisons between some of Crumb's characteristic sounds and his ways of handling instruments, and that of other composers. In describing Crumb's piano writing, Lusk stated that the "fast virtuoso passages have the flavor of Liszt."\textsuperscript{42} Other passages of Crumb's piano music remind him of a different composer. In the same work he hears music which reflects "Webern's economy of notes and enjoyment of short, pithy motives as well as frequent rests."\textsuperscript{43} Steinitz, too, recognized that composer. In Night Music II he can make out "the eerie, fragmentary, hyper-expressive minutiae of Webern's prophetic op. [sic] 5. Tiny ostinatos, very high flautando phrases for the violin, harmonics and melancholy glissandos . . . ." combine to give that impression.\textsuperscript{44}

Lusk also saw the influence of Bartok in Crumb's works. Makrokosmos III, he noted, has scoring "identical to Bartok's Sonata for Two Pianos and Percussion." He must have been referring only to the title, for there are differences in the

\textsuperscript{41}Steinitz, op. cit., p. 845.
\textsuperscript{42}Lusk, op. cit., p. 394.
\textsuperscript{43}Ibid.
\textsuperscript{44}Steinitz, op. cit.
percussion instrumentation. Regarding actual piano performance, he stated that there are "many passages where left and right hands play lines in contrary motion, one hand all in flats and one in naturals or sharps, a technique frequently encountered in Bartok's compositions." He also drew a comparison between Bartok's "night music" and "Nocturnal Sounds," the opening piece of *Makrokosmos III*. Steinitz was also aware of sound reminiscent of Bartok's "insect-inhabited 'night music'." But for him it occurred in Crumb's own *Night Music I* and *II*.46

Comments on the structure (non-timbral) of Crumb's music can also be found. For Steinitz, Crumb is unquestionably a "coloristic" composer. Nevertheless, his music is "structurally strong," and does not consist only of effect. "What is important . . . is less the effect-making than the assured expressive purpose which gives Crumb's coloristic language both meaning and justification."47

In their analytical comments, several other writers dealt specifically with a number of different musical parameters. The aspects of timbre (sound characteristics in general), tempo, duration, dynamics, and form are assigned varying degrees of importance in Lewis's discussion of *Night Music I*.48

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45 Lusk, op. cit., pp. 393-394.
46 Steinitz, op. cit., p. 845.
47 Ibid., p. 844.
48 Lewis, op. cit., p. 143-155.
Charles Fowler, concerning *Night Music II*, observed that "The texture of the music tends to be extremely transparent, and for this reason, the most subtle timbral and dynamic nuances are of great consequence in the expressive articulation of the work."\(^{49}\)

Donald Chittum discussed harmony, melody, and unity as constructional elements in Crumb's *Madrigals*.\(^{50}\) Gamer examined *Makrokosmos I* and found that "Each of the 12 pieces is based upon a unique timbral idea, and the form of the entire work is largely determined by contrasts of timbre, texture, and register."\(^{51}\)

Harkins found constructional principles in nearly every parameter except timbre, emphasizing pitch and motivic structure.\(^{52}\) In contrast, Chatman presented an analysis of *Night of the Four Moons* from a number of musical viewpoints including comments on timbre.\(^{53}\) Moevs was concerned primarily with pitch structure and extramusical symbolism in *Makrokosmos III*,\(^{54}\) while Thomson in his discussion of *Ancient Voices of Children* marshaled all the parameters which are most clearly involved in the formal

\(^{49}\) Fowler, op. cit., p. 61.

\(^{50}\) Donald Chittum, Record jacket notes for Madrigals, by George Crumb, Turnabout TV-S 34523 (Vox Productions, Inc., 1973).

\(^{51}\) Gamer, op. cit., p. 466.

\(^{52}\) Harkins, op. cit.


\(^{54}\) Moevs, op. cit., pp. 293-302.
shaping of the work. 55 Lindeman examined Crumb's style in terms of pitch, text-setting, instrumentation, texture, and rhythm. 56

One more subject remains to be considered here—that of musical quotation. Steinitz saw it as a character of the times, and treated it seriously:

Suggestions of other musical styles and, indeed, direct quotation have recently become a more significant compositional technique for Crumb, as for a number of composers. This is not just the fashion of the moment but, for Crumb at least, something used for precise expressive ends. More than any, in fact, he seems bent on exploring our antiquarian attitude to the past in order to highlight the perspective of different eras, cultures and styles and the relationships between them. 57

As the foregoing examination of the literature reveals, the great bulk of discussions of Crumb's works merely centers around the subject of sound quality and how this is achieved. These methods include the use of exotic instruments, unusual performance techniques (applied even to the common instruments), unusual instrumental combinations, characteristic textures, and the use of silence. Also appearing frequently in greater or lesser significance are explorations of extramusical symbolism, which is often associated with Crumb's music. Not as often, however, is there much written about the more usual topics of musical analysis, such as melodic and harmonic pitch structure, rhythm, and

56 Lindeman, op. cit., p. 53.
57 Steinitz, op. cit., p. 845.
form. And finally, virtually nothing exists on the subject of timbre as a structural parameter.

Comments by George Crumb Concerning Timbre in His Own Works

Judging from Crumb's own writings and the minutely detailed performance directions he gives in his scores, the quality of musical sounds is of great importance in his music. Regarding the orchestration of his Variazioni, he stated that

My primary objectives in scoring the work were clarity and diversity of color. Much of the score has a soloistic or chamber-music quality, and all opportunities for color-effects were carefully considered. . . . . The idea of smaller orchestras existing within the larger has been exploited for the purpose of achieving maximum contrast in color and texture. 58

Even in this early work, Crumb's penchant for timbral manipulation is pronounced, and it provides a preview of his future involvement and concern with this area of musical expression. Of course, there are additional elements of significance in his music. But he wrote comparatively little about these.

In his analysis of Peter Westergaard's serial Variations for Six Players, Crumb repeatedly announced that a certain compositional procedure can be heard, thus emphasizing its aural significance. In addition, he mentioned tone color in this work, stating that "A most intriguing feature of the Variations is the

imaginative exploitation of the timbre and idiom of the six instruments involved; ...  

And again, "Interesting juxtapositions of timbre continually suggest themselves to the composer in his endeavor to achieve linear continuity . . . ." As if to emphasize this apparent antipathy to convoluted analyses which are not sympathetic to aurally perceived musical phenomena, he summarized: "Structure in Westergaard's music is something aurally tangible rather than an abstraction whose relationships must be isolated by close analysis."

One cannot read Crumb's detailed record jacket notes about his works without noticing the great importance he attaches to the sounds of the various instruments. Besides listing the instrumentation for a particular work, he also refers directly to tone qualities. Regarding Ancient Voices of Children he wrote that the instruments "were chosen for their particular timbral potentialities." Furthermore, such maneuvers as pitch-bending, quarter-tone tuning, and adding materials to vibrating bodies "heighten the 'expressive intensity'" of the sound and give "special pungency" to the tone of an instrument.


60 Ibid., p. 158.

61 Ibid., p. 159.

About Makrokosmos I, he noted that "the first piece of each part requires an external device for the production of its characteristic timbre . . . ."63 (Italics mine.) As for "Another obscure Adam dreams . . . ." (the third movement of Night of the Four Moons), Crumb characterized it as "a fabric of fragile instrumental timbre, with the text set like an incantation."64

Perhaps an insight into his attitude toward sound can be gained from what he has written about the nature of music itself, which, he said, "might be defined as a system of proportions in the service of a spiritual impulse."65 For George Crumb, music is apparently too often treated without the mystical awe and respect it deserves, and is thus to that extent depreciated. As quoted by Peter Hansen, Crumb asserts that "Music is analyzable only on the most mechanistic level; the important elements--the spiritual impulse, the psychological curve, the metaphysical implications--are understandable only in terms of the music itself."66

Not to recognize the significance of the special sound qualities which combine to create the Klangstil of his music

64George Henry Crumb, Record jacket notes for Night of the Four Moons and Voice of the Whale, by George Crumb, Columbia M 32739, 1974.
66Hansen, op. cit., p. 404.
would also demonstrate an inadequate "respect" for an important and characteristic element of Crumb's style. It is to these qualities, then, that this present study directs its attention.

An Analytical Paradigm

A system of musical analysis can become pedantic and unyielding. It can even repudiate its original role as an analytical tool and become instead a substitute for musical perception. Some factors of sound, for example, may be so closely related in a particular composition that it would be of questionable value to distinguish sharply among them merely because the analytical system provides for it. Nevertheless, in the interest of consistency and order, some sort of guidance system should be followed by the theorist as he examines such matters as musical structure and form. For this reason, the following parametric morphology is suggested.67

Parameters of Sound as a Morphology of the Audiogenic Image: A Process of Perception

**Pitch.** Musical pitch involves the perception of vibrational frequency and the location within the audible range where it seems mostly to lie. A tone can be heard as having a specific pitch, i.e., middle C. Or, it can have the character of general

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67 Some of the ideas found in the following analytical approach are found in such sources as *Guidelines for Style Analysis* by Jan LaRue (1970), "Parametric Analysis of Contemporary Musical Form" by Mary Wennerstrom (1967), and *The Analysis of Music* by John White (1976).
pitch and be identified as being, for example, somewhere in the medium range of a particular instrument.

In addition to sounding as single tones, pitches also exist in groups. Multiple tones arranged in a vertical configuration (sounding simultaneously) can be perceived as intervals, chords of various species, clusters, or other more or less random aggregations. Pitches which occupy a horizontal plane (sounding successively) can be heard as discrete tones, as belonging to small groups, or as extending a considerable distance to coalesce into a melodic line. Such pitch groups and lines also form abstract geometrical shapes or contours.

Any group of successive pitches can also be described in terms of physical range. That is, if a particular melodic line contains a very high pitch as well as a very low one, it would have a wide range. If, however, the highest and lowest pitches are relatively close together, the range would be narrow. Range can also be thought of in two general modes: actual and prevailing. Actual range considers only the highest and lowest pitches when computing the extent of the range. In prevailing range, however, the most characteristic high and low points are considered before it is described as narrow or wide. Similarly, two or more simultaneously sounding pitches also possess the

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68 Prevailing range is not to be confused with tessitura. The former merely concerns which pitches seem to be the most significant highest and lowest tones. The latter involves the position of the majority of the notes within the range of a specific instrument or voice.
quality of range, involving the distance from the highest to the lowest pitches.

Finally, a group of pitches may possess the quality of tonality. If this is the case, one pitch seems to predominate over the others in terms of its importance as a center around which the others revolve and toward which they are attracted. This quality, however, does not necessarily exist for all groups of tones.

Dynamics. Dynamics is the quality of perceived loudness or softness of a sound. Such a sound can remain at a particular dynamic level, or it can change by becoming louder or softer. If a particular tone suddenly stands out as louder than the others which occur immediately before and after it, that tone is considered to have been given a dynamic accent.

If, however, a sound becomes progressively softer until it dies out completely, it becomes silent. Silence is the ultimate extension of the dynamic quality of soft. It can have a number of different but related functions. It can serve as a kind of imaginary sonorous frame around a complete work, for example. This type of silence can be thought of as becoming a part of the presentation of that work as the mind anticipates the physical sound before the performance begins, and as the memory extends the properties of the physical sound after the performance has terminated. Silence can also function as a partition between movements or sections, actual segments of silent musical time-space which contribute to the perception of musical form.
and provide balance and perspective to the composition. Another
type of silence is essentially a non-sonorous extension of a
musical sound past the time when that sound has actually stopped.
The ear, however, may not be convinced that it has ended and
imagines that it continues.

Time. Time subsumes a number of durationally-related
characteristics of musical sound. It measures the duration of
sound as well as the absence of sound (silence, rests). It pro-
vides a temporal framework whereby the number of successive notes
per unit of time can be perceived as being performed rapidly or
slowly, as having high successive density or low. In addition,
time measures the length of groups of notes such as motives,
phrases, sections, and even whole movements or complete works.
In general, composers are aware of the effect the temporal qual-
ity of these formal units has on the total shape of their work
as well as how it affects the perception of their listeners.

Another manifestation of time can be seen in rhythm pat-
terns. Frequently these divide time into rather periodic seg-
ments referred to as meter. Creating a sense of meter can be
accomplished in other ways as well, such as by pitch patterns,
dynamic accent, and harmonic rhythm. When this occurs, however,
these elements also tend to create a particular perception of
music which is related to time. Some music may have neither
rhythmic patterns nor meter. In such a case, what usually re-
mains is only a sense of musical pulse—the prevailing rate of
periodic articulation of time.
Tempo is another aspect of time. This is related to pulse and successive density. If the pulse is slow, the music is usually considered to be slow, even though some very rapid passages may be present. If the pulse is fast, then the music is generally perceived to be fast, even though there may be some passages of long notes present. To achieve the most acute sense of fastness or slowness, both the pulse and the note durations should be fast or slow. Tempo can either remain the same or change gradually or quickly.

In musical texture which consists of two or more lines, certain types of durational (rhythmic) relationships occur between these lines. Generally, these relationships can be described in two ways. One way is by a ratio which specifies how many notes in one line occur against those of the other line or lines. The second compares the rhythmic patterns of each line, which may be the same or different. These lines may contrast in other temporal aspects as well, such as in meter and even in tempo.

Texture. Texture involves the vertical and horizontal disposition of tones. Included are simultaneous vertical density, which refers to the number of tones sounding at once, and simultaneous horizontal density, which concerns the number of linear extensions (parts, melodic lines, voices, layers, strata) which are perceived to exist concurrently.

In addition, texture concerns two different types of relational qualities that exist between these linear extensions.
One type involves a comparison of their contours and can be described as parallel, similar, oblique, contrary, or variable. Second, the qualities of vertical space between these dispositions of notes is also an aspect of texture. This can variously be referred to as homogeneous (the space divided approximately uniformly), heterogeneous (the space divided unequally), and variable.

Some terms which are commonly used as referring to types of texture are really parametric composites and imply a musical quality which may be called a parametric fusion. Counterpoint, for example, can be defined in terms of the parameters of texture (contoural relationships) and time (rhythmic relationships). Parametric fusion is also involved in other terms such as homophony, polyphony, and heterophony. It would be more accurate to consider these as genres of parametric fusion or as super-parametric phenomena instead of types of texture. This would facilitate their explanation and understanding, and would result in less confusion.

Monophony, on the other hand, is a purely textural description. Whatever its contour or rhythm, it remains a single line in and of itself, with no complicating relationships with other simultaneously sounding tones. If the term polyphony denoted only that the simultaneous horizontal density consisted of two or more lines, then it could be used as a consistent complementary term to monophony. Unfortunately, it has meant
something more than that for so long now that any change in its meaning would probably not be readily accepted.

