

379
N81
NO, 5788

THE TWO-PART FRAMEWORK IN SELECTED CHORAL WORKS
AS A HARMONIC AND STYLISTIC DETERMINANT

THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF MUSIC

By

Michael W. Turner, B.M.

Denton, Texas

May, 1981

Turner, Michael, W., The Two-Part Framework in Selected Choral Works As A Harmonic and Stylistic Determinant. Master of Music (Theory), May, 1981, 139 pp., 47 Tables, 7 Illustrations, Bibliography, 29 Titles.

The problem with which this investigation is concerned is the determination of compositional styles in terms of manners of employing monadic and dyadic intervals in the music of the common practice period. An aspect for determining style is proposed by way of comparing the frequency of occurrence of dyads and monads in selected musical examples from the baroque, classical, and romantic periods.

Chapter I is a discussion of the problem and methodology of the study. Chapters II, III, and IV present analytic comparison of examples in the baroque, classical, and romantic periods respectively. Chapter V presents a summary of the findings with references to the pedagogical applications of the two-part framework principle.



© Copyright by
Michael Wayne Turner
1981

TABLE OF CONTENTS

	Page
LIST OF TABLES	
LIST OF ILLUSTRATIONS	
Chapter	
I. INTRODUCTION	1
Current and Prevailing Harmonic Systems: A Critique Proposal of An Additional System in Stylistic Analysis Aspects of Analysis Material Used for Analysis Computer Assistance Pedagogical Applications	
II. MUSIC OF THE BAROQUE PERIOD	10
Music of Jean-Philippe Rameau Music of Antonio Vivaldi Music of Johann Sebastian Bach Conclusions and Correlations	
III. MUSIC OF THE CLASSICAL PERIOD	31
Music of Joseph Haydn Music of Wolfgang Amadeus Mozart Music of Ludwig Van Beethoven Conclusions and Correlations	
IV. MUSIC OF THE ROMANTIC PERIOD	51
Music of Hector Berlioz Music of Anton Bruckner Music of Johannes Brahms Correlations and Conclusions	
V. CONCLUSIONS	71
Music of Baroque Period Music of Classical Period Music of Romantic Period	

TABLE OF CONTENTS--Continued

	Page
Soprano Lines of the Baroque, Classical and Romantic Periods	
Bass Lines of Baroque, Classical, and Romantic Periods	
The Two-part Framework of Baroque, Classical, and Romantic Music	
Applications and Demonstrations	
APPENDIX	106
BIBLIOGRAPHY	136

LIST OF TABLES

Table	Page
I. Soprano Intervals of Rameau	11
II. Bass Intervals of J. P. Rameau's Music . .	12
III. Dyad Intervals in J. P. Rameau's Music . .	13
IV. Soprano Intervals in Antonio Vivaldi's Music	14
V. Bass Intervals of Antonio Vivaldi's Music	15
VI. Dyad Intervals in Vivaldi's Music	16
VII. Soprano Intervals in Bach's Music	18
VIII. Bass Intervals in Bach's Music	19
IX. Dyad Intervals in Bach's Music	20
X. Soprano Intervals of Rameau, Vivaldi, and Bach	21
XI. Interval Direction in the Soprano Lines of Rameau, Vivaldi, and Bach	24
XII. Bass Intervals of Rameau, Vivaldi, and Bach	26
XIII. Interval Direction in the Bass Lines of Rameau, Vivaldi, and Bach	27
XIV. Dyad Intervals of Rameau, Vivaldi, and Bach	28
XV. Soprano Intervals of Joseph Haydn	32
XVI. Bass Intervals of Joseph Haydn's Music . .	33
XVII. Dyad Intervals of Joseph Haydn's Music . .	34

LIST OF TABLES--Continued

Table	Page
XVIII. Soprano Intervals of W. A. Mozart's Music	35
XIX. Bass Intervals of W. A. Mozart's Music	36
XX. Dyad Intervals of W. A. Mozart's Music	37
XXI. Soprano Intervals of L. V. Beethoven's Music	38
XXII. Bass Intervals of L. V. Beethoven's Music	39
XXIII. Dyad Intervals of L. V. Beethoven's Music	40
XXIV. Soprano Intervals of Haydn, Mozart, and Beethoven	42
XXV. Interval Movement in the Soprano Lines of Haydn, Mozart, and Beethoven	44
XXVI. Bass Intervals of Haydn, Mozart, and Beethoven	45
XXVII. Interval Movement in the Bass Lines of Haydn, Mozart, and Beethoven	47
XXVIII. Dyad Intervals in the Music of Haydn, Mozart and Beethoven	48
XXIX. The Soprano Intervals of Hector Berlioz .	52
XXX. The Bass Intervals of Hector Berlioz . . .	53
XXXI. Dyad Intervals of Hector Berlioz	54
XXXII. The Soprano Intervals of Anton Bruckner .	55
XXXIII. The Bass Intervals of Anton Bruckner . . .	56
XXXIV. The Dyad Intervals of Anton Bruckner . . .	57

LIST OF TABLES--Continued

Table	Page
XXXV. The Soprano Intervals of Johannes Brahms. . .	58
XXXVI. The Bass Intervals of Johannes Brahms . . .	59
XXXVII. The Dyad Intervals of Johannes Brahms . . .	61
XXXVIII. The Soprano Intervals of Berlioz, Bruckner, and Brahms	62
XXXIX. Soprano Interval Movement of Berlioz, Bruckner, and Brahms	64
XL. Bass Intervals of Berlioz, Bruckner, and Brahms	65
XLI. Bass Interval Movement of Berlioz, Bruckner and Brahms	66
XLII. Dyad Intervals in the Music of Berlioz, Bruckner, and Brahms	68
XLIII. The Soprano Intervals of Baroque, Classical, and Romantic Music	85
XLIV. The Soprano Interval Movement of Baroque, Classical, and Romantic Music	86
XLV. The Bass Intervals of Baroque, Classical, and Romantic Music	88
XLVI. Bass Interval Movement of Baroque, Classical, and Romantic Music	89
XLVII. The Dyad Intervals of Baroque, Classical, and Romantic Music	93

LIST OF ILLUSTRATIONS

Figure		Page
1.	Example of Interval Analysis	5
2.	Example of Bach Chorale	96
3.	Classical Setting of Bach Chorale	97
4.	Romantic Setting of Bach Chorale	98
5.	Example of Beethoven Piano Sonata	99
6.	Romantic Setting of Beethoven's Piano Sonata	100
7.	Baroque Setting of Beethoven's Piano Sonata	101

CHAPTER I

INTRODUCTION

Common Practice Period: General Stylistic Description

The study of harmony and style¹ in tonal music has, for the most part, been limited to music of what is often referred to as the common practice period. Historically, this period lasted from approximately 1600 A. D. to 1900 A. D. and is subdivided into three style periods: Baroque, Classical, and Romantic. The one overriding common denominator during these periods, in terms of harmonic vocabulary, is the manner in which chords are constructed or conceived, known as the tertian principle. However, the very fact that this common practice period is further divided into three parts implies that there are other various musical parametric considerations which contribute to stylistic differences.

¹The term "style" refers to the method in which form, melody, harmony, and rhythm in a musical composition or group of compositions are treated. In actual practice, the term is applied in a variety of ways. It may be applied to single works (the style of Beethoven's fifth symphony); to types of composition (symphonic style, concerto style, etc.); to a specific media (instrumental style, vocal style, etc.); to methods of composition (contrapuntal style, homophonic style, etc.); or to historical periods (Baroque style, Classical style, etc.) or in a combination form such as Beethoven's symphonic style or Mozart's concerto style. This study will refer mainly to historical style; when another connotation of the term is implied, it will be specifically stated.

The stylistic difference is the resulting effect of employing in diverse manners the various musical elements or parameters such as melody, harmony, rhythm, and form. These parameters of music have been enumerated and classified in various texts on musical style and, in most of these texts, the parameter of form is regarded as the most important determining factor. That is, the parameters of melody, harmony, and rhythm are generally considered in the context of a musical form, and not as separate parameters, independent of form, in the determination of a musical style. This approach to style is not always illuminating: for one particular parameter alone, such as harmony or harmonic vocabulary, and the idiomatic manner of its employment, can often be taken as a determining factor in illustrating a particular stylistic trait.