**Timbre.** Timbre has to do with the perceived quality of sound and can be described in "vibrational" as well as in "tonal" terms. The following descriptions contain elements of both types, terms which impinge upon both the physical and the psychological nature of timbre. Also important in timbre, the sound spectrum consists of the number of partials present in a tone, which partials are present and which are missing, the relative loudness of each, and the nature and location of the formant or formants.

The sound envelope is also significant. It includes the attack (most of the transient "noise" occurs as the note is first articulated), the continuation of the tone after the attack, the decay, and the nature of the termination. One way in which musicians alter the sound envelope for special sonorous effect is to vary the manner in which the sound is produced. Some of these ways are by writing for pizzicato articulation instead of arco, terminating sounds by stopping their vibration instead of permitting them to dissipate naturally, and plucking a (piano) string instead of striking it with the action of the hammer.

Another way to manipulate timbre is to play rapidly instead of slowly, thus creating a high horizontal density. Since a rapid series of attacks increases the noise content of the sound and truncates the normal decay, the sonorous character of the sound itself changes.
There exist still other factors which affect timbre, such as registral placement within the range of the sound source. Tones produced in the high range of a clarinet, for example, sound very different from those produced in the low. Another factor is whether a tone is perceived as being produced by one instrument or by several, a circumstance which has a marked effect on tone quality: the term "choric effect" refers to the sonorous result when several instruments play the same pitch as opposed to only one.

Composers can further manipulate the timbral qualities of tones to achieve additional sonorous effects. Certain terms describe these manipulations. (1) Spectral glide describes a smooth alteration of vowel quality in vocal music or of sound quality in instrumental music. In instruments, this can be accomplished in a number of ways, such as by changing the embouchure or by moving the bow's position along the string. (2) Shingling refers to the rapid, staggered entries of different timbres, usually in different pitch areas. (3) Timbral hocketing or interlock are created by providing various tones of a melodic line with different sound qualities. (4) Layering describes the concurrent presentation of several distinct timbral lines or strata. (5) Overlapping occurs when a new timbral line begins before another timbral line ends. (6) Fusion (the opposite of layering) is perceived when all the various timbral qualities of the sound sources blend into a general characteristic timbre.
In practice, music does not always clearly or consistently reflect any one of these procedures. As Erickson expressed it, most music is not either layering or blending. Instead, it is "an amalgam of blends, layers, lines, masses, and blocks."  

Structural and Formal Procedures: The Manipulation of Parameters into Shape

Structural Relationships. The structure of a musical work is considered to exist in its various parts and sections, and in the relationships they have to each other on several architectonic levels. For this present study, no a priori assumption has been made concerning how many of these levels there shall be for each composition. Instead, this number is considered a variable detail to be governed by the work itself.

The term "relationship" implies a certain degree of similarity and difference in character and process. Types of similarity include repetition or restatement (immediate or delayed) and return (reprise-like in nature). Dissimilarity is achieved by the insertion of contrast.

Between these two extremes (similarity and contrast) exists the type of relationship called modification. This involves continuation (extension or development) by such procedures as immediate repetition, sequence, imitation, fragmentation, and extension (motivic).

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**Parametric Manipulative Devices.** Procedures to which any parameter is subject are shift (successive sudden change), gradation (gradual change), overlapping, superposition (several at once; concurrent), interposition (a change of focus to one parameter within another), divergence (separation into component parameters), and fusion.

**Psychological Response Characteristics.** These responses are created by the nature of the parametric relationships on the structural level. There are two general categories of these responses: first, that which is perceived as action, tension, instability, movement, change, forward motion, or growth; and second, that which is heard as inaction, repose, stability, composure, equilibrium, or stasis.

**Form.** Form refers to what is perceived as the complete, synthesized, organic shape of a musical work created by interaction on all the various architectonic levels of structure. Factors involved are relationships between continuity/similarity (flow) and contrast/dissimilarity (interruption)—parametric relationships and actions which are cohesive or differential.

From a consideration of the foregoing factors in the descriptive analysis of each movement or work, the audiogenic image is synthesized and presented as a significant element in the perception of form in that movement or work. The resulting formal shapes and the most salient structural features and actions which contribute most strongly to them are shown on graphic
representations or figures. These figures are placed after the discussion of the parametric features of each movement or work.
CHAPTER 4


Introduction to Night of the Four Moons

Composed in Media, Pennsylvania, during the Apollo 11 flight to the moon in 1969, Night of the Four Moons captures some of the romantic mystery of man's deepest intrusion into space and the resulting ambivalent portents. It is scored for alto voice, alto flute (which doubles on the piccolo), banjo, cello (electronically amplified), and percussion. Although only one percussionist is required, other performers also play some of these instruments: the singer plays four of them, and all except the cellist strike a single crotale as they leave the stage at the end of the work. Its typically large percussion section contains some rather exotic instruments, such as the African thumb piano (mbira), Tibetan prayer stones, and Japanese Kabuki blocks.

The work consists of four movements, corresponding to the four Federico García Lorca poems from which Crumb extracted fragments for them. Each movement has its own character. The first ("The moon is dead, dead . . .") is rather static with instruments predominating and the voice functioning as a subdued, litany-like ritornello. In general, the tempo effect is rather
slow, but the rhythm patterns themselves are highly sophisticated, except for those in the voice part.

The second movement ("When the moon rises . . .") is also restrained, with languid passages separated by extended pauses. Two of the more unique sonorities introduced here are the cello sul ponticello glissando quarter-tone trills, and the particular timbre of the Tibetan prayer stones.

The slow-paced third movement ("Another obscure Adam dreams . . .") is primarily a treatment of timbre. With the text directed to be sung like an incantation, this movement provides important active parts for the piccolo and mbira. The sustained harmonics in the cello foreshadow their more extended use in the final movement.

The fourth and last movement ("Run away moon, moon, moon! . . .") consists of three main divisions. The first two provide a contrast with the preceding music in dynamics, tempo, and intensity. Within the first division, the frenetic, half-sung, half-shouted cries of the child furnish dramatic contrast to the calm, assuring, yet somehow threatening responses of the moon. In the second division, improvisatory procedures are used with great flexibility in tempo, dynamics, and performance media and techniques. During the second and third divisions, which function as a coda to the whole composition, nearly all the performers successively quit the stage, leaving only the cellist who continuously produces high, ethereal, sustained harmonics. The final division presents two contrasting types of music, Musica
Mundana and Musica Humana. The first of these consists of an offstage ensemble (including the singer) which performs farewell music in the style of a Mahler berceuse; the second consists of the high cello harmonics that are suggestive of the electronic signals emanating from deep space. Without concluding its characteristic melodic motive, the cello gradually fades away. And thus, instead of ending, the music seems to disappear into the vast reaches of immeasurable space.

Introduction to the Analysis

Chapters 4 through 7 contain a sound analysis of Night of the Four Moons (one chapter for each movement) which is presented in two stages. The first contains a discussion of the five parameters of pitch, dynamics, time, texture, and timbre. Although the present study does not emphasize pitch, certain aspects of that parameter are involved, primarily those which relate more to properties of sound than of construction.

The second stage of the analysis deals with the audiongenic image—a description of the salient aural events of each movement and their interrelations. This description is necessarily a perceptual exercise with a significant amount of subjectivity. It is also necessarily dependent upon hearing a performance as one of the sources of such sonorous data as amount of dynamic contrasts, variations of tempo, lengths of silences, and the timbral nature of instrumental and textural combinations. These aspects of sound as well as others cannot be completely
extracted merely by reading the score; the ultimate confrontation between music and man occurs in the ear.

The Analysis

"The moon is dead, dead . . ." consists of four sections, each of which is delineated by varied repetition and introduced by the banjo-cello combination. The disposition of the instruments is in two sets of two instruments each (the alto flute and alto voice; the banjo and cello) along with percussion instruments (finger cymbals, bongo drums, and Chinese temple gong). Just how this is accomplished is examined below in the discussion of timbre.

Pitch

The manipulation of pitch in this movement contributes substantially to the static quality of the sound as well as to its movement. Of the voice, alto flute, banjo, and cello, only the flute breaks out of a narrow, restricted range within which the others are closely held. As illustrated in Figure 1, the actual ranges of the voice and banjo are nearly the same, the lower ranges of the voice and flute are identical, and the upper range of the cello is merely a minor third below that of the voice. More revealing, however, is the comparison of the

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1The following analytical descriptions are to be read along with reference to the figures as well as to the complete score in Appendix A.
prevailing ranges of those instruments.\textsuperscript{2} In that respect, the voice, banjo, and cello occupy the same pitch space. The flute, however, is markedly different. With the other instruments acting as a pitch foil, the flute in its upper range soars to an octave and a half above the range of any of the other instruments, creating a stark pitch contrast.

The three percussion instruments—the finger cymbals, the bongo drums, and the Chinese temple gong—provide punctuation in descending pitch areas: high, medium, and low, respectively. They are presented in this order in each of the four main sections of this movement. In the last one, however, the bongo drums are omitted, leaving the pitch spectrum of the percussion group represented by the highest and lowest of the instruments.

\textsuperscript{2}To simplify and facilitate discussion, the voice will henceforth be considered an instrument unless otherwise treated.
Pitch contours are also a point of differentiation. Both the voice and the flute have definite, recognizable contours. In each appearance, the voice describes arches of more or less simple structure which begin low, rise to a high point, then descend again. In its first appearance (0-17)\(^3\) the flute describes an inverted arch, reaching a low point during its course. The second contour (42-ca. 58) begins that way, but flares into a normal arch as it progresses. During the last and longest passage (82-ca. 103), the flute again spins out a double, inverted/normal arch. Finally, the "speak-flute" phrase at the end of the movement also reflects the prevailing arch of the vocal line.

The contours of the banjo and cello are essentially static. This provides enhancing contrast for the movement provided by the other two instruments.

The result of Crumb's treatment of the parameter of pitch in this first movement, then, is a sound which exists primarily within a narrow and static pitch range throughout the whole piece in all the instruments except the flute. That last instrument contains the greatest amount of pitch differentiation, both in range and in contour. Each time it appears, it extends its range upward, until in section three it reaches an unmistakable peak. Finally, in the combined role of voice and flute, it returns to the range in which it began, thus describing on the most general

\(^3\) The numbers enclosed by parentheses refer to seconds and serve to locate the event or passage being discussed.
level what the voice has been repeating continuously on a more
detailed level—an arch.

Dynamics

Dynamic treatment in this movement is associated with the
instruments, each of which has its own dynamic character. The
voice is always pianissimo with only a slight dynamic rise in the
middle of its melodic line. In contrast, the flute has a wide
dynamic range, from nearly inaudible to triple forte. Fortissimo
in the alto flute, however, does not indicate the same dynamic
intensity as it does in the bongo drums or in cello pizzicato.
Nevertheless, the flute is considerably more active dynamically
than the voice. Each of its melodic units is generally shaped by
a crescendo as it progresses to a dynamic climax, after which it
ends quietly.

The bongo drums are like the flute in that they, too,
contain a crescendo in each of their statements. However, unlike
the flute, they begin with a heavy accent preceding the initial
soft passage. Then they proceed to the crescendo and end at the
dynamic climax without returning to a soft passage. The remain-
ing instruments contain no dynamic subtleties: the banjo and
cello constantly sound at a relatively loud level, the cymbals
are always loud, and the gong is always soft.

Dynamic stability, then, is provided by the voice,
strings, cymbals, and gong, while dynamic action is provided by
the flute and drums. The location of the most intense dynamic
action—that is, the dynamic climax—is found in the last statement of the flute (82-103) and the drums (103-111). This dynamic high point is all the more effective since it is followed by the very soft voice and gong music.

Another important aspect of dynamics in this movement is that of silence. The silences which follow the voice are largely imaginary, being a sort of non-sonorous extension of the ringing of the gong (three times) and the finger cymbals (once). However, the silences which immediately precede the vocal entrances may be heard as real, since the reverberations of the bongo drums die rather quickly.

Whatever the nature of these silences (real or imaginary), they function in this movement as partitions which structurally divide one section from another or separate two contrasting events (Figure 2). Structural silences follow the voice statements in three locations (31.5-35, 73-76.5, 122.5-126), where they mark the end of the first three main sections of the work with silences of about 3.5 seconds each. Smaller partitions precede each voice line (after the drums), thus isolating the vocal music, probably to highlight the importance of the text. A larger one precedes the "speak-flute" (after finger cymbals at 140.25) at the very end.

Silences not only play structural roles, but they also form an important segment of the actual music itself. There are seven significant periods of silence within the movement averaging one every 22 seconds of about three seconds each. Nearly 14%
of the total performance time of the movement consists of some sort of silence. During these periods of inactivity the ear is free to continue "hearing" the preceding sound, to prepare for the beginning of the next section, or to notice the contrast between the sounds which occur before a silence with those which occur during it.

This activity can become a significant part of one's perception of the music itself. In fact, because of the frequent silences in structurally important positions, the listener cannot be sure the movement has actually ended until he hears the beginning of the next one. As shown in Figure 2, a partitioning silence can be expected where the music actually terminates,

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4 Empty rectangles signify silences preceding vocal lines. Black rectangles signify silences following voice lines which also partition recurrences of varied repetitions. The line connecting the rectangles in sections 1, 2, and 3 represent the vocal part; the dotted line in section 4 represents the speak-flute. The double bar indicates the notated end of the movement. The numbers at the top indicate seconds.
leading the listener to believe he may be hearing what heretofore was an integral element of the music instead of a kind of open-ended closure to the movement itself.

Time

One of the aspects of time which is readily noticeable in this movement is the contrast among the various instruments with regard to the prevailing density of successive articulations.

This density in the flute, for example, increases each time it nears the end of its line. During the first part of its initial statement (0-9) it performs 10 articulations, or about one per second. But in the remainder of that statement (10-17) it performs 19 articulations or nearly 3 p/s. This pattern is followed throughout the movement. At the terminal points of each complete statement the articulation density is low. Between those points, however, it becomes much higher, with the greater number of notes occurring closer toward the end than the beginning.

The banjo and cello are very similar in density. In the first phrase (0-7.5) they share four articulations, or about 0.5 p/s. From this point through the greater part of the movement (35-136.5), the rate increases to about 2 p/s. In the latter half of the last section (126-140) the rate rises to about 3 p/s, thus ending at approximately six times the rate with which

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5Per second will hereafter be indicated as p/s. Hence, 4 p/s signifies four per second. The single letter s. either before or after a number signifies second or seconds.
it began. To enhance the perception of this increase, the very last music played by these two instruments (136.5-140) contains a rhythmic *accelerando*, which has been characteristic of the drums up to this point.

As has just been mentioned, the rhythm of the drums is characterized by a slow beginning which soon accelerates up to the very end of the statement. Because of this, the drum contains the densest passages of all. In its last statement (103-111), for example, there are 73 articulations in about seven seconds, or a rate of about 10 p/s. This treatment renders the contrast between the rhythmic activity of the drums and the moderate, unvarying rhythms of the voice even more effective.

The voice part is generally stable and of moderate density, with durations more uniform than those of the other instruments. As in the case of the other parameters, the voice provides stability--this time, in rhythm.

Each instrument has its own density and rhythm characteristics. The voice is stable and uses few different durations. The flute contrasts with the voice in having a greater number of different durations as well as in changing its density rate along the length of its statements. The strings are characterized by a sort of *accelerando* throughout the whole movement, whereas the drums begin each of their statements slowly and increase speed up to the end.

Meter, though indicated in the score, is not easily perceived, if at all. There are no periodic rhythmic patterns, and
measure lines usually bisect silences or tied notes. Nor does a consistent pulse occur for any length of time in the movement, except possibly in the voice part. What emerges instead of meter, then, is a flux of activity and inactivity, a shifting density of articulation which at certain times and in certain instruments is relatively stable (voice) or variable (strings) or changing (flute and drums).

With regard to the duration of the main sections of the work, each time a section is repeated it becomes longer. This can be seen in Figure 2, which is located on page 108. Section 1 is 35 s., section 2 is 41.5 s., and 3 is 49.5 s. This is the result of two actions. One is the successive lengthening of the flute and voice parts in each section. The other is the temporal shift of the flute to a position after the strings have begun instead of starting concurrently as at the beginning of the first section. However, the very last section of the movement (the fourth) reverses this trend. This section is a partial restatement, or coda, and is the shortest section of all, lasting only 27 s. This brings to a halt the growth in length at an appropriate place, the end. Its brevity is accomplished by the elimination of the successive order of performance for the flute and voice, combining them instead in the "speak-flute" passage which closes the work.
Texture

The texture of this movement consists essentially of one part. There are times, however, when more than one instrument sounds at the same time. These instances can be categorized in three ways. The first, which is the most convincing two-part texture effect, results when the instruments are actually articulating concurrently. This occurs only in the last appearance of the banjo-cello combination, as shown in Figure 3 (126-134.5). Contained in the whole passage (126-140) are six examples of concurrent articulations (Figure 3 shows the first four). Two of these events form chords which fuse timbrally into one sound, thus weakening the two-part effect.

Another type of simultaneity occurs as the flute sustains a note it began earlier, and the other instruments rhythmically punctuate that sound with single articulations. This is located at (3), (7.5), (84), and (88), where the banjo and cello sound against the sustained flute tones, and also at (8.5), where the finger cymbals do the same.

Finally, a third type of concurrence results when a plucked or struck instrument continues to resound while another sound is articulated in a different instrument, such as can be seen in Figure 4. This occurs most frequently in the banjo and cello.

This movement, therefore, is primarily of monophonic texture. The concurrent sonorities that do occur become more complex and convincing just before the end of the movement.
Figure 3. Movement I: Concurrent Articulations (126-134.5)

Figure 4. Movement I: Sounding Concurrence (35-42)
Timbre

The disposition of the instruments and their interaction with each other as sound qualities show Crumb's timbral sensibilities. They are arranged according to timbral similarity: the alto voice/alto flute, the banjo/cello, and the percussion (finger cymbals, bongo drums, and Chinese temple gong)—two groups of two, and one of three.

The primary melodic and sensuously expressive instruments are the voice and the alto flute. As has been noted earlier, the voice part is similar in each of its appearances. This consistency applies to its timbral parameter as well. The flute, however, contains more variation. Each of its melodic segments is preceded by a percussive sound, at first by tone clicks, and finally by the finger cymbals. In addition, it performs a slow and wide vibrato at the end of each of its statements (13, 54, and 99). And during the vibrato, it contains a slight spectral glide.

While the voice and flute are always temporally disassociated, the banjo and cello are not. Timbrally the most similar of the instrumental groups, these stringed instruments form a "sound-melody" which has the effect of timbral hocketing (see Figure 4). This unusual effect is created by each instrument playing alternating segments of the music in a rich variety of different modes of performance, such as finger plucks, plectrum articulations, and pizzicato (both right hand and left) among others.
The banjo/cello combination also provides a great deal of timbral action, despite pitch and dynamic limitations. These two instruments begin with the flute at first, then (in succeeding sections) shift to appear prior to it. The result is timbral overlap as the flute enters in sections two and three. In the fourth section, however, the shift reaches its ultimate dislocation, and the instruments appear alone in their most complex textural and timbral passage of the movement. During this last appearance (see Figure 3) they abandon their hocketing procedure and present their sounds in a combination of timbral layering and overlapping.

A similar but even more dramatic operation takes place in the melody instruments. This is shown in Figure 5, which contains an excerpt from the very end of the movement. Here, the voice and flute organically combine to create a flute whisper which has sufficient quality of pitch to describe a melodic contour reminiscent of the opening vocal line. Thus, at the end of the movement, the composer combines the timbres of two instrumental groups (the banjo and cello, the voice and flute) in what can be thought of as a timbral summing-up or cadence, a focusing down from the many to the few.

Each of the percussion instruments is associated with at least one other type of instrument. The finger cymbals end the percussive tones of the banjo and cello, and clear the stage for the flute to appear alone with the second portion of its melodic line. This is immediately terminated by the drums (the most
raucous of sounds) which provide a dramatic introduction to the voice (the most melodically expressive and sensuous of sounds).

After the voice has sung the first line of the text, the gong announces the end of that particular section. The voice, however, extends the line by repeating the last few notes of the previous phrase, as if to emphasize its own importance and the significance of the word muerte. The percussion instruments, then, are used much as punctuation marks for the succession of timbre provided by the other instruments.
At the very end of the movement, timbral ambiguity is created by the "speak-flute" (see Figure 5). Throughout this movement the flute performs after the strings; hence, one is led to expect this to occur again at this point. Reinforcing this expectation is the appearance of the finger cymbals (ca. 140) ending the string passage; they, too, have been associated with the flute. However, the accelerando during the latter part of the strings (136.5-140) is imitative of the drum passages, which previously have always heralded a vocal entrance. Also, the appearance of the gong is suggestive of voice, for it, too, has been associated with the vocal line.

What exists here, then, is a tension created by two conflicting timbral expectations. This causes the listener to wonder if the combined timbre at the close of the movement comprises an "end-signal," or if it implies more timbral manipulation to come.

The Audiogenic Image

In this movement the particular succession of instrumental sounds (including the voice) constitutes an important part of the audiogenic image. The plucking, clicking sounds of the strings and tongue capture the immediate attention. Then the flute begins, the first part of its melodic line sounding against the continuing strings until they drop out part way through. Next, the drums provide pure percussion, after which the voice contributes pure melody. This particular progression of timbres
and their superposition, followed by their divergence into simpler component qualities, characterizes the whole movement, as can be seen in Figure 6. Since this timbral treatment occurs four times, it serves to divide the movement into four sections. This can be seen in Figure 6 in the timbre graph along the top of the figure, where the banjo/cello combination can be seen beginning each section at (0), (35), (76.5), and (126).

Dynamics and tempo are more salient aspects of sound. As shown in Figure 6, the wedges most noticeable are those which accompany the drums (e.g., ca. 18-21.5), and the modified wedges (rounded off) of the flute. These dynamic wedges are associated with variations in tempo, generally speeding up as loudness increases, and vice versa. In contrast to this dynamic movement are the relatively static dynamics and tempos of the strings and voice—the first being loud, the second, soft. This different treatment of dynamics tends to differentiate the instrumental sound qualities. It also contributes a cohesive effect to the movement, since the manner in which dynamics are handled is virtually consistent throughout.

Another important element concerns pitch. Although a discussion of pitch structures per se is not germane to the present study, it should be mentioned that the unique aural Grundgestalt of the basic scale pattern of G A C-sharp E-flat G-flat (with its fragments and modifications) pervades not only this movement but the whole work. The pungent sonorous qualities of the tritone and various seconds and sevenths contribute heavily
"The moon is dead, dead . . ." Audiogenic Image.\textsuperscript{6}

\textsuperscript{6}Voice is represented by diagonal lines slanting downward to the left, flute by lines slanting downward to the right, banjo/cello combination by dots, drums by horizontal lines, finger cymbals by an "x," gong by encircled "x," and silence by blank space.
to the characteristic sound of *Night of the Four Moons*. Indeed, their absence is one thing which helps the *Musica Humana* passages in the fourth movement to achieve an impact of simplicity.

Two other pitch-related phenomena are also important features of this movement: contour and pitch register. The voice and flute are the only instruments with contour activity, usually some form of an arch. The other instruments provide a static pitch frame which enhances the effect of the activity elsewhere. With regard to range, however, even the voice is unmoving. The flute alone provides interest in this respect, beginning in its lower range and gradually progressing upward into its high range, as shown in Figure 6 by the pitch register blocks.

Also aurally conspicuous is the nature of the texture. Even though two or more instruments may sound concurrently, their individual articulations are so arranged that the ear is drawn from one to the other as each is played. The result is essentially a single line of events forming a monophonic sound-melody throughout the movement, with the possible exception of a portion of the last section. This provides a powerful unifying parameter through the four sections.

Formally, each of the last three sections is a modified restatement of the first. The first section, however, is not necessarily the "theme," for one receives the impression that all four sections comprise the variations themselves--the theme being truncated. Framed and separated by silences, each section contains variety that is produced primarily by differences in
length, treatment of pitch material in the strings, and the regis-
ter of the flute. The final section terminates the growth pro-
cedures by bringing the flute sound back to the low range (in the
"speak-flute"), by combining the function of the drum with the
sound of the strings, and by fusing the timbres of the voice and
the flute.

The close relationship between this movement's sonorous
events and its formal arrangement can be seen in Figure 6. Also,
the disruption in the last section of the normal order of events
is clear, as is the reason for the expectation of silence to fol-
low the final speaking section.
CHAPTER 5

ANALYSIS OF NIGHT OF THE FOUR MOONS:
II, "WHEN THE MOON RISES . . ."

As happens in some of Robert Schumann's Lieder, this movement seems to consist of a song preceded and followed by a prelude and a postlude, both rather long. The simple arch concept is also characteristic of this work, from its appearance as a pitch contour to its existence on several levels of the formal structure.

The Analysis

Pitch

One of the primary characteristics of pitch perceived in this movement is the generally descending pitch line from the beginning of the piece of a point two-thirds of the way through (Figure 7). The very first pitch that the cello plays (D-sharp) is the highest one of the whole movement. From there, the flute and voice move the pitch downward to its lowest point in the movement (F-sharp) at about (146), as shown in Figure 8. Although the sounds produced by the flute (196-ca. 204) are theoretically lower than the lowest of the vocal pitches (Figure 9), the actual pitches perceived seem to be a fourth lower than notated instead
Figure 7. Movement II: General Descending Pitch Contour (0-155.5)

Figure 8. Movement II: Final Vocal Line (145.5-162)

Figure 9. Movement II: Tibetan Prayer Stones and Flute Key
Clicks (ca. 195-204)
of an eleventh. In any case, since the resultant pitch quality is somewhat ambiguous, the vocal F-sharp remains as the lowest perceived pitch.

The banjo, however, provides some contrast to this descending progression. In the central portion of the movement where the voice begins its long descent (ca. 67), the banjo actually rises in the first two of its melodic statements (67-ca. 92). Then it partially follows the descending vocal contour, but holds at E-flat (115.5-ca. 140), a diminished seventh higher than the lowest pitch in the voice. But after the voice breaks free from this descending contour (see Figure 8), the banjo moves upward also, and plays its highest pitches in the longest line of music for that instrument in the movement.

The movement ends by contrasting the very low sounds (theoretically the lowest of all) of the key clicks (Figure 9) with the highest (unvoiced) sounds since the initial flute music (43 ff.). The lowest pitch of the key click sounds and the highest pitch of the wind sounds create the widest range found in the movement, from great G to A-flat double prime. This span of three octaves and a semitone encompasses all the preceding pitch activity since the prelude, and creates a fitting pitch-frame to close the movement.

In a sense, the voice provides a similar ending gesture at the close of its song. In its last statement (Figure 9) the range embraces all the pitches which have been sung prior to that point. Since this accomplishes for the main song what the flute
and wind sounds do at the end of the whole movement, it, too, contributes to the perception of a main structural division.

Related to this are the contours formed by the instruments. The voice describes a series of arches which can be seen in Figure 10. The first and last of these are simple (58.5-72, 145.5-155.5). The central one is a long, compound arch (78.5-126) composed of a number of melodic fragments of varying lengths outlining smaller arches, creating an arch of arches. This provides a balanced, integrated contour structure which also supplies needed variety for movement and growth.

Not all the arches are restricted to the vocal line. The banjo music also forms a series of arches and related contours. Even the Tibetan prayer stones describe arch-related contours. Whether all these are suggestive of word painting to reflect a rising moon is possible, although arches can be traced in a great many musical works besides this one. The other movements of Night of the Four Moons, however, do not contain as many arches as does "When the moon rises . . . ."

![Figure 10. Movement II: Vocal Contours (58.5-155.5)](image-url)
Another significant use of pitch found in this movement is pitch sharing. The opening flute-and-string statement (43-62) illustrates. Figure 11 contains most of this passage in which the banjo and cello play precisely the same pitches used by the flute but in the form of a pitch outline (Figure 12) which the flute elaborates. (Note: The flute part has been reduced. Notes for banjo and cello are as played.) Together, these instruments form a kind of minimal heterophony.

Figure 11. Movement II: Pitch Sharing (43-56)
A similar but less noticeable operation occurs in the voice/banjo combination (Figure 13) which forms a leader-follower relationship throughout the song. The two instruments share important pitches, such as highest pitches, beginning pitches, or ending pitches. This sharing also forms a kind of heterophony, but one which is temporarily shifted, thus rendering the relationship even more subtle.

The composer, however, specifically avoids the use of the initial pitches which the voice sings on its very first entrance. This unused pitch territory assures the freshness of sound and the perception of structural significance of the first appearance of that instrument.

Dynamics

In this movement, dynamics are not highly varied. Usually associated with pitch contour, the intensity increases as the
contour rises, and decreases as the contour falls. Dynamics are also linked to instrumental ranges, especially where the voice and banjo reach their highest pitches. At those locations (149, 172) the dynamic level rises for the first and only time to forte in the voice and fortissimo in the banjo. Dynamics here function to reinforce the climactic point of the movement.