Current and Prevailing Harmonic Systems: A Critique

Ever since Jean-Phillipe Rameau, in his Treatise on Harmony (1722), formulated the theory of the invertibility of triads (chords), there have been many texts and treatises which deal specifically with harmonic vocabularies of the common practice period. These works, however, are often mere enumerations and classifications of chords and chord types and none, to the best of this writer's knowledge, approach these chordal vocabularies from a stylistic point of view. Chords and chord types are merely explained in terms of functional harmonic behavior and, although excerpted

from actual compositions, the musical examples used are not discussed from a historical-stylistic perspective. That is, although various chord types (triads, sevenths, etc.) are employed in compositions of all three style periods, in actual practice the manner in which they are employed exhibits certain distinguishable stylistic and compositional practices.

Proposal of An Additional System in Stylistic Analysis

The structural fabric of music, as with any other art form, is the synthesis of various elements that contribute to its distinct shape, (vertical and horizontal), texture, and overall style. One of these basic elements is the harmonic vocabularies found in music and, in the common practice period, these harmonic vocabularies are founded upon the tertian principle. However, there is another, if not more fundamental and perhaps often overlooked element, that can be employed in determining the distinct characteristics of a particular historical style. This element is "anphony". That is, the manner in which the two outer linear parts (i.e., soprano and bass) proceed in music is believed to exhibit certain features which also contribute to stylistic characteristics. Specifically, the basic two part progression in music conveys or reflects the acceptable practice in terms of intervallic progression of a given historical era. This anphonic (as opposed to homophonic,

monophonic, or polyphonic) approach to music will be referred to in this study as the two-part framework.²

Aspects of Analysis

Through a careful analytic and comparative study of the works in the common practice period with respect to their two-part framework, it is believed that conclusions may be drawn which will aid in a clearer definition and description of various stylistic characteristics. The methodology of this study is to reduce the selected works of several composers to a two-part framework (soprano and bass) in order to show the melodic (within one line) and dyadic (between two outer parts) intervallic successions. Through a study of interval sizes and their frequencies of occurrence in soprano, bass, and dyad parts, the manner in which the types of intervals in the individual lines as well as between the lines are used can be more precisely examined. The frequency of occurrence of each interval will be represented by its percentage of the total intervallic content. This study, in essence, proposes that a comparison of these percentages within each period will show the significance of interval makeup as a determining factor of a compositional style.

²The term "two-part framework" is borrowed from Paul Hindemith's Craft of Musical Composition Volume I, pg. 144. In this volume, Hindemith refers to the two-part framework as a "skeleton" that has significant importance in the harmony of any musical composition. There is, however, no reference to stylistic importance, and the harmonic importance that he describes is somewhat vague, and lacks any supportive evidence for his claims.

The following musical example and its accompanying analysis will illustrate the procedure in which the monadic intervals in each line, and dyadic intervals between soprano and bass lines are measured.

Figure 1: Example of Interval Analysis

As this example illustrates, there are five soprano monads, five bass monads, and nine dyads. In the soprano line there are three major seconds and two minor seconds which can be represented by the percentages of 60% for major seconds and 40% for minor seconds. The bass line contains three major seconds, one minor second, and one perfect fifth, which can be represented by the percentages: 60% for major second, 20% for minor second, and 20% for perfect fifth. The dyads and their percentages are as follows: one minor second (11.1%), one minor third (11.1%), one major third (11.1%), one perfect fifth (11.1%), one minor sixth (11.1%), one minor seventh (11.1%), one major seventh (11.1%), and two perfect octaves (22.3%).

Melody and bass lines can also be used as a determinant of harmony and, as such, can be utilized in a manner that will further aid in stylistic comparison. In addition,

dyadic content will also be compared with the concurrent harmonic (chordal) successions, which will in turn indicate the importance of interval makeup and its mutual relationship with harmonic idioms of each style period.

Material Used for Analysis

For this study, selected works of three representative composers from each of the three style periods, baroque, classical, and romantic, are analyzed. The composers are Jean-Philippe Rameau, Antonio Vivaldi, Johann Sebastian Bach; Franz Joseph Haydn, Wolfgang Amadeus Mozart, and Ludwig van Beethoven, Hector Berlioz, Anton Bruckner; and Johannes Brahms. A total of thirty complete works from the literature of these composers is examined. In addition, portions from another twenty works were examined to substantiate the validity and reliability of the findings.

For the purpose of expediting the reductive process, choral music was selected for the following reasons: 1) a comparatively clearer and more consistent harmonic content, smaller tonal range, and 2) generally simpler rhythmic pattern. The majority of these choral works are from the sacred literature because they tend to exhibit a consistent, if somewhat conservative style. Also, all aforementioned composers wrote some sacred choral music. It should be mentioned, however, that the conclusions drawn from this study will be applied to a few selected instrumental works in order to further demonstrate the validity and reliability of the findings.

Computer Assistance

As an aid in the compiling and analysis of data, a computer is used to store the information gathered from a preliminary study. Furthermore, the computer calculates the percentages of interval information with regard to each work, each composer, and composers of the same historical period. The information is then stored on magnetic disc for future reference. The computer used is the National Systems model 5000 with an IBM cobol compiler. The computer language utilized in the writing of the program is cobol (see Appendix A for listing of computer cards used) and the program is also stored on magnetic disc (see Appendix B for computer printout of the program).

The interval classes that are used for the data set consisted of the following: perfect unison, minor second, major second, minor third, major third, perfect fourth, augmented fourth, diminished fifth, perfect fifth, augmented fifth, minor sixth, major sixth, minor seventh, major seventh, and perfect octave. To facilitate more efficient computer programming, the following abbreviations are used for the above data set: UN, N2, M2, N3, M3, P4, A4, D5, P5, A5, N6, N7, M7, and P8.

Because of certain computer limitations, the following intervals classes have been left out of the data set: augmented second, augmented sixth, and diminished seventh. Although these intervals have their enharmonic equivalents

in the above data set, they are none the less important in that they require specific manner of resolution. In order to resolve the problem of excluding those intervals, an "error clause" has been included in the computer program. This clause compiles any errors (intervals not included in the data set) and subtracts them from the total number of intervals and adjusts the percentages of the data set. The data set percentages do not total 100% when any "errors" are included and thus the difference (remaining percentage up to 100%) is the total percentage of errors that is programmed into the computer. It should be noted, however, that the incidence of these intervals in the "error clause" is minute and therefore is regarded as of minimal significance in this study. These intervals, however, will be dealt with separately.

Pedagogical Applications

From a pedagogical standpoint, the understanding of the two-part framework is beneficial not only in analytical study but also in other aspects of theoretical instruction such as harmonization and aural skills, particularly ear-training. Also, stylistic differences illustrated by reducing the harmonic music to soprano, bass, and chord symbols will manifest features of musical style which harmonic analysis alone does not reveal, as will be illustrated in the conclusion of this study. On the other hand,

the realization of figured bass can also be better understood when using the two-part framework as a model. An application of the principle of the two-part framework in the instruction of the basic two-year theory course and other theoretical courses, such as form and style analysis and counterpoint, will, probably, have an added dimension in the understanding of the compositional process, characteristic of each historical era.

CHAPTER II

MUSIC OF THE BAROQUE PERIOD

Works of three composers are selected to represent Baroque music: Jean-Philippe Rameau (1683-1764), Antonio Vivaldi (ca. 1678-1741), and Johann Sebastian Bach (1685-1750). An effort was made to find musical examples that represented a chronological cross-section (early, middle, and late) of each composer's work. In this manner, it is believed, a more accurate representation of stylistic features pertaining to intervallic relationships can be examined for analytical comparison.

Music of Jean-Philippe Rameau

The music of Jean-Philippe Rameau contains certain intervallic features that, when compared to that of other Baroque composers, are comparable in some aspects while, in other aspects, distinguish the style of Rameau from other Baroque composers. Before these comparisons can be made, however, it is necessary to thoroughly examine Rameau's examples.

Melodically, Rameau used the intervals of perfect unison, minor second, and major second in great majority (approximately three-fourths). Also, if the intervals of

minor third, major third, and perfect fourth are included in the calculation, these six intervals then comprise nearly all of the intervals employed. (See the following table for individual percentages.)

TABLE I
SOPRANO INTERVALS IN J. P. RAMEAU'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	28.60	96.61
Minor Second	18.87	
Major Second	31.73	
Minor Third	7.93	
Major Third	5.04	
Perfect Fourth	4.44	
Augmented Fourth	0.00	
Diminished Fifth	0.60	
Perfect Fifth	1.44	
Augmented Fifth	0.00	
Minor Sixth	0.60	
Major Sixth	0.12	
Minor Seventh	0.12	
Major Seventh	0.00	
Perfect Octave	0.24	

The monadic content of Rameau's bass lines bears essential similarities with that of his soprano lines and the percentage use of the six aforementioned intervals is 91.37%, only slightly lower than that of the soprano line. (See Table II). The difference that accounts for this lower percentage in the bass lines is due to the increased employment of the perfect fifth and perfect octave intervals at certain points, particularly cadence. It may be said, therefore, that Rameau's bass and soprano lines are very similar

in regards to intervallic motions, with the only exception that the bass lines use the perfect fifth and perfect octave at cadence points.

TABLE II
BASS INTERVALS OF J. P. RAMEAU'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	23.02	68.64 91.37
Minor Second	16.08	
Major Second	29.54	
Minor Third	9.43	
Major Third	5.68	
Perfect Fourth	7.62	
Augmented Fourth	0.27	
Diminished Fifth	0.55	
Perfect Fifth	3.46	
Augmented Fifth	0.00	
Minor Sixth	0.83	
Major Sixth	0.13	
Minor Seventh	0.00	
Major Seventh	0.00	
Perfect Octave	3.32	

The intervals most often found between the soprano and bass lines (dyads) of Rameau are the minor third, major third, perfect fifth, and perfect octave. These intervals, when totalled, constitute a majority of intervals used (66.47%). The next most often found intervals in the dyadic writing of Rameau's examples is the minor and major sixths which, together, occupy nearly one-fifth of the intervals used (16.2%). These above intervals, when totaled together, account for more than four-fifths (82.67%) of the entire dyadic content. (See Table III). The remainder of the

intervals found are divided among the rest of the intervals; the only intervals not found are the augmented second, augmented sixth, and diminished seventh. (See Appendix C for complete computer printout of the intervals used in Rameau's examples).

TABLE III

DYAD INTERVALS IN J. P. RAMEAU'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	0.00	
Minor Second	0.81	
Major Second	4.45	
Minor Third	17.70	82.67
Major Third	14.86	
Perfect Fourth	5.13	
Augmented Fourth	1.75	
Diminished Fifth	0.67	
Perfect Fifth	16.62	16.15
Augmented Fifth	0.27	
Minor Sixth	6.75	16.15
Major Sixth	9.45	
Minor Seventh	3.10	
Major Seventh	1.08	
Perfect Octave	17.29	

Music of Antonio Vivaldi

Examples of Antonio Vivaldi reveal certain differences in interval usage from that of Rameau and Bach and other Baroque composers. These differences will be discussed later, following analytical examination of the music of Vivaldi and Bach.

In melodic (soprano) writing, Vivaldi used the perfect unison, minor second, and major second intervals; these

comprise a little more than three-quarters of the intervals found (77.2%). When the intervals of minor third, major third, and perfect fourth are taken into account with the above intervals, the great majority of the monadic content of Vivaldi's soprano lines contains these six intervals. (See following table).

TABLE IV
SOPRANO INTERVALS IN ANTONIO VIVALDI'S MUSIC

Intervals	Percentages	Group Percentages	
Perfect Unison	26.60	77.2	
Minor Second	27.20		
Major Second	23.40		
Minor Third	6.40		92.6
Major Third	4.60		
Perfect Fourth	4.40		
Augmented Fourth	0.20		
Diminished Fifth	0.80		
Perfect Fifth	2.60		
Augmented Fifth	0.00		
Minor Sixth	1.20		
Major Sixth	1.80		
Minor Seventh	0.20		
Major Seventh	0.00		
Perfect Octave	0.20		

Antonio Vivaldi's bass lines employs less frequent use of perfect unisons, minor and major seconds, when compared to his soprano lines; when totaled, these intervals are used more than half of the monadic content (i.e., 63.7% as compared to 77.2%). If, however, the intervals of the minor and major thirds, and perfect fourth are included with these other intervals, the total accounts for slightly

more than four-fifths (82.7%) of the intervals found in Vivaldi's bass lines. Although these intervals constitute a lesser frequency of occurrence than that of the soprano lines, the difference is due primarily to the increased use of the perfect fifth and perfect octave (13.18% for both), especially at cadences. These eight intervals constitute the percentage occurrence for nearly all (95.8%) of the monadic motion in Vivaldi's bass lines of these examples. Noteworthy is the small percentage of minor and major sixth intervals (see the following table for individual percentage).

TABLE V

BASS INTERVALS OF ANTONIO VIVALDI'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	24.74	63.50
Minor Second	22.47	
Major Second	16.49	82.46
Minor Third	5.36	
Major Third	2.68	
Perfect Fourth	10.92	
Augmented Fourth	1.64	
Diminished Fifth	0.20	
Perfect Fifth	8.24	
Augmented Fifth	0.00	
Minor Sixth	0.20	
Major Sixth	1.44	
Minor Seventh	0.00	
Major Seventh	0.00	
Perfect Octave	4.94	

The interval usage in the dyadic writing of Vivaldi is different from that of his soprano and bass lines. The intervals that are most frequently employed are the minor third, major third, perfect fifth and perfect octave. When

the frequency of occurrence of these intervals is totaled together, it is found that they account for almost two-thirds (60.53%) of total dyadic intervals found. The remaining one-third of the intervals consists of other intervals, largely that of minor and major sixths, and an unusually high incidence of the diminished fifth and minor seventh. The significance of this high number of diminished fifth and minor sevenths lies in the increased usage of dominant harmonies (dominant triads, dominant seventh chords, diminished triads, half diminished seventh chords, and full diminished seventh chords). The following table illustrates the individual percentages of each dyadic interval in Vivaldi's examples.

TABLE VI
DYAD INTERVALS IN VIVALDI'S MUSIC

Intervals	Percentages	Group Percentages	
Perfect Unison	0.00		
Minor Second	1.38		
Major Second	1.73		
Minor Third	10.20	76.78	
Major Third	19.37		
Perfect Fourth	4.49		
Augmented Fourth	2.07		
Diminished Fifth	4.15		
Perfect Fifth	16.43		
Augmented Fifth	0.17		
Minor Sixth	8.47		16.25
Major Sixth	7.78		
Minor Seventh	6.57		
Major Seventh	0.51		
Perfect Octave	14.53		

Music of Johann Sebastian Bach

The monadic content in Bach's soprano lines is similar to that of the other Baroque composers in many respects; there are, however, certain differences that will be discussed later in fuller detail.

Bach's use of the three primary intervals (perfect unison, minor second, and major second) occupies slightly more than three-fourths of all intervals used (77.55%). A noteworthy factor in Bach's melodic writing is the high incidence of the major second (42.21%), which is somewhat distinctive from works by other Baroque composers examined in this study. The percentage occurrence of minor and major thirds and perfect fourths, holds no particular significance when examined individually; if, however, the total percentage of these intervals is added to the percentage of the three primary intervals, it is found that the great majority of intervallic movement in Bach's soprano lines is these six intervals (i.e., $77.5\% + 16.05\% = 93.6\%$). See Table VII for an illustration of the individual and total percentages of interval movement in Bach's soprano lines.

The monadic content of Bach's bass lines bears essential similarities with that of his soprano lines, with the exception that the perfect fifth and octave are used predominantly at cadence points. The percentage occurrence of the six aforementioned intervals (i.e., unison, minor and major seconds, minor and major thirds, and perfect fourth), when

TABLE VII

SOPRANO INTERVALS IN BACH'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	11.89	93.67
Minor Second	23.45	
Major Second	42.21	
Minor Third	4.69	
Major Third	4.46	
Perfect Fourth	6.97	
Augmented Fourth	0.11	
Diminished Fifth	0.22	
Perfect Fifth	3.31	
Augmented Fifth	0.00	
Minor Sixth	0.11	
Major Sixth	0.68	
Minor Seventh	0.11	
Major Seventh	0.45	
Perfect Octave	0.91	

totaled together, is slightly less than that of his soprano lines (i.e., 86.38% vs. 93.6%); this is due, primarily, to the increase of perfect fifths and perfect octaves (10.86% for both) at cadence points. See Table VIII for an illustration of the individual and group percentages of interval movement in Bach's bass lines.