Silence, however, is even more important here than in the first movement. Twenty-five periods of silence, averaging one every 8.4 seconds for about two seconds each, comprise fully 25% of the performance time. The locations where the composer indicates pauses of a specific number of seconds are mostly in the initial instrumental section preceding the voice entrance. Here they function as partitions (22.5-28 and 48-51). The next
notated silences straddle the climactic final vocal statement (see Figure 8), where again they provide partitioning effect.

**Time**

One of the treatments of time in this movement is an all-pervasive tempo flexibility. With no sense of meter throughout the movement, the pulse is constantly pressed and relaxed. This is always done moderately, however, providing an effect of mild temporal ebb and flow from beginning to end.

Contributing to this sense of only moderately disturbed temporal equilibrium is the fact that prevailing note durations are relatively equal or of similar length throughout. This obtains irrespective of the instrumentation, although the durations in the voice part are generally a little longer than those in other instruments.

Even the comparative lengths of the note groups are fairly uniform. The only significant change in this area is a shortening of the voice and banjo melodic lines (93-ca. 140) which immediately precede the climax of the movement. This creates a certain tension which is relieved by the longer lines which follow.

A characteristic of the rhythmic relationships which exist between concurrent horizontal lines is that one line is always noticeably more active than the other one sounding against it.
Texture

This movement contains a considerable amount of single line music, although not as much as the first movement. The lines, however, frequently overlap at their ends or beginnings, or both. This represents an increase in complexity over the texture of the first movement.

In general, the texture progression is from simple to complex to simple (a textural ABA form), with the most activity located between the voice and banjo up to the final climactic vocal statement—which is then performed alone. This treatment tends to isolate and highlight the sound of the voice (and later the banjo) at the most important structural point of the movement.

Timbre

Except for the closely associated voice and banjo, the instruments are rather free to sound and to function independently, unlike the arrangement in the first movement. The cello, for example, appears only once arco (to initiate the movement) and once pizzicato (with only two articulations, as seen in Figure 11), each time with or adjacent to a different instrument. The tam-tam is used even less, supplying only one nail stroke (22.5).

The flute is played as a melody instrument only in the beginning music and is not associated with any one other instrument, either. The key clicks at the end of the movement (see Figure 9) sound like a different instrument, and the wind sound
like still another. Neither do the prayer stones form timbral associations that are consistent in their appearances in the prelude and postlude music.

Most of the instruments, then, form a succession of free associations throughout the movement. This is particularly noticeable before the voice's first entrance and after its last. The result is a vivid contrast between the non-association in the prelude and postlude music, and the close association which exists between the voice and the banjo. At no time, however, do these two instruments begin and end together. In fact, they sound alone at times, completely disassociated except by juxtaposition. Nevertheless, they both are melodic, they both share some pitch material, and, in their first two appearances, perform together part of the time. The association is clear.

From a timbral action point of view, this association provides a certain amount of interest. As shown in Figure 14, the lines overlap several times at both the beginning and ending points, which provides timbral "modulations" as first one instrument, then both, then the other are heard in succession. But at points of particular importance, they sound alone. Such passages occur before its climactic passage, at that climatic passage itself, and during the ensuing banjo line. At these places, the instruments are heard solo.

Timbre also functions as a means of transition from one section to another. The flute passage at the beginning of the movement, for example, has the dual role of providing
introductory music (along with the cello and stones) as well as effecting a direct connection to the song itself. It accomplishes this by beginning as the stones play their last five notes (see Figure 11) and ending as the voice sings its first three (Figure 14).

A similar timbral transition occurs when the song is over. The banjo follows the final vocal line with a solo passage, which seems appropriate enough since it has always been associated with the voice. However, it is now separated from the voice by a partition of silence after which it becomes associated with the stones instead. Thus is formed the transition to the ending music, of which the stones are an essential part.
Crumb's treatment of instrumental timbres divides the movement into three sections. The first and last are characterized by timbral flux and variety, while the central section (the song) is comparatively stable, depending upon the contrast between overlapping sonorities and solo sonorities for timbral interest. Such an arrangement could be summarized by suggesting the presence of a timbral arch in the ternary form A (various instrumental sounds), B (voice and banjo), and A' (more but different instrumental sounds).

The Audiogenic Image

"When the moon rises . . ." conveys the general sound of fragility, tenuousness, critical balances. Its dynamics and silences no doubt contribute significantly to this, for it is quieter than the first movement and contains a larger amount of partitioning silences, of which Figure 15 shows the major ones. Some of the periods of inactivity are rather long (22.5, 48, 140), and the listener may begin to wonder if the music has ended.

But it does continue, often in a succession of sonorities which flow into one another—the ultimate converse of partitioning. As these overlappings (seen in the timbre segment of Figure 15) physically join contrasting timbres, they also result in timbral mixtures and fusions. One such mixture occurs at (58.5), where the flute and voice are widely separated in range and have different pitch material. An example of fusion is found at (43),
Figure 15. "When the moon rises . . ." Audiogenic Image
where the banjo and flute share pitches and ranges, while at the same time the stones provide a brief timbral mixture.

The voice and banjo are the two predominant parts, forming a type of duet throughout the song. Overlapping or performed successively, they form a series of exchanges of varying lengths, dynamic levels, and pitch ranges, and provide the climax of the movement. In contrast to this simple instrumentation, the two sections on either end of this song contain a variety of sounds from several different instruments.

Figure 15 also demonstrates the close relationship between dynamic shape and contour. The loudest portions occur when only one instrument is performing, unlike the treatment elsewhere, as the beginning of the fourth movement.

There are a number of arch-related configurations in this movement. One of these is formed by the opening figure of the cello and the closing gesture of the voice, which together constitute a kind of timbral statement and return. These sounds are characterized by no pitch breaks between notes (glissando, portamento), timbre which is rather high in upper partials with a certain amount of noise content (sul ponticello and white noise), and shape (complex arch, simple arch). Another instance occurs in the song proper, where the voice begins and ends with long arches that bracket a larger, fragmented arch in the middle. On a lower hierarchical level, the dynamics are mainly a succession of arches, some too minute to be placed on the chart.
Even the texture moves from simple to complex, then back to simple, as shown in Figure 15. The independent parts are located only in the song, where they occasionally overlap. The lines on the chart that are connected vertically indicate that the individual voices combine to create a fused timbre heard as one timbral line, such as at (43) between the flute and banjo.

The tempo is constantly in flux—slowing, speeding, changing. Meter in the normal sense is absent, as is rhythmic pattern. The amount of time required for each linear event, however, creates its own temporal effect. The long cello introduction to the prelude, the first entrance of the voice which begins the song, and the long vocal and banjo statements which end the song take the most time to perform. Following each of these three sections, the musical events gradually shorten. When taken together, this arrangement creates the perception of rhythm on a broad level.

What emerges, then, is a variegated succession of sound events which are unified by shape (arches), pitch material, linear overlapping, dynamic treatment, and, of course, text. Parameters of differentiation include timbre (instruments/voice, solo/multiple, mixtures/fusion, layering/overlapping), duration of linear events (long lines versus frequent changes), and silences.

The piece arranges itself into a pattern of sounds represented by the form outlined in Figure 15. The formal function of the long, expressive banjo line (165-183) seems to have been
engineered by the composer to provide an element of ambiguity. In a sense it belongs with the song instead of the postlude, because until now this style of banjo playing has been associated only with the voice; the prelude contains none. Besides, it can be seen as a modified repetition or an expanded synopsis of what it has played during the song, just as the voice does in the passage beginning at (145.5). But it does contain elements of postlude function as well: it is no longer associated closely with the voice, it contains no text, and it moves smoothly into the music of the stones (which were last heard in the prelude). For these reasons, then, the end of the song and the beginning of the postlude can be considered to be telescoped—a procedure which occurs frequently on the phrase and sectional level. A brief precedent for this—the insertion of the flute into the beginning of the song at (58.5)—is an argument in favor of considering the end of the song to be timbrally telescoped with the beginning of the postlude.
CHAPTER 6

ANALYSIS OF NIGHT OF THE FOUR MOONS: III, "ANOTHER OBSCURE ADAM DREAMS . . ."

This is the shortest movement of the four in Night of the Four Moons, and the least melodic. Divided timbrally into three main sections, it is primarily a composition which emphasizes sound color over every other musical parameter. Crumb himself has characterized it as consisting of "a fabric of fragile instrumental timbre . . ."¹

The Analysis

Pitch

There is comparatively little pitch activity in this movement. Indeed, pitches seem to be used primarily to present sound rather than to create "harmony" and "melody." In the first section, the articulations of most of the sustained pitches are too far apart to cohere easily into a melody. Furthermore, the piccolo solo in the central section (52-88) contains too much reiteration of a limited set of disjunct pitches to be "melodic"; it is more like a series of bird calls. And when the voice

¹George Crumb, Record Jacket Notes for Night of the Four Moons and Voice of the Whale by George Crumb, Columbia M 32739, 1974.

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appears later, it intones a single pitch. At the very end, the vocal line finally does resemble a melody providing a startling contrast to all that has preceded it. Its contour, however, is consistent with the ending contours of the previous two movements, and (on a smaller scale) the last movement as well.

Another contrast arises out of the pitch placement and ranges in the various parts of the movement. Broadly speaking, pitch registers divide the movement into three sections: medium to high (0-50), high to very high (52-88), and low to medium (92.5-ca. 170). With regard to the ranges within each section, the wide, sweeping linear motion of the piccolo in the central section contrasts with the music in the more moderate first and especially with the static music of the last. But then the bright sound of the banjo/cello/mbira "trio" (137.5-145) seems to break the mysterious, constricting spell of the flute/voice combination, resulting in a melodic vocal line of a one and one-half octave spread. This new melodic activity and the final, unpitched whisper create tension through change. Thus the movement closes with an ending gesture that seems more portentous than concluding.

Dynamics

Generally, the dynamic level is soft, with moderate but frequent changes. These changes usually take one of two forms, both of which are related to phrase shaping rather than to section delineation. One of these dynamic processes is the familiar
arch in which a phrase begins soft, grows in loudness toward the middle, then tapers off.

Another type is the dynamic wedge. An earlier example is that of the bongo drums in the first movement, which begin soft and gradually increase in loudness to the very end of the phrase. Here, however, the shape is reversed. As illustrated by Figure 16, this occurs (most frequently) in the piccolo in the second main section of the piece (52-88). In a sense, this dynamic shape begins at the very first sound, where the piccolo and glockenspiel combine to create an intense dynamic accent for the beginning of each sustained note. The last sound is cast in the same shape, as the fading reverberation of the tam-tam terminates the movement (158 ff.).

The dynamic wedge, characteristic of the piccolo, can also be found elsewhere. But in most of these cases, it is a natural result of a particular manner of performance (e.g., pizzicato), or is related to the way an instrument normally sounds (e.g., the tam-tam).

Silence continues to be used as a stylistic element. About 15% of the performance time for this movement is silence, real or imaginary. Sixteen of these pauses occur at an average of one very 10.6 seconds, each for an average length of about 1.6 seconds.
Time

The parameter of time is most noticeably manifested by the various densities of successive articulations. For nearly the first third of the movement, the piccolo sustains relatively long pitches preceded by a rapid, double grace note figure (Figure 17). The cello joins the piccolo shortly after the grace notes have been played, and supports the woodwind sound with a long harmonic note of the same pitch. Finally, the mbira begins, by echoing the rhythm of the piccolo but with the grace note figure extended, and the sustained sound shortened.

Thus the section is characterized by a time structure in which protracted notes are contrasted with small groups of short ones that precede the longer appearance of the mbira. Following this, a much longer group of fast notes is introduced (Figure 18). These notes foreshadow the style of music which characterizes the solo piccolo section (52-88) and provide a perceptual transition between two parts (see Figure 16). Similarly, the long notes in
Hesitantly, with a sense of mystery [z^2-50]

Figure 17. Movement III: Short versus Sustained Pitches (0-ca. 15)

Figure 18. Movement III: Rapid Notes on Mbira (33-38)
the second section (52-88) are preceded and followed by rapid ones (although in much longer groups), providing temporal unity. The last long group of rapid notes (85-88), however, contains no long note—a rhythmic differentiation that apparently signals the end of that section.

The next and last section of this movement (92.5 ff.) presents a change in rhythm (Figure 19). Combined as a musical unity, the voice and flute project a sound which is perceived as a long, sustained tone vaguely reminiscent of the first section but which does create a sense of rhythmic motion. This motion is accomplished by two methods: the vocal articulation of the text, and the pulsing quarter-tone pitch adjustments of the flute. Since the rhythm is periodic not only here but throughout the section, the movement ends with a relatively strong sense of pulse. Nevertheless, neither the durational pulses nor the pitch patterns create a sense of meter.

A related phenomenon creating the opposite effect of durational instability occurs in the last instrumental group—the "trio" referred to earlier in the discussion of pitch. In this passage (Figure 20), even though the banjo and cello play notes of equal durations (within each instrument), pitch and tempo are treated so as to mitigate against a clear perception of pulse. Furthermore, the addition of the mbira part way through the passage complicates the situation still more in that its rate of articulation is in constant flux. Thus, each of the three instruments has its own rhythmic character, creating a sort of
Figure 19. Movement III: Voice-Flute Combination (104.5-117)

Figure 20. Movement III: Instrumental Trio (137.5-145)
"polypulse," and the ear vacillates between hearing each as separate (channeling) or hearing them as a rhythmic unit (fusion).

Together with the vocal part which precedes and follows the trio, this last section forms a tripartite rhythmic unit that moves from simplicity to complexity and back in an ABA arrangement of rhythm. On a larger scale, the whole movement proceeds from extreme rhythmical differentiation, to more regular durations (the piccolo solo), to clear periodicity.

Texture

Like the first two movements, this one is essentially one-line music. True, a considerable portion of it contains more than one instrument sounding concurrently. But there are few instances in which there is any sense of several layers of musical events occurring simultaneously, either dependently or independently.

At the very beginning, for example (see Figure 17), the glockenspiel and piccolo, though notated on separate staves, form one timbrally fused sound. The same is true of the sustained piccolo notes and the cello harmonics. Thus, despite the fact that there are three instruments performing, the result is one linear expression of sound.

The addition of the mbira at (3.5) creates a semblance of a horizontal density of two lines. But instead of articulating concurrently with the other instruments, it appears successively. This tends to weaken the textural individuality of the
instruments, and the whole can be heard as a single sound-melody consisting of a variety of successive events. The piccolo solo section contains no such complexities, mainly consisting of monophony.