The dyadic writing of Bach reveals a high percentage of occurrence of the following intervals: minor third, major third, perfect fifth, and perfect octave (totalling 59.18%). However, when the intervals of the minor and major sixths (inversions of the major and minor thirds) are included (i.e., minor and major thirds, minor and major sixths, perfect fifths and octaves) it is found that they

TABLE VIII
BASS INTERVALS IN BACH'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	7.91	
Minor Second	26.45	
Major Second	34.36	
Minor Third	3.95	
Major Third	4.32	
Perfect Fourth	9.39	
Augmented Fourth	0.12	
Diminished Fifth	0.49	
Perfect Fifth	6.42	
Augmented Fifth	0.00	
Minor Sixth	0.49	
Major Sixth	0.49	
Minor Seventh	0.61	
Major Seventh	0.37	
Perfect Octave	4.44	

occupy slightly more than three-fourths (78.35%) of the total dyadic content in Bach's dyadic writing. The remaining fourth of the intervals used is comprised of the rest of the intervals, with perfect fourth, diminished fifth and minor seventh comprising the majority of occurrence (see Table IX).

Conclusions and Correlations

A careful comparison of the music of these Baroque composers in terms of intervallic usage will suggest certain phenomena in which differences can be regarded as a manifestation of stylistic differences of individual composers. It goes without saying that the similarities can be seen as a common factor within that historical period and thus can

be used in the comparison with other historical periods (Classical and Romantic).

TABLE IX
DYAD INTERVALS IN BACH'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	00.00	
Minor Second	0.33	
Major Second	3.74	
Minor Third	16.86	78.35
Major Third	12.56	
Perfect Fourth	6.17	
Augmented Fourth	1.54	
Diminished Fifth	3.19	
Perfect Fifth	15.98	
Augmented Fifth	0.22	
Minor Sixth	8.59	
Major Sixth	10.58	
Minor Seventh	4.85	
Major Seventh	0.77	19.17
Perfect Octave	13.78	

The soprano lines of Bach, Vivaldi, and Rameau reveal certain monadic trends that seem to indicate changes in the compositional style of composers within the Baroque period. There is a steady decline from Rameau to Bach in the percentage occurrence of perfect unisons and major and minor seconds and thirds, while there is an increase of perfect fourths and fifths. The intervals larger than a perfect fifth are used infrequently in Baroque soprano lines. The highest frequency of the perfect fifth is found in Bach's soprano lines (3.31%).

While there is little difference in the total frequency of occurrence of the six aforementioned intervals among these three Baroque composers, there are certain differences in the percentage occurrence of individual intervals that note mention. While the percentage occurrence of perfect unison is basically the same in Rameau and Vivaldi's soprano lines (28.6% and 26.6% respectively), there is a marked difference in Bach's use of the same interval (11.89%). Vivaldi uses the minor second considerably more than Rameau or Bach, while the use of the major second in Bach's music is considerably more than that in Rameau and Vivaldi's soprano lines (see Table X).

TABLE X
SOPRANO INTERVALS OF RAMEAU, VIVALDI, AND BACH

Intervals	Rameau Percentages	Vivaldi Percentages	Bach Percentages
Perfect Unison	28.60	26.60	11.89
Minor Second	18.87	27.20	23.45
Major Second	31.73	23.40	42.21
Minor Third	7.93	6.40	4.69
Major Third	5.04	2.68	4.46
Perfect Fourth	4.44	4.40	6.97
Augmented Fourth	0.00	.20	.11
Diminished Fifth	.60	.80	.22
Perfect Fifth	1.44	2.60	3.31
Augmented Fifth	0.00	0.00	0.00
Minor Sixth	0.60	1.20	0.11
Minor Seventh	0.12	1.80	0.68
Major Seventh	0.12	0.20	0.11
Perfect Octave	0.24	0.20	0.91

As this table illustrates, there is a consistent decline in the frequency of occurrence of minor and major thirds from Rameau to Vivaldi to Bach. The perfect fourth, however, is used by Bach slightly more than Vivaldi or Rameau, while the perfect fifth shows a steady increase in use from Rameau to Vivaldi to Bach. The minor and major sixths are more common with Vivaldi than Rameau or Bach. The minor and major sevenths are seldom used by any of the composers; the major seventh, however, is used only by Bach and not by Rameau or Vivaldi. The occurrence of the perfect octave is more prevalent in Bach's soprano lines than Vivaldi or Rameau. Table X illustrates the percentage of occurrence of all intervals in the soprano lines of these composers.

While interval content (percentage of occurrence) is important in the determination of the style of composers, there are other factors that can also be used in aiding the stylistic differentiation. One of these factors is the direction of intervallic motion and, it is believed, an examination of the manners of intervallic motion may also reveal features between composers, and between historical periods. Since the major and minor seconds are, or can be regarded as the universal melodic interval, they may not be as revealing as others in differentiating stylistic characteristics. For this reason, only intervals larger than seconds will be used in the analysis of monadic interval motion.

The interval content of these Baroque composers with respect to their melodic (soprano) writing shows certain similarities as well as variations. With regard to monadic motion, the differences are not as apparent as the similarities. In general, monadic motion (ascending or descending intervals) among these composers is generally the same. Generally the majority of monadic third motions are descending (the ascending motion occupies approximately one-third of the minor third motions while ascending major thirds constitutes only one-fourth). However, the monadic perfect fourth generally moves upward (approximately three-fourths of the time). The motion of the augmented fourth (occurring twice only) is indeterminant, while the diminished fifth occurs only as a descending interval. The perfect fifth, as opposed to the perfect fourth, shows the tendency of downward movement and such movements are attributed to the frequent progression in the dominant-tonic relationship. The general tendency of the minor sixth is the upward motion, while that of the major sixth is divided equally between ascending and descending, although the upward movement is found to be predominant in the examples of Rameau. The only major seventh motions found in the Baroque examples studied are in Bach's and they are all of downward skips. The octave motions in Rameau's and Vivaldi's examples are all downward, while that of Bach is upward. The following table lists the percentage of intervallic motions in the soprano lines of these composers.

TABLE XI

INTERVAL DIRECTION IN THE SOPRANO LINES OF
RAMEAU, VIVALDI, AND BACH

Intervals	Rameau Percent		Vivaldi Percent		Bach Percent	
	Up	Down	Up	Down	Up	Down
Minor Third	33.0	67.0	31.2	68.8	39.0	61.0
Major Third	26.2	73.8	17.4	82.6	23.0	77.0
Perfect Fourth	65.0	35.0	82.0	18.0	72.1	27.9
Augmented Fourth	00.0	00.0	00.0	100.0	100.0	00.0
Diminished Fifth	00.0	100.0	100.0	00.0	00.0	100.0
Perfect Fifth	33.0	67.0	46.1	53.9	15.4	84.6
Augmented Fifth	00.0	00.0	00.0	00.0	00.0	00.0
Minor Sixth	80.0	20.0	84.0	16.0	00.0	100.0
Major Sixth	00.0	100.0	80.0	11.0	100.0	00.0
Minor Seventh	00.0	100.0	00.0	100.0	60.0	40.0
Major Seventh	00.0	00.0	00.0	00.0	00.0	100.0
Perfect Octave	00.0	100.0	00.0	100.0	52.8	47.2

The intervallic movement of bass lines in these Baroque examples shows general similarity with that of the soprano lines, with a few notable differences found mostly at the cadence points. Certain trends can be noticed when the intervals are compared, and these trends coincide in general with that of the soprano lines. Certain differences may be observed, however, by a comparison of individual interval classes.

Between the bass lines of Rameau and Vivaldi, the repeated note (perfect unison) occurs approximately in the same frequency (23% vs. 24.74%). However, it is substantially

less in Bach's bass lines (7.91%). This may be regarded as reflecting, essentially, the contrapuntal nature of Bach's linear writing. The use of minor second movement shows a steady increase from Rameau to Bach; the major second exhibited a marked decrease from Rameau to Vivaldi (29.5% to 16.5%) but a two-fold increase from Vivaldi to Bach (16.5% to 34.36). This, again, further underscores the contrapuntal nature in Bach's writing as compared with that of his two contemporaries. The minor third movement shows a steady decrease from Rameau to Bach, while that of major third shows a decrease from Vivaldi to Bach. In all examples the perfect fourth was used in a greater frequency within the bass line, as compared to that in the soprano lines, with Vivaldi's examples containing the highest percentage (11%). Also, the perfect fifth is used more in Vivaldi's examples (8.24%) than that of Rameau (3.46%) or Bach (6.42%). The minor sixth movement reveals that Rameau uses it more than Vivaldi's bass line and Bach's bass line. Minor and major seventh movement is found exclusively in Bach's bass lines. The perfect octave is found to be nearly equal in terms of frequency of occurrence among these composers. The following table illustrates percentages for all intervals used in the examples of these composers.

The intervallic motion in the bass lines of these Baroque examples follows the same basic principles as that

TABLE XII

BASS INTERVALS OF RAMEAU, VIVALDI, AND BACH

Intervals	Rameau Percentages	Vivaldi Percentages	Bach Percentages
Perfect Unison	23.02	24.74	7.91
Minor Second	16.08	22.47	26.45
Major Second	29.54	16.49	34.36
Minor Third	9.43	5.36	3.95
Major Third	5.68	2.68	4.32
Perfect Fourth	7.62	10.92	9.39
Augmented Fourth	0.27	1.64	0.12
Diminished Fifth	0.55	0.20	0.49
Perfect Fifth	3.46	8.24	6.42
Augmented Fifth	0.00	0.00	0.00
Minor Sixth	0.83	0.49	0.49
Major Sixth	0.13	1.44	0.49
Minor Seventh	0.00	0.00	0.61
Major Seventh	0.00	0.00	0.37
Perfect Octave	3.32	4.94	4.44

of the soprano lines: the minor and major thirds predominantly move downward; the perfect fourth shows an upward tendency (three out of four times in all the Baroque examples); the motion of augmented fourth is almost always in an upward direction, while the diminished fifth in all instances moves downward. An examination of the direction of movement of the perfect fifth, shows general trends of downward motion. However, the frequency of downward motion reveals some individual statistics; Rameau's 60%, Vivaldi's 76%, and Bach's 84.6%. The minor sixth shows the consistency of a downward motion, while the major sixth showed upward motion in Bach's and Rameau's examples. The sevenths are found only in Bach's examples and, while the minor seventh tends to move upward (60%),

the major seventh is found consistently downward. The perfect octave is found both up and down in Rameau's and Bach's bass lines, while in Vivaldi's it often moves downward (62.5%). The following table illustrates the percentages of ascending and descending intervals in the bass lines of these Baroque examples.

TABLE XIII
INTERVAL DIRECTION IN THE BASS LINES OF
RAMEAU, VIVALDI, AND BACH

Intervals	Rameau Percentages		Vivaldi Percentages		Bach Percentages	
	Up	Down	Up	Down	Up	Down
Minor Third	10.3	89.7	23.0	77.0	37.5	62.5
Major Third	12.2	87.8	15.4	84.6	28.6	71.4
Perfect Fourth	72.7	27.3	77.3	22.7	77.6	22.4
Augmented Fourth	100.0	00.0	75.0	25.0	100.0	00.0
Diminished Fifth	00.0	100.0	00.0	100.0	00.0	100.0
Perfect Fifth	40.0	60.0	25.0	75.0	15.4	84.6
Augmented Fifth	00.0	00.0	00.0	00.0	00.0	00.0
Minor Sixth	00.0	100.0	00.0	100.0	00.0	100.0
Major Sixth	00.0	100.0	100.0	00.0	100.0	00.0
Minor Seventh	00.0	00.0	00.0	00.0	60.0	40.0
Major Seventh	00.0	00.0	00.0	00.0	00.0	100.0
Perfect Octave	54.2	45.8	37.5	62.5	52.8	47.2

The use of dyadic intervals in these Baroque examples reveals certain similarities among them as well as differences between those composers. The perfect unison is not used while the occurrence of minor second is minimal (See Table XIV). Also, this table shows, the dyadic major second

TABLE XIV
DYAD INTERVALS OF RAMEAU, VIVALDI, AND BACH

Intervals	Rameau Percentages	Vivaldi Percentages	Bach Percentages
Perfect Unison	00.00	00.00	00.00
Minor Second	0.81	1.38	0.33
Major Second	4.45	1.73	3.74
Minor Third	17.70	10.20	16.86
Major Third	14.86	19.37	12.56
Perfect Fourth	5.13	4.49	6.17
Augmented Fourth	1.75	2.07	1.54
Diminished Fifth	0.67	3.15	3.19
Perfect Fifth	16.62	16.43	15.98
Augmented Fifth	0.27	0.17	0.22
Minor Sixth	6.75	8.47	8.59
Major Sixth	9.45	7.78	10.58
Minor Seventh	3.10	6.57	4.85
Major Seventh	1.08	0.51	0.77
Perfect Octave	17.29	14.53	13.78

is used very little, while the minor and major thirds account for almost a third of the total dyadic interval content. A closer examination indicates that the frequency of dyadic thirds (major and minor) slightly decreases from Rameau to Vivaldi to Bach (32.56% to 29.57% to 29.42% respectively).

The dyadic interval of perfect fourth accounts for only 5% and reveals no particular trends. The use of the augmented fourth and diminished fifth is minimal; they are found more in Vivaldi's examples than that of the two other composers. The use of the perfect fifth is found to be almost exactly the same among these composers (only indicating

a very slight decrease in use from Rameau to Bach). The augmented fifth is rarely found. The use of the minor and major sixth intervals, when totaled together, is approximately one-half that of the minor and major thirds. The minor seventh is found to be more prevalent in Vivaldi's examples than either Rameau or Bach. The major seventh is seldom used. The perfect octave shows a decrease in use from Rameau to Vivaldi to Bach.

While the frequency of occurrence of dyadic intervals manifests certain stylistic tendencies, the manner of dyadic succession reveals another aspect which, perhaps, is more significant than the former in terms of stylistic study. This aspect will be dealt with later in a greater detail; it will suffice to mention the following regarding the dyadic successions in these Baroque examples. Major and minor consonant intervals (i.e., major and minor thirds and sixths) are preceded and followed by any interval. Augmented and diminished intervals are mostly followed by perfect intervals. Perfect intervals (i.e., perfect fifths, fourths, and octaves) are seldom preceded or followed by another perfect interval. The consistent manner in which these dyadic successions are handled can be regarded as a manifestation of a compositional concern: observation of certain essential contrapuntal rules such as often stated in treatises on composition, and adherence to certain essential harmonic rules such as those often given in texts and treatises on music theory.

One additional point that should be considered is the relation of dyadic intervals with their concurrent harmonies. It is found that in Baroque music certain dyads were associated with certain harmonies in great frequency and therefore conclusions may be drawn from these coincidental harmonies and dyads. The major and minor consonant intervals (major and minor thirds and sixths), perfect fifths and perfect octaves are most generally associated with consonant harmonies (major and minor chords). The use of the dissonant intervals (major and minor seconds and sevenths, tritone, perfect fourth, and augmented fifth) are generally found in association with dominant function harmonies. Certain non-functional harmonies are also found; in general, they are the direct result of contrapuntal writing. (These non-functional harmonies will not be discussed in comparing the dyads and relative harmonies.) The aspect of dyadic succession versus harmonic progression as a stylistic determinant will be discussed further in the concluding chapter.

CHAPTER III

MUSIC OF THE CLASSICAL PERIOD

Works of three composers are selected to represent classical music: Franz Joseph Haydn (1732-1809), Wolfgang Amadeus Mozart (1756-1791), and Ludwig Von Beethoven (1770-1827). An effort was made to find musical examples that represented a chronological progression (early, middle, late) of each composer's work. In this manner, it is believed, a more accurate representation of stylistic features pertaining to intervallic relationships can be examined for analytical comparison.

Music of Joseph Haydn

The music of Franz Joseph Haydn contains certain intervallic features that, when compared to that of other classical composers are similar in some aspects, while in other aspects, differentiate the style of Haydn from that of other classical composers. Before these comparisons can be made, however, a thorough examination of the music of each composer, in terms of intervallic content and the two-part framework need to be made.

Analytic study reveals that melodically Haydn's examples use the perfect unison, minor second and major second

approximately three out of four times (see Table XV). This table also shows that the use of the minor third, major third, and perfect fourth accounts for nearly one out of five intervals. Also, if the percentage of occurrence of these six intervals are combined, the frequency of usage of these intervals occupies a great majority (94.25%) of the total interval content. Augmented intervals do not occur, while sevenths, sixths, tritones, and octaves account for only 5% of the total monadic content of soprano lines.

TABLE XV
SOPRANO INTERVALS OF JOSEPH HAYDN

Intervals	Percentages	Group Percentages
Perfect Unison	25.68	94.25
Minor Second	23.64	
Major Second	25.17	
Minor Third	7.33	
Major Third	5.30	
Perfect Fourth	7.13	
Augmented Fourth	0.00	
Diminished Fifth	0.30	
Perfect Fifth	1.83	
Augmented Fifth	0.00	
Minor Sixth	0.50	
Major Sixth	1.01	
Minor Seventh	0.61	
Major Seventh	0.10	
Perfect Octave	1.12	

The monadic content of Haydn's bass lines bears essential similarities with that of his soprano lines and, although slightly lower, the percentage use of the six aforementioned intervals is still significantly high (88.38%; see Table XVI).