Beginning with the short introductory passage to the vocal entrance (Figure 21), the texture becomes more complex. The extended trill on the banjo sounds first against the *pizzicato* cello, then the mbira, and finally with the voice and flute. The effect is similar to that in the first section: a kind of event-melody which is variously colored with shifting timbres.

In the instrumental trio which soon follows (see Figure 20), three rhythmically and timbrally independent lines sound at once. The fact that they share pitch material and the same general pitch register tends to lessen their individuality; but each line does describe a somewhat different contour from the others, distinguishing them.

The movement ends as it begins, with articulation in one instrument (voice whisper) sounding against a sustained pitch of another (tam-tam). Thus the cycle is complete, and yet another ternary structure is created (complexity, simplicity, complexity), this time in texture.

**Timbre**

This piece is primarily an exposition of timbre. Disparate instrumental sounds (glockenspiel/piccolo/cello; voice/flute; banjo/cello/mbira) are fused to create new and unusual
timbres. Especially is the coalescence of the voice and flute (see Figure 19) a remarkable sound, one which closely resembles the choric effect of a larger group of instruments. This effect is achieved by the flute's moving above and below the stable voice pitch by quarter-tone intervals, approximating the sonority of several instruments playing slightly out of tune.
Also in this category of unusual sounds is the banjo thimble trill (see Figure 21) that prepares for the entrance of the voice. The tam-tam is unique in that it appears only once in the whole movement (158), contributing a single stroke—an ambiguous, ending-continuing signal as the music ceases.

Another example of timbral manipulation is the orchestrated succession of different sounds on the phrase level, such as the sound-melodies in the first and last sections (0-39 and 92.5-145) illustrated in Figures 17 and 21. This type of succession can also be seen in the series of different sounds proceeding through the whole movement, from the first glockenspiel/piccolo/cello klang to the final whisper, which seems to vanish with the tam-tam into infinity.

A third type of timbral process in this movement is the constant overlapping of the instrumental sound layers. In the first section, the glockenspiel and piccolo begin together (0), the cello soon follows (1.5), and the mbira joins them two seconds later (3.5). This type of staggered arrangement is typical not only for the beginnings of instrumental groupings, but also for their endings. Frequently, all the instruments leave a particular sound structure at different times. This creates a procession of ever-changing timbral qualities consisting of overlapping, layering, and fusion. This kind of activity continues throughout the movement whenever several instruments appear concurrently, as is illustrated in Figure 20.
This instrumental staggering exists on the higher, sectional level as well. The first section, for example, ends this way: first the cello ceases (ca. 29), next the mbira (ca. 39), then the glockenspiel (ca. 50), and finally the piccolo itself, which has been unifying the whole passage.

Timbre also functions as a co-creator of formal divisions, along with other parameters. From the strident, metallic fusion of the glockenspiel/piccolo/cello combination in the first division, the sound progresses to the piccolo alone in its moderate, most expressive range, then to the fruity, voice/flute combination and the mellow-bright timbre in the last part. Instead of another ABA type sequence, this forms a general timbral diminuendo or diminishing wedge, reflected in a movement away from emphasis on the intense, upper partials toward the less strident sound of tones of simpler sound spectra.

The Audiogenic Image

Texture is a fairly active parameter in "Another obscure Adam dreams ..." As Figure 22 shows, there are three textural types in this movement: multiple, single, and multiple. Pitch registers are also well differentiated, arranged in the order of medium-high, to high, to medium-low, with each having approximately the same size of range. The contours are essentially flat in this movement, with the exception of the final melodic line for the voice. Dynamics and silence are typical in that they follow pitch, contour and function structurally as partitions.
Figure 22. "Another obscure Adam dreams ..." Audiogenic Image

Singing alto voice represented by lines slanting down to the left, whispering by broken lines, piccolo and alto flute by lines slanting down to the right, cello by undulating lines, banjo by dots, mbira by circles, glockenspiel by crosses, tam-tam by an encircled x and horizontal lines, and silence by blank space.
But the former are somewhat dissimilar from those of the second movement in that they are more commonly wedge-shaped than arch-shaped, particularly in the solo piccolo.

A considerable amount of activity occurs within the time parameter. The piece opens with rapid notes leading directly to protracted ones. A piccolo solo follows in which this idea is extended: the prefixed rapid notes increase in number, and a corresponding suffix of rapid notes appears. Finally, the following section contains notes of more equal length, with no contrasting short-long durations.

Each of these sections is also characterized by the rate of individual articulations. The graph shows the number of these which occur in five-second intervals of time. Thus, the first interval (0-4.9) shows a total of nine articulations, or almost two per second for that one temporal segment. The first and third sections have the same articulation rate, but the second one has a rate that is nearly twice as rapid (note the aberration caused by the instrumental trio in the third section). These aspects of time are readily perceived, and constitute an important part of the audiogenic image of this movement.

Timbre, however, is even more significant than time. As the graph depicts, there are three basic treatments of instruments. The first (0-50) contains several instruments which play during the whole section resulting in a consistent sound. Even more consistency exists in the second part (52-88). But instead
of the timbral mixtures and fusions of the previous section, only the simple, unmixed sound of the solo piccolo prevails here.

The third and last section constitutes a major instrumentation change. The voice appears for the first time, as do the alto flute, banjo, cello pizzicato, and tam-tam. The glockenspiel and piccolo drop out. The treatment of these instruments is different from that of the first section, for no longer does a consistent sonority prevail. Instead, there is an emphasis on the contrasting procedure of presenting a succession of different sounds.

The late addition of the voice creates a situation analogous to a symphony in three movements in which a vocal part is added to the last movement. But instead of a chorale, there appears a solo incantation. The sound of a chorus singing a unison is approximated through the clever use of the alto flute, which joins and fuses with the alto voice to produce a remarkable choric effect. This music is followed by a brief instrumental interlude of overlapping timbres. Finally, the voice solo appears, punctuated by the tam-tam on the final whisper.

As Figure 22 illustrates, the important differential functions of the various parameters are synchronous. At (50) a point of change is especially clear in timbre, dynamics, and pitch. Texture and time also show marked changes, but more generally within the sections instead of at the terminal points. Another obvious change is located at (88). After that, a
considerable change in dynamics and texture occurs at (137.5) and (145), between which two points the instrumental trio performs.

These last changes mark the beginning points of the second and third subsections of the last (third) main section of this movement. The first main section is one, organically unified part. The second divides into three, with the first and third parts characterized by long phrases, and the second part by short phrases. The third, as we have seen, is also in three parts: voice plus instruments, voice only, voice with tam-tam.

Cohesion in the first and third sections is provided by the texture and timbre of the multiple instruments and by the mbira music. The first and second sections are unified by the piccolo, by the emphasis on the tritone, by the similarity of the rhythmic patterns (a rapid-note prefix to a protracted tone as well as by the mbira figure at s. 33), and by the absence of the voice (instruments only). Between the second and third parts, however, the relationship is primarily one of contrast.
CHAPTER 7

ANALYSIS OF NIGHT OF THE FOUR MOONS: IV,
"RUN AWAY MOON, MOON, MOON! . . ."

Nearly as long as the three preceding movements put together, "Run away moon, moon, moon! . . ." is the most imposing of all. Although it is stylistically arranged in two divisions (the last section contains an intentional stylistic allusion to Mahler), it formally consists of three: the child/moon dialogue, the improvisatory narrative/descriptive section, and the final Musica Mundana/Musica Humana tableau. Altogether, it constitutes an effective final movement in which the composition literally disappears as all the performers except one leave the stage, and the remaining cello sound fades to nothing.

The Analysis

Pitch

This movement employs pitch in a variety of ways, one of which is register placement, as shown in Figure 23. In the first large division of the work (the child/moon dialogue), the general placement moves from the upper portion of the various instrumental ranges in the first section (the child's music) to a somewhat lower area in the next (the moon's reply). The music in the child's second call is higher than the music of the first, and

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Only pitched instruments with specific notated pitches are considered. The obliquely striped portions in the last two sections indicate the range shared by alto flute and voice; the blank portions represent the banjo and vibraphone. Only the diagrams for the child's music show temporal progression in seconds. The high A of the cello is omitted.
the music of the moon's second reply is also higher than the first (the high E-flat in the first reply is barely touched upon).

Thus, in the first main division of the piece, both alternating sections are high and generally occupy the upper portion of the pitched instrument's ranges. The moon's music, however, uses a number of sound sources that do not have specific pitch, such as the banjo membrane, the tambourine, a suspended cymbal, and castanets. Although the exact register, therefore, cannot be located for all the instruments, the moon's music does have a noticeably lower pitch quality than the child's music.

At the _drammaticamente_ a conspicuous change occurs. It is here that the cello begins its seven-minute high A, interrupted only five times by a set of several lengthy pitches.

In the Epilogue, both the voice and flute move to a more comfortable, expressive range, while the banjo and vibraphone cross over to the pitch space below the other instruments in an accompanimental, supportive role. Thus the general pitch register becomes progressively lower as the end of the composition approaches.

Pitch action in the child's music shows a clear movement from a high, wide range to a comparatively low, narrow range. From the beginning of the section to the end, the range is reduced from a width of two and one-half octaves to a single pitch.
Pitches in the other sections are variously scattered throughout the duration of each section.

Besides this progression of general pitch register, another related quality is also present—contour. The prevailing sound of the child's sections is one of short, descending contours, but ending with very long ones which are found twice in the cello (ca. 12-23 and ca. 55-67) and once in the voice (ca. 53.5-55). The **drammaticamente** section, however, contains two very marked ascending contours, both located where the voice speaks—shouts (113-118 and 144-148.5). In addition, the flute, the humming or singing voice, and the banjo all have gently rising-falling arches. The contour is again altered in the last division of the movement, where the voice describes inverted arches, while the other instruments form contours that are serpentine.

**Dynamics**

In one respect, dynamics seem to follow the pitch contours. Within the first division, the music for the cries of the child provides the loudest passages in the whole work. While they begin loud, they end with a long, gradual diminuendo, becoming almost inaudible—a direct reflection of the descending contour. In contrast, both the overall dynamics and the contour of the moon's music are static. But in the **drammaticamente** section, as the pitch contour of the speaking voice rises, so does the dynamic level. Similarly, as the instruments describe their
melodic arches, the dynamics create analogous arches of their own to match.

The dynamics of the Epilogue, on the other hand, form a succession of variations on "very soft." Figure 24 shows that generally, whenever pitch action begins, the dynamics begin a slight crescendo from the initial level marked dal niente; and as the activity ends, the dynamics diminuendo to the level marked al niente.

In this division of the movement (245-ca. 507), silence is treated as a quality of dynamics. The interplay between very soft sound and silence is very subtle, and the distinction between them is not always immediately apparent. In addition to this "dal niente-al niente" progression, the constant presence of the ethereal high A from the cello provides another ambiguous dynamic quality. As a constantly ticking clock can eventually evade conscious recognition, so does this ever-present sound. Perhaps one could think here in terms of audible sound versus inaudible sound. Only when the cello moves during its five periods of relief from stasis does the listener become aware of this sound as contributing to the musical fabric. For this reason, the sustained note can be perceived as a sort of pseudo-silence, broken only when the pitch changes.

Although this use of silences as partitions between important events or sections is typical of this movement, the absence of silence where by now one expects it is both atypical and highly expressive. This occurs very noticeably at (47.5)
Figure 24. Movement IV: Epilogue Music (396-414)

(see Figure 25). The sudden entrance of the child's music conveys the impression that he is not convinced the moon understands the importance of the warning to run, whereupon he interrupts the moon with another warning. Actually, there is no silence in the whole dialogue, which increases the tension of the activity considerably.

The only real silence in the whole performance is the eight seconds (seven seconds marked in the score) between the second dance section and the drammaticamente section (84-92). The effect of silence, however, occurs in the remainder of the
piece where all activity except the high cello drone ceases, for the result in perceptual terms is qualitatively similar to real silence.

The amount of silence used in this movement and where it occurs is significant. As noted earlier, in the first part (the child-moon dialogue), there is no silence at all—events seem to follow each other breathlessly. In the next part (drammaticamente), however, they are numerous. The silences in this part
are of the modified variety discussed above, where the high A on the cello is a constant presence. Altogether there are 16 instances where only the high A is sounding, and these occur about 9.5 seconds for an average duration of 2.8 seconds each. This compares markedly with those in the last division (245 ff.), which contains 10 examples of modified silence occurring approximately every 26 seconds for an average of 8.5 seconds each—three times as long as in the preceding music. These extended silences not only slow the forward movement of the work to an effective conclusion, but they also demonstrate Crumb's penchant for long periods of time in which articulations are drastically reduced or even halted.

Each section, then, is characterized by its use of silence. The first has none, but is followed by eight seconds of the only unambiguous silence in the movement as a partition to the second section. This one has numerous, relatively short silences, while the last has fewer, but very long ones.

Time

With regard to the number of successive articulations, the density of the child's music is the most intense of the whole composition. The flutter tongue piccolo together with the extremely fast, unmeasured tremolo of the cello (see Figure 25) create a welter of notes to which the clusters of the crotales are added. The voice and banjo which follow the flute and crotales continue in the same style of rapid delivery. After the
banjo and then the voice cease sounding, only the cello remains, fast-paced and nonmetric to the end.

The dance, of which Figure 26 contains the opening two measures, presents an arresting contrast. Marked to be performed rather languidly, it contains a composite rhythm pattern which sets up a fairly clear triple meter (Figure 27), unusual for Crumb.

The rhythm of the vocal and castanet parts have not been included in the composite rhythm of Figure 27. Although they provide a contrasting band of nonperiodic durations, their rhythm neither enhances nor substantially weakens the meter effect of the other instruments.

The next division (drammaticamente) presents a third temporal character, as can be readily seen in Figure 28. Whereas the preceding two sections were consistent within themselves, this one is highly varied. Perhaps the most prominent elements are the accelerandos and notated ritardandos, such as in the Kabuki blocks (108.5-110), the spoken voice (113-118), and the banjo (129.5-136). This rhythmic treatment is much more characteristic than the meter of the dance music.

Finally, the Epilogue (see Figure 24) contains the most traditional rhythmic texture, although its metric organization into six-four time is not apparent to the ear. Thus, it forms the last part of a succession of rhythmic treatments containing temporal elements that alternate between nontraditional and traditional throughout the movement.
Quasi danza spagnola (un poco languido)

Figure 26. Movement IV: Quasi danza (23.5-ca. 28)

Figure 27. Movement IV: Composite Rhythm of Quasi danza spagnola (23.5-31)^2

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^2Rhythm has been simplified and durations expanded to facilitate ease of reading as if in three-four meter instead of three-sixteen. Compare Figure 26.
One more aspect of time should be mentioned. In the Epilogue, the durations of the cello's moving pitches increase each time the notes are played. As a result, each group becomes progressively more protracted until at the end of the piece the last note stretches into a duration that seems unending.
Texture

This movement contains some of the most complex texture of the work. Three definite layers of independent sound, a rare phenomenon, occur in the first 10 seconds of music. \(^3\) The texture gradually regresses to only one layer at (12), however, where the cello continues alone for two seconds until it is joined by a single stroke on a large tam-tam. In the danza, the voice line sounds against an accompanimental sound-melody in the instruments to form a two-part texture.

In the next main division (drammaticamente) the horizontal density varies from one to four lines (if the high A on the cello is included). An example of this can be seen in Figure 29 where the sound is simultaneously produced by the humming voice, the flute, the cello, and the half-whispering voice (124.5-126). The resulting texture is the most complex of the division; elsewhere there are passages of one, two, and three simultaneous layers (as well as the occasional four). Whereas in other divisions of the movement the texture is comparatively consistent within each section, here it is variable.

The last section (Epilogue) returns to consistency once again, alternating between the one line of the cello and the several regions of multi-lined music in the Musica Humana

\(^3\)Figure 25 shows a texture of four layers at (47.5) where the banjo overlaps the child's music for one second. This amount of time was judged to be of too short a duration for the music to be perceived as creating four-part texture.
sections. These latter passages of music contain up to three and even four lines (see Figure 24) with the voice predominating variously over the banjo, vibraphone, and flute. Although clearly notated on separate staves, however, the instruments are not always perceived to create their own independent lines. Unlike the child's music, this music is so arranged rhythmically that the articulations in the different instruments usually occur at different times, tending to form a timbral hocketing evocative of a
one-line sound-melody. This effect can be clearly seen in Figure 24 between the banjo and the vibraphone.

Timbre

The voice fairly dominates the sound structure of this movement. Besides singing in an ordinary manner, the voice produces a wide variety of sounds: it must half-sing, glissando, hiss, whisper, speak, shout, hum, and hoot.

In the first main division, short, descending glissandos in its upper range characterize the voice sound in the child's music, whereas a widely modulated *sprechstimme* style in a more moderate range typifies the moon music (perhaps an allusion to *Pierrot lunaire*?). Variety pervades the *drammaticamente* section in which the greatest number of different vocal procedures are found, often utilizing the lower end of the range. The Epilogue contains only "ordinary" singing in a medium range.

The instruments used and their manner of performance constitute an important sound element in this movement. Except for the brief piccolo ejaculations, long lines of high, legato sound distinguish the child's music from the fragmentary, staccato, percussive sonorities of the moon's dance music. This dance section is also characterized by voice-plus-accompaniment effect, another infrequent textural arrangement in Crumb's music. The first two measures of this accompaniment can be seen in Figure 26, where the sound-melody of timbral hocketing is clear. In the *drammaticamente* passage, the severe, explosive impacts of the
Kabuki blocks along with the dramatic, insistent speaking passages form a stark contrast to the mellow legato of the flute and vocally sung lines. For the last part, the performance methods are unusually ordinary.

Another contrast between sections is the instrumentation. In the child's music, all the instruments are clearly pitched. Those of the following dance, however, are mostly non-pitched (banjo membrane, tambourine, suspended cymbal, castanets) or played in such a way that minimizes their pitched quality (see the banjo and cello in Figure 26). The voice alone carries the "melodic" line. The _drammaticamente_ section utilizes a rich variety of sound sources (see Figures 28 and 29), presenting a constant timbral flux. The Epilogue restores consistency as well as the use of all pitched instruments again, as in the beginning.

Perhaps the most subtle shading of sonority occurs when the performers leave the stage one by one while performing (ca. 144-245), creating an effect of location transition--a moving from a near point to a distant one. This relocation of sound is completed prior to the Epilogue, in which all the music except the half-sounds of the cello emanates from offstage.

Shifting sound qualities are also produced by Crumb's technique of overlapping timbral layers by staggering their entrances and exits. This procedure is common in this work and can be seen in Figures 24 and 29 above. The result is a sort of variegated timbral flow as well as a textural progression.
A related situation occurs at points of repetition, either immediate or delayed, where there is a change in the order in which the same instruments appear. In the first dance music, for example, the order is cymbal, banjo string, tambourine, cello string, banjo membrane, voice, castanets, and piccolo. When the music returns, however, the order is cymbal, banjo string, cello wood, cello string and castanets (together), tambourine, voice, and piccolo, with banjo membrane making a late entrance near the end. Another clear example can be seen by comparing the entrances (as well as the exits) of the instruments in the second and third segments of the Epilogue music. Figure 30 shows not only this instrumental progression, but also the sonority contrast which results. The timbral variety is real, and provides a unique quality of variation to an otherwise static instrumentation. Purely timbral in nature, this device is one which the composer is fond of using.

The Audiogenic Image

In the final movement, "Run away moon, moon, moon! . . . .," every parameter of sound is important. Again, timbre plays a predominant if not the most significant role. Containing the most extensive list of instruments of all the movements, this one exhibits the richest variety of instrumental and vocal sounds—a kind of timbral summary—arranged vertically as well as horizontally. The timbral variety is further enhanced by Crumb's
extensive use of overlapping the entrances and exits of the various instruments, creating additional shades of color.

The frequency of these color changes are plotted in Figure 31 on the basis of the number of changes per five-second units of time. Except for the rapid succession of percussive instrumental articulations in the two danza sections (as well as a few elsewhere), both the ending as well as the beginning of a melodic segment or line is counted as a timbral change. The situation in

4Alto voice is represented by descending lines slanting left, alto flute by lines slanting right, banjo by dots, and vibraphone by undulating lines.
Figure 31. "Run away moon, moon, moon! . . ." Audiogenic Image*
which two or more instruments end simultaneously (e.g., at s. 310) is considered to be one timbral change. As the graph shows, most timbral activity occurs during the two \textit{danza} sections, which average 1.7 and 1.6 changes respectively per second. The next most active is the child's music (0.8 and 0.7 changes per second), then the \textit{drammaticamente} section (0.36 changes), and finally the remaining portion of the movement (0.2 changes). Thus, the rate of timbral change is highest nearer the beginning of the piece and declines as it progresses until a number of time segments contain no changes at all.

The opening music shows a complex mixture of several layers of timbres which begin together but overlap their endings. Even more complex texture and overlapping occurs in the \textit{drammaticamente}, where as many as four distinguishable lines sound at once (125). In the ending music, the texture of the \textit{Musica Humana} also has four and occasionally even five different instruments performing at the same time. However, their similar sound qualities, note durations, and registral placement (as well as some pitch sharing and timbral hocketing) tend to fuse the resultant sonorities.

The general effect of the texture is one of complexity relieved by periods of simplicity. This alternation is particularly true of the ending music, where the most consistent multiple texture of the piece alternates with the most simple—the nearly inaudible, protracted cello harmonics. The texture of the moon's music (\textit{danza}) is rather consistent, since it is made up of
only the vocal line and the sound-melody of the percussion instruments (and others percussively played). This is the only example in the whole work where the voice is clearly provided an "accompaniment." Elsewhere, instruments are added primarily to enhance sonorous interest rather than to contribute support. One possible exception is the accompanimental role of the instruments in the Epilogue music, but this is a special case of musical allusion.

Dynamics are very much a part of the audiogenic image of this piece. As shown in Figure 31, they are particularly vigorous at the outset in diminishing wedge configurations—a startling sound compared to the more gentle growing wedges or arch shapes in most of the music of this work. This makes the very soft remainder of the movement even more effective by way of contrast. The long stretches of modified silence are also particularly effective as they work to slow the action not only of this movement, but of the whole composition.

As the movement progresses from beginning to end, the pitch register becomes lower (except for the cello A). The voice begins very high, then (with the flute) moves low for the dramatic section, finally slightly higher to sing the ending music. The other instruments move generally lower, too, until at last they are actually below the voice in the Epilogue.

Each section has its own characteristic pitch contour. The child's music projects a series of descending contours, the moon's music is essentially continuously serpentine in the voice
and flat in the accompaniment, the *drammaticamente* section alternates ascending contours with arches, and the final part contrasts inverted arches in the voice with the generally flat contour in the other instruments.

With regard to tempo, there is a general, perceptible slowing throughout, from the breathless rapidity of the beginning to the *ancora più lento* at the end. In the *Musica Mundana* the cellist is directed to play his notes ever more slowly each time they reappear, until each is to last four seconds at the end.

These, then, constitute the elements of the audiogenic image. They contribute to the formal shape of the movement by differentiating the sections as well as unifying them into a larger whole. For example, although dynamics and pitch register are different in each section, they provide a continuous, overall progression from loud to soft and from high to low. Both tempo and contour tend to be more differential than cohesive. Contrast in texture from section to section is moderate, but on the whole texture is more complex than simple. Timbre is primarily differential, each section having its own particular instrumental or vocal timbre.
CHAPTER 8

SUMMARY AND CONCLUSIONS

Since timbre is an important aspect of much contemporary music, it would be useful to know the history of the concept of timbre and how it has been used by composers of the past as well as of the present. This knowledge, together with an understanding of the nature of timbre, can provide the groundwork for the formation of a modern, expanded concept of timbre through which the "sound" of some of today's music can be better appreciated. This study was undertaken to investigate these aspects of timbre and to devise and demonstrate a system for the analysis of musical sound.

There are a number of difficulties which attend such a study. These include such problems as a lack of literature dealing with perceived sound analysis; the inconsistent use of the word "timbre" and other related terms; the small amount of published literature dealing with the analysis of timbre within a musical context; the subjective nature of the perception of sound quality; musical notation which does not adequately provide for explicit timbral designations; and the difficulty of quantifying the non-verbal.
Within the historical development of the concept of timbre there are a variety of terms related to sound quality. Although the term "timbre" actually appears as early as the late seventeenth century, it does not then refer to sound quality as we know it. For example, in 1690 in his Dictionnaire universel, Furtières applied the term to a variety of clock or watch bells. But by the middle of the eighteenth century some dictionaries defined timbre in a manner similar to those of the twentieth.

In place of the term "timbre," "sound" and "tone" often were used to convey the idea of sound quality. Furetière used these terms, and two and one-half centuries later so do the discussions in Die musik in Geschichte und Gegenwart. This latter source actually does not contain articles under the word "timbre," or even under the German terms "Klang" and "Klangfarbe." The discussion of these concepts are contained, instead, under "Ton."

Such ideas as timbre, tone color, sound quality, and characteristic sound structure developed over a relatively long period of time, as did the sharpening of their definitions. And it was not until about the turn of the eighteenth century that acoustics finally became established on a firm, scientific foundation through the experiments of such men as Sauveur and later Helmholtz.

Carl Seashore did pioneer work in the area of human response to sound stimuli and the perception of tone quality. More recently, G. von Bismark provided statistical support for
accepting verbal descriptions of tone color as a valid form of analysis. His careful experiments showed a positive correlation between such descriptions and the physical structure of sound.

Published literature has historically associated a wide variety of perceived timbral qualities with the sound character of music. These include such descriptions as shrill or mellow, high or low, loud or soft, as well as the timbral differentiation of one instrument from another. Lately, writers have incorporated additional aspects of sound such as special instrumental effects (e.g., an emphasis on attack transients), the use of specific registers, ensemble or solo quality, and texture.

In short, nearly any sound-related phenomenon can belong to a broader concept of timbre, a sonorous parameter to be manipulated as an essential component of a musical work. Hence this study proposed an expansion of the concept of timbre to include all the aspects of sound that contribute to the "audiogenic image" of a work--its aurally perceptible, characteristic structure as formed by or related to its total sound. To facilitate detailed description, however, mostly those aspects of timbre more generally understood to be components of that parameter were employed in the sound analyses themselves.

Many composers have long been careful to create their own sound image (Klangstil) through specific handling of sonorous qualities. Giovanni Gabrieli may be cited as an early example of a composer who designated specific instruments, dynamic levels, and ensemble groupings. At times Haydn showed his sound
manipulation skills by formally differentiating his works through dynamics, texture, instrumentation, and registral placement instead of by melodic "theme."

From the Romantic era to the present many composers have shown a definite movement toward the elevation of sound as a significant characteristic of their music. A list of these composers would certainly include such names as Berlioz and Debussy. More recently, Varese contributed enormously both to the concept and the practice of making timbre a primary component of music.

A present-day composer widely regarded as one of the foremost musical colorists is George Crumb. Indeed, timbre in his works usually transcends the incidental to achieve an essential role. That is, the timbre itself becomes primary, with pitch functioning as a vehicle for its disposition. Thus, Crumb chooses instruments for their timbral possibilities, alters their sounds and pitches to enhance expressiveness, and arranges texture and other elements to clearly present the sonorous qualities which make up the essence of his musical expression.

A new system of sound analysis, although developed for the present study, can be applied to any music to show the extent to which "sound" is used as compositional material and the role it plays in delineating the structure of a work. Formulated to reveal the use of sound in any musical style, this system utilizes aurally perceived information instead of technical data supplied by acoustical analysis by mechanical or electronic apparatus.
Applied specifically to Crumb's *Night of the Four Moons*, this analytical process is based upon a consideration of five musical parameters: pitch, dynamics, time, texture, and timbre (in the more conventional sense). These parameters were considered separately and in conjunction with each other. In addition, their relational function was examined—how they provide cohesion and differentiation through similarity and contrast.

The particular qualities of each of these five parameters are: (a) **Pitch** has to do with such elements as vertical and horizontal pitch relations, whether they are heard as discrete tones or in groups, their placement within the audible pitch range, and the contours which result from their melodic action. (b) **Dynamics** includes relative loudness and softness, as well as silence. (c) **Time** measures the temporal character of sound and silence. Subsumed are such elements as tempo, meter, successive articulation rate, pulse, rhythmic patterns, and length of notes, note groups, phrases, sections, and movements. (d) **Texture** includes the vertical and horizontal disposition of tones and their contoural relationships. (e) **Timbre** concerns such components as the aurally perceived character of the sound spectrum and the sound envelope, as well as sound quality related to registral placement and tessitura, choric or solo effect, presence, and noise content.

Sectionalization within the movements through the action of parametric relationships creates the sense of action and growth, or repose and stasis. These parameters also function to
mark coherence or differentiation, unity, or contrast, as the organic whole of each movement is formed. Finally, all these relationships and processes work together to synthesize the perceived sound shape of the composition, the audiogenic image.