The difference between soprano and bass lines with respect to monadic percentage occurrence is due primarily to the following aspects: greater amount of perfect unison, perfect fifths and octaves, and considerably lesser amounts of major second. The increase in perfect fifths and octaves is due primarily to the "harmonic bass" (as opposed to linear bass) of the dominant-tonic progression particularly at cadence points. The perfect fifth and octave accounts for nearly 10%.

TABLE XVI

BASS INTERVALS OF JOSEPH HAYDN'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	31.11	
Minor Second	21.24	69.30
Major Second	16.95	
Minor Third	6.54	88.38
Major Third	4.61	
Perfect Fourth	7.93	
Augmented Fourth	0.32	
Diminished Fifth	0.10	
Perfect Fifth	6.33	
Augmented Fifth	0.00	
Minor Sixth	0.53	
Major Sixth	0.32	
Minor Seventh	0.21	
Major Seventh	0.00	
Perfect Octave	3.21	

In Haydn's dyadic writing the intervals of minor and major thirds, perfect fifth, minor and major sixths, and perfect octave occupy the majority (84.09%) (see Table VII).

As this table illustrates, the most predominantly used interval is the perfect octave (27.08%). The perfect fifth accounts for 13.26% of the intervals used and the minor and major thirds account for a 24.38 percentage occurrence. It is to be noted that the augmented fourth and diminished fifth intervals occur considerably more in Haydn's examples than that of the Baroque composers. This is also true with regard to the perfect fourth and minor seventh intervals.

TABLE XVII

DYAD INTERVALS OF JOSEPH HAYDN'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	0.09	
Minor Second	0.37	
Major Second	1.76	
Minor Third	10.38	84.09
Major Third	14.00	
Perfect Fourth	5.10	
Augmented Fourth	1.57	
Diminished Fifth	2.87	
Perfect Fifth	13.26	
Augmented Fifth	0.00	
Minor Sixth	8.99	19.37
Major Sixth	10.38	
Minor Seventh	2.59	
Major Seventh	0.55	
Perfect Octave	27.08	

Music of Wolfgang Amadus Mozart

The monadic content of Mozart's soprano lines consists primarily of the following intervals: perfect unison, minor second, and major second (see Table XVIII). The combined percentage occurrence of these intervals is 73.34%; when it

is combined with the percentage occurrence of minor and major thirds and perfect fourths, they occupy 94.68% of the total monadic content. The perfect fifth in Mozart's soprano lines occurs considerably more than that of Haydn.

TABLE XVIII
SOPRANO INTERVALS OF W. A. MOZART'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	28.85	94.68
Minor Second	25.99	
Major Second	18.50	
Minor Third	8.14	
Major Third	6.38	
Perfect Fourth	6.82	92.56
Augmented Fourth	0.00	
Diminished Fifth	0.44	
Perfect Fifth	3.30	
Augmented Fifth	0.00	
Minor Sixth	0.88	
Major Sixth	0.00	
Minor Seventh	0.00	
Major Seventh	0.00	
Perfect Octave	0.66	

The monadic content of Mozart's bass lines bears certain similarities with that of his soprano lines; there are, however, certain differences that should be mentioned. The most notable difference is the increased use of the repeated note (see Table XIX). This increase characterizes the often stagnant bass line in Mozart's example.

The primary monadic intervals of perfect unison, major and minor seconds, minor and major thirds, and perfect fourth, occupy a great majority (92.56%) of the total interval content.

TABLE XIX

BASS INTERVALS OF W. A. MOZART'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	36.36	
Minor Second	21.05	
Major Second	21.29	
Minor Third	2.87	
Major Third	3.34	
Perfect Fourth	7.65	
Augmented Fourth	0.00	
Diminished Fifth	0.23	
Perfect Fifth	4.06	
Augmented Fifth	0.00	
Minor Sixth	0.47	
Major Sixth	0.47	
Minor Seventh	0.00	
Major Seventh	0.00	
Perfect Octave	2.15	

The perfect fifth and octave occur considerably more in Mozart's bass lines than they do in his soprano lines, and the combined percentages of these two intervals occupy a greater portion of the remaining percentages. The intervals of perfect fifth and perfect octave are primarily found at or near cadence points. A greater frequency of cadential points and the regularity of their occurrence in Mozart's examples explains these higher percentages.

The dyadic intervals of major and minor thirds, perfect fifths, major and minor sixths, and perfect octave occupy a significant portion in the total dyadic content succession of Mozart's examples. As Table XX illustrates, the interval of the perfect octave is by far the most predominantly used

(20.76%). One noteworthy aspect is the almost identical use of major and minor thirds (24.94%) and major and minor sixths (24.75%). Perhaps an even more significant fact in this table is the almost identical use of minor thirds (13.71%) and its inversion: the major sixth (13.33%) and major thirds (11.23%) and its inversion: the minor sixth (11.42%). This use of the thirds and sixths will be discussed further at a later time. Another noteworthy factor is the percentage occurrence of the tritone, perfect fourth, and minor sevenths which, when combined, accounts for a higher percentage of use as compared to the interval content in Haydn's examples.

TABLE XX

DYAD INTERVALS OF W. A. MOZART'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	0.00	
Minor Second	0.76	
Major Second	1.71	
Minor Third	13.71	81.11
Major Third	11.23	
Perfect Fourth	5.71	
Augmented Fourth	2.66	
Diminished Fifth	2.85	
Perfect Fifth	10.66	
Augmented Fifth	0.38	
Minor Sixth	11.42	24.75
Major Sixth	13.33	
Minor Seventh	3.42	
Major Seventh	0.38	
Perfect Octave	20.76	

Music of Ludwig Van Beethoven

The music of Beethoven, like that of the other classical composers, contains certain intervallic features that are unique to his music. In the examples studied, the repeated note (i.e., monadic perfect unison) occupies over one-third (36.07%) in his soprano lines and is by far the most predominantly used melodic interval (see Table XXI). The major second accounts for 28.95% of the intervals used and the minor second accounts for 14.42%; the combined usage of these three intervals accounts for approximately four-fifths of the intervals used. When the percentage occurrence of the major and minor thirds and perfect fourth are included in the calculation, the percentage occurrence of these six

TABLE XXI

SOPRANO INTERVALS OF L. V. BEETHOVEN'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	36.07	
Minor Second	14.42	
Major Second	28.95	
Minor Third	5.31	
Major Third	3.60	
Perfect Fourth	2.90	
Augmented Fourth	0.30	
Diminished Fifth	0.10	
Perfect Fifth	2.90	
Augmented Fifth	0.00	
Minor Sixth	1.20	
Major Sixth	1.20	
Minor Seventh	0.40	
Major Seventh	0.10	
Perfect Octave	2.30	

	79.44
	91.25

intervals is 91.25%. The use of other intervals constitutes a percentage which is slightly higher than that of the other classical composers.

The monadic content of the bass lines in Beethoven's examples bears certain similarities with the monadic content of his soprano lines, with a few exceptions most notably in the interval of perfect fourth, fifth, and octave. The perfect unison is used slightly more in his soprano lines. The major and minor seconds, however, are used considerably less in the bass lines of Beethoven as compared to his soprano lines (see Table XXII). This may be used to explain a particular nature of bass line movement (i.e., less linear or more harmonic in character. There is also a considerable difference in the use of the perfect fourth in

TABLE XXII

BASS INTERVALS OF L. V. BEETHOVEN'S MUSIC

Intervals	Percentages	Group Percentages
Perfect Unison	38.70	69.77
Minor Second	11.58	
Major Second	19.49	87.32
Minor Third	4.72	
Major Third	4.24	
Perfect Fourth	8.59	
Augmented Fourth	0.00	
Diminished Fifth	0.19	
Perfect Fifth	4.72	
Augmented Fifth	0.00	
Minor Sixth	0.48	
Major Sixth	0.48	
Minor Seventh	0.48	
Major Seventh	0.28	
Perfect Octave	5.98	

his bass lines (8.59%) as compared to the soprano lines (2.90%). This difference is also noted in the areas of perfect fifth and perfect octave. All of these differences are largely attributable to the more harmonic character of the bass lines at cadential points of the dominant-tonic relationship.

In his dyadic writing, the perfect octave is the most frequently used interval, with the perfect fifth having approximately the equal frequency of occurrence with that of the octave (see Table XXIII). Also, Table XXIII shows, intervals of thirds, sixths, perfect fifth and octave occupy nearly three-fourths of the total dyadic content. The remaining percentages are primarily divided among the intervals of major seconds, minor sevenths, and perfect fourths.