Night of the Four Moons contains a number of compositional devices which relate to the manipulation of sound for specific aural effect. These are (a) "choric effect," the creation of an ensemble sound as opposed to a solo sound; (b) "fusion," the coalescing of two or more sounds into a simple sound event which has a single complex timbral quality; (c) "layering," two or more different qualities of sound events occurring concurrently which do not fuse; (d) "overlapping," the staggered entrances and exits of two or more layers; (e) "spectral glide," the smooth alteration of vowel-like quality; (f) "timbral hocket" or "timbral interlock," the succession of timbral qualities creating a sound-melody as distinct from a pitch melody. Of these, the most frequently used are overlapping, timbral hocketing, and fusion.

Various aspects of sound quality are used to create the typical sound character of each individual movement. The first movement ("The moon is dead, dead . . .") contrasts vigorous instrumental activity with a slow, languorous solo vocal line that is separated from the instrumental parts by partitioning silences. "When the moon rises . . ." projects a sense of remote fragility which results from the large amount of silence incorporated into the music along with the subdued dynamic level broken only briefly near the end. The arrangement of the instruments and voice
into a prelude, song, and postlude is also distinctive. The third movement ("Another obscure Adam dreams . . .") consists of a mosaic of short units of music which can be described as clusters of changing sonorities of differing articulation rates, timbre, and rhythm. A great deal of overlapping and fusion is characteristic, also.

The fourth movement, "Run away moon, moon, moon! . . .", is the longest and most complex. Its predominant characteristic is one of a succession of contrasts in tempo, timbre, texture, and dynamics. In this movement, a number of unique phenomena occur: an "accompaniment" for the voice, the loudest and fastest passages, the greatest contrast in range, the richest variety of timbre, the high, protracted harmonics in the cello, the gradual removal of the instruments to a position offstage, and the inaudible dynamic level which is ultimately reached. All these comprise the most salient features of its sound.

Parameters used differentially for contrast and cohesively for continuity varied within each movement. Their action is summarized below.

**Pitch**

Pitch is used both to unify and to differentiate in the first movement. With the presentation of each "timbral stanza," all the instruments except the flute remain in the same ranges and play essentially the same pitches as before. The flute, however, moves higher and extends its line with additional notes
with each appearance. Thus, the flute provides an element of pitch contrast against the background of unity in the other instruments. Contours, too, tend to differentiate not only the individual instrumental parts but also the subsections, the voice and flute having active contours, the other instruments static ones.

In II,\(^1\) pitch creates a descending line moving downward from the beginning to a point about two-thirds the way through, where it suddenly moves back up in a climactic vocal statement. This motion of pitch creates movement and cohesion simultaneously. An abundance of arch-related contours also provides unity for the movement.

Generally, pitch plays a differentiating role in III, primarily through register placement. In IV, it differentiates the sections, both by register and by contour.

**Dynamics**

Dynamics differentiate between layers as well as between successive events. In I, several of the instruments have their own dynamic character. However, the use of dynamic arches and wedges throughout the piece provide a cohesive dynamic character to the main sections. Another dynamic action, the association of dynamics with pitch contours, is seen in this movement as well.

\(^1\)From here onward each movement will be referred to by its number expressed in Roman numerals.
as in each of the others—an arch pitch contour, for example, nearly always brings with it an arch dynamic shape. In III, the continuously low dynamic level gives a static dynamic unity to the piece. In IV, dynamics also follow pitch contours throughout. Each section, however, has its own dynamic character.

Silence is used to separate sections and important events in every movement. The one exception occurs in the dialogue between the child and the moon in IV, where the immediate succession of markedly different sections of music creates a dramatic effect not characteristic of the preceding music.

Time

Aspects of time are active in cohesive and differential roles. Each section of each movement and often each instrument usually has its own contrasting tempo, rhythmic, and successive density (articulation rate) character. Another action of time is seen in I, where the stanza becomes longer with each appearance (until the fourth, which is shorter), thus providing differentiation by length. One type of cohesive action involves tempo, which sets up a consistent movement in IV from fast to slow as the piece progresses.

Texture

Texture functions primarily as a cohesive element in I, being cast in a single line of music throughout. In this movement (as in the others), such a line occasionally consists of a "sound-melody" of several instruments articulating concurrently
but successively in such a manner that the result is perceived as a single line of events. Overlapping of lines is especially prevalent in II and IV, where this process tends to give a cohesive textural effect through the whole of those two movements. In III, however, texture is used differentially, some parts having more layers than others, or having different textural action: for example, one section may consist of only one particular texture, but another contains variety.

Timbre

A highly manipulated parameter, timbre functions particularly in differential roles. In I, the first three sections have the same succession of instruments, which in itself provides a certain continuity. However, each instrument or group of instruments is assigned its own separate section, forming a timbral mosaic of differential tonal qualities. The fourth section is essentially a timbral variation of the other three. In II, the voice separates the song from the instrumental prelude and postlude; but all three contain the common procedure of timbral overlapping, yielding mixtures and fusions of cohesive elements within those sections. In addition, timbral modulation provides continuity between the prelude and song, and between the song and postlude.

Fusion occurs in two of the three main sections of III, providing a similarity of procedure. The musical action, however, consists of a succession of different timbres which supply
the main interest. In IV the voice with its wide variety of sounds dominates the movement, whereas the instruments function in supplementary and accompanimental roles, providing timbral contrast and similarity for enhancement of interest. Each section and subsection is clearly assigned its own characteristic sound qualities. When sections return, within each is a change of instrumental order, furnishing timbral variety within the cohesive process of return. The high A of the cello adds not only stability in the most unstable of the sections (the *drammaticamente*) but also results in a timbral telescoping effect between the last two sections. Overlapping and timbral heterophony are also present, especially in the last section.

Most parameters in *Night of the Four Moons* are used both for cohesive as well as differential operations. Of the five, only *time* and *timbre* are found in differential roles more often than cohesive, demonstrating the high degree of activity with regard to sound qualities within this composition. Sound qualities provide not only much of the musical material of the work, but also the processes of differentiation and cohesion which lend to the overall structure and shaping of the musical form.

During the course of this investigation, a number of topics emerged that if pursued could yield fruitful results. For example, a complete investigation of the historical development of sound awareness among composers is needed. Related to such a study would be further research into both the physical and
psychological aspects of tone color, an inquiry particularly apropos to an understanding of much of the music written in the present era as well as that of earlier times. As Bernard Rogers suggested, composers develop a style of timbre. He said, "Composers, like painters, use color for its emotional as well as sensuous appeal . . . . This question is deeply affected by the character of the music and by the composer's personality and accent--by all that is represented by the word style." One result, then, from research of this nature could be the development of a method for determining a composer's sound style, a theory of Klangstil.

With an increasing number of composers using voice as another sound source, either with or without a recognizable text, another area for research is suggested. Cogan, in his article dealing with verbal timbre, wrote, "The aesthetic uses of these timbral possibilities are hardly known. Even more than rhythm, the timbre of words is a point where language and music become almost one." He urged the formation of "a new crucial and deep level of analysis (and composition!), one whose implications and

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3 Robert Cogan, "Toward a Theory of Timbre: Verbal Timbre and Musical Line in Purcell, Sessions, and Stravinsky," Perspectives of New Music, 8 (Fall-Winter, 1969), 81.
consequences are hardly foreseeable, yet, even at this stage, immensely suggestive.\textsuperscript{4}

This topic of vocal analysis is especially relevant to the works of Crumb. An in-depth study could be made of his use of text--its selection, its alteration, its function within the composition. Other related questions also could be addressed, such as the location within the work where the voice begins and ends, the choice of instrumental timbres which accompany or supplement the voice, and the relationship of the voice to these instruments.

Computerized sound analysis is another dimension of research which could prove profitable. Cogan and Escot suggested that the time is not far hence when musicians will perform complete, detailed analyses of all the tonal characteristics of compositions, including the incredibly complex interactions of every frequency upon every other frequency.\textsuperscript{5} Of course, care would be necessary in processing such data, for the ear does not apprehend sound on a linear scale as do machines. Therefore, appropriate adjustments would have to be made to render the results useful from a perceptual point of view.

Related to this is the need for the creation of a theory of timbre which recognizes not only the objective but also the

\textsuperscript{4}Ibid.

subjective natures of the phenomenon and how it is perceived. As Donald Rauscher succinctly remarked, "Music is sound, not merely notation and analysis."\(^6\) The music itself must never be lost in a welter of anatomized acoustical minutiae. Erickson specifically insisted that "Any theory of musical timbre will have to build itself from music."\(^7\) It must, therefore, be a musical theory, one that makes sense to the critical ear as well as to the calculating eye.

An additional subject for study is Crumb's use of timbre as compared to that of his contemporaries. Particularly fruitful would be a comparative analysis of three timbral elements which typify his style: timbral overlapping, timbral hocketing, and structural use of silence. This could also include that aspect of sonorous character which pervades his music--his penchant for arranging a series of relatively small timbral-textural clusters in succession to make up a larger, longer mosaic of musical sound.

Another proposal for further research is suggested by pitch placement, consonance-dissonance, and dynamics: these phenomena exist within a continuum from low to high, stable to unstable, soft to loud. As there is also a certain continuum in the colors of a rainbow, could it be possible that a similar

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"timbral continuum" exists? Perhaps there are meaningful musical analogues in the concepts of primary and secondary colors; or, perhaps even more promising, in the aspects of hue, lightness (or brightness), and saturation. If such an analogy and continuum could be demonstrated, it may be one way to bring simplicity and order to an incredibly complex musical phenomenon.

To pursue solutions to these and other problems related to timbre is manifestly of more interest to the theorist than to the composer. The latter is usually a try-it-and-see-how-it-sounds experimenter; if it sounds right, it is used. The ear is an awesome instrument, and the mind is rather more capable of dealing intuitively and empirically with these matters of sound than it is in explaining scientifically in detail just how a particular sonorous effect is created.

For the theorist, however, it is important to explain such phenomena. And although such knowledge may also to some degree be useful to the composer, he never has been and probably never will be accountable to the theorist for his creative choices. It is important, therefore, that any research which is done in this aspect of musical expression not only address a demonstrable need, but also yield practical results.
APPENDIX A

THE SCORE OF NIGHT OF THE FOUR MOONS

A copy of the score is given in Appendix A. Reduced in size from the original, it contains numbers which have been added to indicate the passage of time in seconds. These numbers are located at specific points to show either a single incident or the beginning and ending points of a more complex event such as a phrase or a passage of a particular sonority.

Generally, each number is placed directly above or below the event to which it refers. Otherwise, it is located slightly to the side with a dotted line connecting it to the event associated with it (see "When the moon rises . . .", s. 117.5). Where there is not enough horizontal space to accommodate a series of numbers that need to be close together, the numbers are abbreviated (e.g., 260, 262, 264 become 260, -2, -4), such as at s. 260 ff. in the last movement.
NIGHT OF THE FOUR MOONS
for Alto, Alto Flute [doubling Piccolo], Banjo, Electric Cello and Percussion [one player]

George Crumb

1. La luna está muerta, muerta...
[The moon is dead, dead...]

(i. 1)

Boldly, with rhythmic élan (d.92)
II. Cuando sale la luna...
[When the moon rises...]

Languidly, with a sense of loneliness
III. Otro Adán oscuro está soñando...
[Another obscure Adam dreams...]

Hesitantly, with a sense of mystery [×50]
IV. ¡Huye luna, luna, luna!...
[Run away moon, moon, moon!...]

Intense, breathlessly! [A-60]

The notation includes a score for various instruments, including Alto, Piccolo, Sax, and Percussion, with detailed musical notations and instructions.

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Note:
- **Finger:** D/E (m/b). Make a rapid trill on the same string with D fingered-capped and E fingered.
- The trills should strike the string at a point near the center of the string length, in order to produce a sonorous trill, with the principal tone of the trill sounding an octave higher than the second tone (harsh). The principal point of the string might be varied in order to produce a trill variety in sound.

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Note:
- *The voice of the child (él niño) and the moon (la luna) should be sharply differentiated in style of performance. Each voice should be highly stylized by means of vocal tone, inflections, and phrasing.*
EL NIÑO (THE CHILD):
The percussionists should be very slow and solemn. The sung and played passages should be "drawn out" in order to produce an overall effect of grace and fluidity.

The French should be played in a slow, legato style, with a focus on the sustained notes. The other percussionists should follow the lead of the French, maintaining a consistent tempo and focus on the overall effect of the piece.

The woodwinds should be played with a focus on the ornamentation and the melody, using a variety of techniques to add interest to the piece. The brass should be played with a focus on the dynamics and the effect of the sound, using a range of dynamics and articulations to create a rich, full sound.

The strings should be played with a focus on the texture and the overall effect of the piece. The piano should be played with a focus on the expression and the melody, using a range of dynamics and articulations to create a rich, full sound.
"Musica Mundana"

Epilogue: Farewell-music as Berceuse (in stilo Mahleriano)
Lentamente e con eleganza (slowly, with elegance)
George Henry Crumb, Jr., was born October 24, 1929, in Charleston, West Virginia. He attended the local schools there until 1950 when he graduated from Mason College of Music and Fine Arts with the Bachelor of Music degree. In 1952 he received the Master of Music degree from the University of Illinois, Urbana. In 1953 he entered the University of Michigan to begin his doctoral studies in composition. That year also marked the appearance of the String Quartet, his first composition as currently listed in available sources.

The year 1955 was particularly significant in Crumb's early career. Besides writing the Sonata for Solo Cello, he studied composition during the summer with Boris Blacher as an Elizabeth Croft Scholar at the Berkshire Music Center, Tanglewood, Massachusetts. In addition, he won a Fulbright Fellowship to continue his studies with Blacher at the Hochschule für Musik (Berlin) for the 1955-56 year.

Returning to the United States, Crumb resumed his doctoral studies in 1956 at the University of Michigan. The next year he was awarded the BMI prize in composition for the Sonata for
Solo Cello. In 1958 he joined the faculty of Hollins College, Virginia, as instructor of music theory.

Two very important events occurred in 1959. The first was Crumb's completion of the D.M.A. degree in composition under Ross Lee Finney at the University of Michigan. His doctoral composition, *Variazioni: For Large Orchestra*, is a harbinger of his future fascination with subtle sonorities and unusual orchestration. The second event was his appointment to the music faculty at the University of Colorado in Boulder where he taught theory, composition, and piano for five years. During this time, he wrote *Five Pieces for Piano* in 1962 and *Night Music I* in 1963. Written for David Burge, *Five Pieces* is Crumb's first work requiring unconventional piano performance techniques. *Night Music* is particularly notable because it is the first of many compositions in which Crumb utilizes the poetry of Federico García Lorca.

The year of 1964-65 was a transitional one for Crumb. Awarded a Rockefeller Foundation grant, he spent that year as Creative Associate at the Center for the Creative and Performing Arts (associated with the State University of New York at Buffalo). Then, instead of returning to the University of Colorado, he moved to Pennsylvania and joined the faculty of the School of Music at the University of Pennsylvania at Philadelphia.