TABLE XXIII

DYAD INTERVALS OF L. V. BEETHOVEN'S MUSIC

Intervals	Percentages	Groups Percentages
Perfect Unison	0.18	
Minor Second	0.55	
Major Second	5.08	
Minor Third	9.98	72.80
Major Third	14.69	
Perfect Fourth	7.67	
Augmented Fourth	1.20	
Diminished Fifth	1.20	
Perfect Fifth	15.80	
Augmented Fifth	0.00	
Minor Sixth	6.09	14.31
Major Sixth	8.22	
Minor Seventh	6.37	
Major Seventh	0.46	
Perfect Octave	18.02	

Conclusions and Correlations

The melodic writing of the three classical composers reveals certain personal traits in terms of monadic movement which illustrates not only one aspect of individual style but also that of the classical period as a whole. As Table XXIV shows, the perfect unison increases in percentage occurrence from Haydn to Mozart to Beethoven. This table also indicates that the percentage occurrence of the unison, minor second, and major second are almost equal in Haydn's examples, while in Mozart's examples there are more minor seconds and less major seconds, and Beethoven's examples more major seconds and less minor seconds. The combined percentage occurrence of these three intervals are, however, very similar in the Haydn and Mozart examples, and considerably greater in Beethoven examples due to a greater occurrence of repeated notes (monadic unison).

The intervals of minor and major thirds, and perfect fourth occur in approximately the same frequency in the examples of Haydn and Mozart, indicating certain melodic similarities between these two composers. In contrast, these intervals in Beethoven's examples occur only half as often as that in Haydn's or Mozart's examples. Also, while the augmented fourth does not occur at all in Haydn's or Mozart's example, it occurs occasionally in Beethoven's melodies. The perfect fifth is used more by Mozart than Haydn or Beethoven. The minor and major sixths occur more

TABLE XXIV

SOPRANO INTERVALS OF HAYDN, MOZART, AND BEETHOVEN

Intervals	Haydn Percentages	Mozart Percentages	Beethoven Percentages
Perfect Unison	25.68	28.85	36.07
Minor Second	23.64	25.99	14.42
Major Second	25.17	18.50	28.95
Minor Third	7.33	8.14	5.31
Major Third	5.30	6.38	3.60
Perfect Fourth	7.13	6.82	2.90
Augmented Fourth	0.00	0.00	0.30
Diminished Fifth	0.30	0.44	0.10
Perfect Fifth	1.83	3.30	2.90
Augmented Fifth	0.00	0.00	0.00
Minor Sixth	0.50	0.88	1.20
Major Sixth	1.01	0.00	1.20
Minor Seventh	0.61	0.00	0.40
Major Seventh	0.10	0.00	0.10
Perfect Octave	1.12	0.66	2.30

often in Beethoven's examples than in Haydn's and Mozart's; in Mozart's examples, major sixth does not occur. Major sevenths occur infrequently in Haydn's and Beethoven's; they are not found in Mozart's examples. Lastly, the frequency occurrence of the perfect octave in Beethoven's examples is almost twice that of the Mozart and Haydn examples.

An examination of the direction of monadic movements in these examples reveals a predominance of descending minor and major thirds in the soprano lines, with the only exception that Mozart's examples contain more ascending major thirds. The majority of perfect fourths are found in an ascending direction. An examination of Table XXV also reveals that the

use of ascending perfect fourths increases from Haydn to Mozart or Beethoven (61.4%, 67.7%, and 75.9% respectively). The tritone skip is generally in the descending direction in Beethoven's examples while it is generally ascending in Haydn and Mozart examples. The perfect fifth is more likely to be descending except in the Haydn examples where equal percentages of ascending and descending perfect fifths are used. Frequency of occurrence of the major and minor sixths is equally divided between up and down movement in all the examples of these composers. As stated previously, major sixths do not occur in the Mozart examples studied. The percentage of occurrence of minor seventh, with respect to interval direction, is equally divided between ascending and descending in the Haydn soprano lines while in Beethoven's examples ascending minor seventh occurs more often. Only the ascending major seventh is found in Haydn and Beethoven's examples. The melodic interval of minor and major sevenths do not occur in the Mozart examples studied. Only the ascending perfect octave is found in Mozart melody examples while in Haydn and Beethoven's examples, the octave motion is mostly descending.

The monadic content of these composers' bass lines bears essential similarities with that of their soprano lines. As mentioned previously, a notable difference between soprano and bass lines with regard to the monadic use is the increased frequency of perfect fifths and octaves which occur in the bass lines, mostly at cadence points. The use of perfect unison shows slight increase from Haydn to Mozart to

TABLE XXV

INTERVAL MOVEMENT IN THE SOPRANO LINES OF
HAYDN, MOZART, AND BEETHOVEN

Intervals	Haydn Percentages		Mozart Percentages		Beethoven Percentages	
	Up	Down	Up	Down	Up	Down
Minor Third	23.6	76.4	37.8	62.2	35.8	64.2
Major Third	38.5	61.5	62.0	38.0	38.9	61.1
Perfect Fourth	61.4	38.6	67.7	32.3	75.9	24.1
Augmented Fourth	----	----	----	----	33.3	66.7
Diminished Fifth	63.7	33.3	100.0	00.0	00.0	100.0
Perfect Fifth	50.0	50.0	33.3	66.7	31.0	69.0
Augmented Fifth	----	----	----	----	----	----
Minor Sixth	20.0	80.0	50.0	50.0	50.0	50.0
Major Sixth	60.0	40.0	----	----	58.3	41.7
Minor Seventh	50.0	50.0	----	----	75.0	25.0
Major Seventh	100.0	00.0	----	----	100.0	00.0
Perfect Octave	45.6	54.6	100.0	00.0	43.5	56.5

Beethoven (31.11%, 36.36%, and 38.70% respectively), while the minor second decreases in use particularly from Haydn and Mozart (21.24%, 21.05%) to Beethoven (11.58%). The frequency of occurrence of major seconds increases from Haydn to Mozart but it decreases from Mozart to Beethoven (See Table XXVI). The minor and major thirds occur more often in Haydn's bass lines than that of Beethoven and Mozart. The use of the perfect fourth, on the other hand, does not show any notable change in the examples of these composers. The perfect fifth and octave are used considerably less frequently in Mozart's bass lines, as opposed to

that of Beethoven and Haydn. The major and minor sixths and sevenths occur infrequently. This aspect is similar to the bass line monadic use of Baroque examples studied. (This will be discussed in greater detail later in this study).

TABLE XXVI
BASS INTERVALS OF HAYDN, MOZART, AND BEETHOVEN

Intervals	Haydn Percentages	Mozart Percentages	Beethoven Percentages
Perfect Unison	31.11	36.36	38.70
Minor Second	21.24	21.05	11.58
Major Second	16.95	21.29	19.49
Minor Third	6.54	2.87	4.72
Major Third	4.61	3.34	4.24
Perfect Fourth	7.93	7.65	8.59
Augmented Fourth	0.32	0.00	0.00
Diminished Fifth	0.10	0.23	0.10
Perfect Fifth	6.33	4.06	4.72
Augmented Fifth	0.00	0.00	0.00
Minor Sixth	0.53	0.47	0.48
Major Sixth	0.32	0.47	0.48
Minor Seventh	0.21	0.00	0.48
Major Seventh	0.00	0.00	0.28
Perfect Octave	3.21	2.15	5.98

An examination of the direction of monadic movements reveals certain features that are highly significant from the personal stylistic viewpoints. For example, while the movement of minor third shows consistency among these three composers--approximately one third of the frequency of occurrence is in an upward direction and two thirds is in a

downward direction, the movement of the major third indicates highly personal differences: Haydn's usage is divided more equally between upward and downward (48.8% and 51.2% respectively), Beethoven's usage is mostly downward (81.8%), and Mozart rarely in an upward motion (7.1%) (see Table XXVII). The use of perfect fourth shows consistency of ascending direction. However, it is to be noted that there is more descending perfect fourths in the bass lines as opposed to the same interval occurring in soprano lines of these classical examples. Also, the tritone consistently occurs in a descending direction. The perfect fifth is in a descending direction three-fourths of the time. This interval also exhibits consistency in its usage--it constitutes nearly equal percentages in the bass lines of all these composers (i.e., 76.3% for Haydn, 76.5% for Mozart, and 77.6% for Beethoven). The direction of major and minor sixth is another example showing distinctive personal traits: Haydn's consistent use of these intervals is descending, while Mozart's minor sixth is always ascending and major sixth is always descending. Beethoven uses a majority of descending minor sixths and ascending major sixths.