In 1964 he composed *Four Nocturnes (Night Music II)* and was given a Koussevitsky Foundation Commission, for which he wrote the Madrigals I and II the following year. Commissioned in

The University of Chicago commissioned Crumb in 1966 to write a work for the celebrations marking their 75th anniversary in 1967. The resulting Echoes of Time and the River won the Pulitzer Prize in 1968.

Besides the premiere of Echoes by the Chicago Symphony, two other significant events took place in 1967. Crumb was awarded a Guggenheim Foundation grant for music composition, and he was given the National Institute of Arts and Letters award "for his imaginative and colorful sound world, organized with great refinement and variety, and used for highly expressive ends" (American Academy of Arts and Letters and the National Institute of Arts and Letters: Proceedings, 1968, p. 76). During the summer of the next year, 1968, Crumb taught composition at Harvard University as a visiting professor. That year also saw the completion of Songs, Drones and Refrains of Death (begun in 1962), a work commissioned by the University of Iowa.

Commissioned by the University of Washington, the final two volumes of his Madrigals (III and IV) were finished in 1969, as was Night of the Four Moons. The latter work, commissioned by the Springfield Chamber Players, constituted the composer's response to the historic Apollo 11 manned space flight to the moon. Also during this year, Crumb received two more commissions, one from the Elizabeth Sprague Coolidge Foundation, another from the Stanley Quartet of the University of Michigan.
In the summer of 1970 Crumb returned to the Berkshire Music Center at Tanglewood, this time not as a student but as visiting professor of composition. The same year two new works appeared, works which made a considerable impact on the music world. Composed for electrically amplified string quartet, Black Angels (for the Stanley Quartet) was one of these. The other was Ancient Voices of Children (the Coolidge commission), a highly acclaimed work which received the International Rostrum of Composers Award (UNESCO) and the Koussevitsky International Recording Award, both in 1971. Vox Balaenae (Voice of the Whale), commissioned by the New York Camerata, and Lux Aeterna, commissioned by the Philadelphia Composers Forum, were both written in 1971.

The series of Makrokosmos volumes began in 1972 with Makrokosmos, Volume I, written for David Burge (for whom the Five Pieces of 1962 were also written). Representing an extension of performance techniques begun in the earlier set, these works employ a compendium of nonnormative devices and procedures. Makrokosmos, Volume II (written for Robert Miller) was finished the next year (1973), and Volume III (Music for a Summer Evening), for two pianos and percussion, the year following. Volume III was commissioned by the Fromm Music Foundation and was written for the dedication of the new music building at Swarthmore College, Pennsylvania.

In 1973, Crumb received his second Guggenheim Foundation grant (technically a renewal of the first). He also was awarded
a Ford Foundation grant to begin work on a composition for large orchestra. Two years later he was elected to the National Institute of Arts and Letters.

The next compositions from Crumb's pen are *Dream Sequence (Images II)* of 1976 and *Star Child* of 1977 (the Ford Foundation commission). The former, commissioned by Marian Feldman and written for the Aeolian Chamber Players, is scored for one of Crumb's typically esoteric chamber ensembles. *Star Child*, however, is a composition for a very large performing group. Subtitled "A Parable for Soprano, Antiphonal Children's Voices, Male Speaking Choirs and Bell Ringers, and Large Orchestra," it was written for the New York Philharmonic Orchestra.

Crumb's most recent works are *Celestial Mechanics (Makrokosmos IV)* for amplified piano, four hands (1979); *Apparition*, a cycle of Walt Whitman songs for voice and amplified piano (1979); and *A Little Suite for Christmas, A.D. 1979* for piano (1980).

The composer lives in Media (near Philadelphia) and teaches composition at the University of Pennsylvania.
The material for this musicography was derived from music scores, descriptions on the jackets of sound recordings, general and specialized reference sources, and direct communication with the composer.

The musicography itself is in two parts. The first is an alphabetical arrangement of Crumb's works listed under their main titles as well as their secondary titles. Since many of these compositions are known by either title, this arrangement will help to identify them. The year in which the piece was completed follows the title in the main entry; the number in parenthesis located after the date indicates where the work may be found in the second part of Appendix C.

Part Two presents Crumb's works in chronological order. Containing more details than Part One, Part Two lists each work only once. A dash following a category heading indicates that there is no pertinent information which applies in that instance.

Part One: Alphabetical List


*Apparition*, 1979 (25).
Celestial Mechanics (Makrokosmos IV), 1979 (24).
Dream Sequence (Images II), 1976 (22).
Echoes I (see Eleven Echoes of Autumn).
Echoes II (see Echoes of Time and the River).
Echoes of Time and the River: Four Processionals for Orchestra (Echoes II), 1967 (10).
Eleven Echoes of Autumn, 1965 (Echoes I), 1966 (9).
Five Pieces for Piano, 1962 (4).
Four Nocturnes for Violin and Piano (Night Music II), 1964 (6).
Images I (see Black Angels).
Images II (see Dream Sequence).
Lux Aeterna, 1971 (17).
Madrigals, Book I, 1965 (7).
Madrigals, Book II, 1965 (8).
Madrigals, Book IV, 1969 (13).
Makrokosmos, Volume I. Twelve Fantasy-Pieces after the Zodiac for Amplified Piano, 1972 (19).
Makrokosmos, Volume II. Twelve Fantasy-Pieces after the Zodiac for Amplified Piano, 1973 (20).
Makrokosmos, Volume III (see Music for a Summer Evening).
Makrokosmos, Volume IV (see Celestial Mechanics).
Music for a Summer Evening (Makrokosmos III), 1974 (21).
Night Music I, 1963 (5).
Night Music II (see Four Nocturnes for Violin and Piano).
Night of the Four Moons, 1969 (14).
Sonata for Violoncello Solo, 1955 (2).
Star Child, 1977 (23).
String Quartet, 1953 (1).
Thirteen Images from the Dark Land (see Black Angels).
Twelve Fantasy-Pieces after the Zodiac (see Makrokosmos, Volume I or Volume II).
Variazioni: For Large Orchestra, 1959 (3).

Vox Balaenae (see Voice of the Whale).

Part Two: Chronological Catalog

1. TITLE: String Quartet. SCORED FOR: String quartet. TEXT:--. COMPOSED: 1953; Ann Arbor, Michigan. PUBLISHED:--. PREMIERE: 1954; Ann Arbor, Michigan; University of Michigan student ensemble. WRITTEN FOR: --. COMMISSIONED BY: --. MISCELLANEOUS: Earliest composition listed in any of the sources; performance time, ca. 23 minutes. DISC RECORDING:--.

3. TITLE: Variazioni: For Large Orchestra. SCORED FOR: Orchestra. TEXT: --. COMPOSED: 1959; Ann Arbor, Michigan; Roanoke, Virginia; and Boulder, Colorado. PUBLISHED: 1973; Peters, #66524 (available on rental). PREMIERE: May, 1965; Cincinnati, Ohio; Cincinnati Symphony Orchestra. WRITTEN FOR: --. COMMISSIONED BY: --. MISCELLANEOUS: Written in partial fulfillment for the requirements of the D. M. A. degree, University of Michigan, Ann Arbor, under Ross Lee Finney; theme based on 12-tone row; performance time, ca. 25 minutes. DISC RECORDING: --.


water; Martha Baird Rockefeller Fund for Music gave a grant in 1967 which made possible the CRI recording; Crumb's first Lorca work; performance time, ca. 18 minutes. DISC RECORDINGS: Candide 31113; CRI 218 USD.


COMPOSED: Spring, 1966; Media, Pennsylvania. PUBLISHED: 1972; Peters, #66457. PREMIERE: 1966; Bowdoin College, Brunswick, Maine; Aeolian Chamber Players. WRITTEN FOR: Aeolian Chamber Players. COMMISSIONED BY: Bowdoin College. MISCELLANEOUS: A sentence fragment from Lorca is intoned as a preface to each of the three cadenzas; performance time, ca. 16 minutes. DISC RECORDING: CRI 233 USD.

percussion and wind players while playing; performers also speak in a variety of words and phrases (such as the State motto of Virginia) in a variety of ways (such as whispers and shouts); xylophone taps out composer's name in Morse Code; quote from "Were you there when they crucified my Lord?"; aleatory sections; performance time, ca. 20 minutes. DISC RECORDING: Louisville Orchestra First Edition Records, LS-711.


Elizabeth Suderburg, soprano. COMMISSIONED BY: University of Washington, Seattle, Washington. MISCELLANEOUS: Unusual instrumental and vocal techniques; vocal effects added to text; performance time, ca. 6.5 minutes. DISC RECORDINGS: AR-Deutsche Grammophone 0654-085; Turnabout TV-S 34523.


is electronically amplified; partly performed offstage; all performers except cellist leave stage at the conclusion; composed during the Apollo 11 flight; performance time, ca. 16 minutes. DISC RECORDING: Columbia M 32739.


Award, 1971; quotes from Bach, "Bist du bei mir," from the Notebook of Anna Magdalena Bach; contains music reminiscent of Mahler; vocal sounds added to fragments from text; performance time, ca. 27 minutes. DISC RECORDING: Nonesuch H-71255.


18. TITLE: Voice of the Whale (Vox Balaenae): For Three Masked Players. SCORED FOR: Flute, piano, cello, antique cymbals (played alternately by cellist and flutist), voice (vocalized by flute player). PUBLISHED: 1972, 1973; Peters, #66466. PREMIERE: 1972; Library of Congress, Washington, D. C.; New York Camerata. WRITTEN FOR: New York Camerata. COMMISSIONED BY: New York Camerata. MISCELLANEOUS: Performers wear masks; the flute, piano, and cello are amplified; flute player sings in a vocilaise style through the flute; to be performed with deep blue stage lighting (optional); inspired by the singing of humpback whales, a recording of which the composer heard in 1969;
19. **TITLE:** Makrokosmos, Volume I. Twelve Fantasy-Pieces after the Zodiac for Amplified Piano. **SCORED FOR:** Amplified piano. **TEXT:**-. **COMPOSED:** 1972; Media, Pennsylvania. **PUBLISHED:** 1972, 1974; Peters, #66539a. **PREMIERE:** February 8, 1973; Colorado College, Colorado Springs, Colorado; David Burge. **WRITTEN FOR:** David Burge. **COMMISSIONED BY:** David Burge. **MISCELLANEOUS:** Quotes from "Will There Be Any Stars in My Crown" and Chopin's Fantasie-Impromptu; performer moans, chants, shouts, whistles; various operations inside piano; piano is electronically amplified; reflects Crumb's admiration for Bartok's Mikrokosmos and Debussy's 24 Preludes; performance time, ca. 33 minutes. **DISC RECORDING:** Nonesuch H-71293.

20. **TITLE:** Makrokosmos, Volume II. Twelve Fantasy-Pieces after the Zodiac for Amplified Piano. **SCORED FOR:** Amplified piano. **TEXT:**-. **COMPOSED:** 1973; Media, Pennsylvania. **PUBLISHED:** 1973, 1975; Peters, #66539b. **PREMIERE:** November 12, 1974; Alice Tully Hall, Lincoln Center, New York; Robert Miller. **WRITTEN FOR:** Robert Miller. **COMMISSIONED BY:** Robert Miller. **MISCELLANEOUS:** Similar to Makrokosmos, Volume I; performance time, ca. 33 minutes. **DISC RECORDING:** Columbia/Odyssey Y 34135.

21. **TITLE:** Music for a Summer Evening (Makrokosmos III). **SCORED FOR:** Two amplified pianos, percussion. **TEXT:**-. **COMPOSED:** February, 1974; Media, Pennsylvania. **PUBLISHED:** 1974; Peters, #66590. **PREMIERE:** March 30, 1974; Swarthmore
College, Pennsylvania; Gilbert Kalish, James Freeman, Raymond DesRoches, Richard Fitz. WRITTEN FOR: Gilbert Kalish, James Freeman, Raymond DesRoches, Richard Fitz. COMMISSIONED BY: Fromm Music Foundation. MISCELLANEOUS: Reflects the medium of Bartok's Sonata for 2 Pianos and Percussion (1937); commissioned for the dedication of the new music building at Swarthmore College; performance time, ca. 40 minutes. DISC RECORDING: Nonesuch H-71311.


Requires four conductors; the Latin texts are freely adapted, primarily from Medieval sources of the 13th century; a kind of Requiem; largest work for orchestra since *Echoes of Time and the River*; performance time, ca. 33 minutes. **DISC RECORDING:**

24. **TITLE:** *Celestial Mechanics (Makrokosmos IV).*

**SCORED FOR:** Amplified piano, four hands. **TEXT:**

**COMPOSED:** 1979; Media, Pennsylvania. **PUBLISHED:** 1979 (photocopy); Peters. **PREMIERE:** November 18, 1979; Alice Tully Hall, Lincoln Center, New York; Gil Kalish and Paul Jacobs. **WRITTEN FOR:** Gil Kalish and Paul Jacobs. **COMMISSIONED BY:** Chamber Music Society of Lincoln Center. **MISCELLANEOUS:** Four movements; performance time, ca. 25 minutes. **DISC RECORDING:** Recorded by Smithsonian Records, but not yet released.

25. **TITLE:** *Apparition.* **SCORED FOR:** Voice, amplified piano. **TEXT:** From Walt Whitman, "When Lilacs Last in the Dooryard Bloom'd." **COMPOSED:** 1979; Media, Pennsylvania. **PUBLISHED:** 1979 (photocopy); Peters. **PREMIERE:** January 13, 1981; Theresa L. Kaufmann Concert Hall at the "Y" in New York; Jan DeGaetani, Gilbert Kalish. **WRITTEN FOR:** Jan DeGaetani, Gilbert Kalish. **COMMISSIONED BY:**

**MISCELLANEOUS:** Six songs and three vocalises; performance time, ca. 22 minutes. **DISC RECORDING:** Projected.

26. **TITLE:** *A Little Suite for Christmas, A.D. 1979.*

**SCORED FOR:** Piano. **TEXT:**

**COMPOSED:** 1980; Media, Pennsylvania. **PUBLISHED:** 1980 (photocopy); Peters. **PREMIERE:** December 14, 1980; Smithsonian Institution (Hirshhorn Museum),
COMMISSIONED BY: --. MISCELLANEOUS: No whistling or vocal
sounds, no electronic amplification; indicated as being written
after Giotto's Nativity frescoes in the Arena Chapel at Padua;
seven individual pieces; performance time, ca. 15 minutes. DISC
RECORDING: Projected.
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