The dyadic intervals of Haydn, Mozart and Beethoven contain certain similarities and differences that deserve mentioning. The minor second occurs infrequently and therefore no conclusions of any significance can be drawn. The major second occurs slightly more in the Haydn and Mozart

TABLE XXVII

INTERVAL MOVEMENT IN THE BASS LINES OF HAYDN,
MOZART, AND BEETHOVEN

Intervals	Haydn Percentages		Mozart Percentages		Beethoven Percentages	
	Up	Down	Up	Down	Up	Down
Minor Third	37.3	62.3	33.3	66.7	38.8	61.2
Major Third	48.8	51.2	7.1	92.6	18.2	81.8
Perfect Fourth	62.2	37.8	59.4	40.6	57.3	42.7
Augmented Fourth	00.0	100.0	-----	-----	-----	-----
Diminished Fifth	00.0	100.0	00.0	100.0	00.0	100.0
Perfect Fifth	23.7	76.3	23.5	76.5	22.4	77.6
Augmented Fifth	-----	-----	-----	-----	-----	-----
Minor Sixth	60.0	40.0	100.0	00.0	40.0	60.0
Major Sixth	66.7	33.3	00.0	100.0	80.0	20.0
Minor Seventh	100.0	00.0	-----	-----	40.0	60.0
Major Seventh	-----	-----	-----	-----	33.3	66.7
Perfect Octave	36.7	63.3	88.0	11.1	43.5	56.5

examples; however, in Beethoven's example the same interval occurs significantly more, approximately five times that of Haydn or Mozart's usage (see Table XXVIII). The minor and major third dyads occur frequently in all these examples and, although there are differences in the percentages between these two intervals the combined percentage occurrence reveals a near identical frequency of usage among these composers (i.e., 24.38% in Haydn's examples, 24.94% in Mozart's, and 24.67% in Beethoven's). The frequency of perfect fourth is about the same in Haydn's and Mozart's examples, while it is more in Beethoven's examples. The frequency occurrence of tritones is slightly higher in

Mozart's examples. It should also be mentioned that the tritone is found more often in these classical examples than in Baroque or even Romantic examples. This and other relative matters will be discussed in greater detail later in this study. The frequency occurrence of perfect fifth is slightly higher in Beethoven's examples than Haydn's or Mozart's. The minor and major sixth occur more often in Mozart's examples than either Haydn or Beethoven, constituting nearly one-fourth of all dyadic intervals. The minor seventh, however, constitutes significantly higher percentages in Beethoven's examples than Mozart or Haydn. The use of perfect octave is the only dyad that exhibited a historical trend: its usage decreases from Haydn to Mozart to Beethoven (i.e., 27.08%, 20.76%, and 18.02% respectively).

TABLE XXVIII

DYAD INTERVALS IN THE MUSIC OF HAYDN, MOZART
AND BEETHOVEN

Intervals	Haydn Percentages	Mozart Percentages	Beethoven Percentages
Perfect Unison	0.09	0.00	0.18
Minor Second	0.37	0.76	0.55
Major Second	1.76	1.71	5.08
Minor Third	10.38	13.71	9.98
Major Third	14.00	11.23	14.69
Perfect Fourth	5.10	5.71	7.67
Augmented Fourth	1.57	2.66	1.20
Diminished Fifth	2.87	2.85	1.20
Perfect Fifth	13.26	10.66	15.80
Augmented Fifth	0.00	0.38	0.00
Minor Sixth	8.99	11.42	6.09
Major Sixth	10.38	13.33	8.22
Minor Seventh	2.59	3.42	6.37
Major Seventh	0.55	0.38	0.46
Perfect Octave	27.08	20.76	18.02

An examination of the dyadic succession in these examples reveals that perfect intervals (i.e., fifths, fourths, and octaves) are seldom preceded or followed by another perfect interval. There is, however, more frequent occurrence of these perfect intervals than that in Baroque examples. Particularly, in Beethoven's examples a perfect interval is often preceded or followed by another perfect interval; such dyadic succession occurs more often in Beethoven music than in Haydn or Mozart's examples. Major and minor intervals are preceded and followed by any interval, and no particular preference is to be noted. The only exception is that the major seventh is always followed by a perfect octave. The augmented fourth is most often followed by a larger interval (i.e., perfect fifth or larger) and the diminished fifth is most often followed by a smaller interval (perfect fourth or smaller). These dyadic motions are very much in accordance with that of the music of the preceding era. The augmented sixth, though infrequently used (approximately 2%), is always followed by a perfect octave.

The great majority of dyads in the classical examples used in this study are associated with harmonies (chords) that are, for the most part, diatonic and not chromatic. These concurrent harmonies exhibit some resemblances to Baroque music, with certain differences that will be discussed later in this study. The more consonant harmonies (i.e., major and minor chords) are primarily associated with intervals of major and minor thirds, major and minor

sixths, perfect fifth, perfect octave, and occasionally perfect fourth. The more dissonant harmonies (i.e., diminished seventh chords) are primarily associated with dissonant dyadic intervals: minor and major seconds, minor and major sevenths, augmented fourth, diminished fifth, and to some extent, perfect fourths. There are indeed more examples of chromatic harmonies in the classical examples than the Baroque examples, and these chromatic harmonies are more often associated with the more dissonant intervals such as mentioned above.

CHAPTER IV

MUSIC OF THE ROMANTIC PERIOD

Choral works of Hector Berlioz (1803-1869), Anton Bruckner (1824-1869), and Johannes Brahms (1853-1897) are selected to represent music of the Romantic period. In selecting musical examples, an effort was made to include pieces that represent a chronological progression (early to late) of styles of these composers. It is believed that in this manner, a more representative cross-section of linear and harmonic styles in the romantic period can be presented for analysis and thus providing material for stylistic comparison. The examples of these composers contain certain intervallic as well as other features that are stylistically unique to these individual composers. Before discussing these features, it is necessary to examine their selected work in detail.

Music of Hector Berlioz

The melodic (soprano) lines of Berlioz reveal that the great majority of intervals used are the perfect unison and minor and major seconds occupying over 80% (see Table XXIX). If the intervals of minor and major thirds and perfect fourths are added to the three aforementioned intervals, their

combined percentages occupy nearly all the monadic intervals used (95.73%). The remaining intervals constitute an insignificant amount in the motion of Berlioz's soprano lines. This aspect underscores the extremely melodious feature of Berlioz melodic material.

TABLE XXIX
THE SOPRANO INTERVALS OF HECTOR BERLIOZ

Intervals	Percentages	Group Percentages
Perfect Unison	37.09	80.47
Minor Second	22.33	
Major Second	21.05	
Minor Third	6.67	95.73
Major Third	4.49	
Perfect Fourth	4.10	
Augmented Fourth	0.12	
Diminished Fifth	0.12	
Perfect Fifth	1.92	
Augmented Fifth	0.00	
Minor Sixth	0.38	
Major Sixth	0.89	
Minor Seventh	0.00	
Major Seventh	0.00	
Perfect Octave	0.25	

The monadic content of the bass lines in Berlioz examples, however, exhibits quite different character from that of his soprano lines (see Table XXX). The occurrence of perfect unison in Berlioz's bass lines is considerably more than that of his soprano lines, constituting approximately half of all intervals used (43.21%). The frequency occurrence of minor and major seconds is considerably less than that of his soprano lines, and the minor third is used slightly more

than that of his soprano lines. The perfect fourth and fifth are used approximately twice as much as in his soprano lines. Another noteworthy factor is the infrequent use of the perfect octave in the bass lines, as compared with other Romantic composers. This particular aspect will be dealt with in greater detail later in this study.

TABLE XXX

THE BASS INTERVALS OF HECTOR BERLIOZ

Intervals	Percentages	Group Percentages
Perfect Unison	43.21	
Minor Second	17.28	71.51
Major Second	11.02	
Minor Third	5.21	92.21
Major Third	6.40	
Perfect Fourth	9.09	
Augmented Fourth	0.00	
Diminished Fifth	0.00	
Perfect Fifth	4.32	
Augmented Fifth	0.00	
Minor Sixth	0.59	
Major Sixth	0.89	
Minor Seventh	0.59	
Major Seventh	0.00	
Perfect Octave	0.89	

The most frequently occurring dyad in Berlioz's examples is the perfect octave, occupying approximately one-fourth of the total dyadic content (22.4%). The interval having the next highest frequency of occurrence is the major third. This offers a notable contrast to examples of Baroque and Classical composers so far examined. If the

frequency of occurrence of the major and minor thirds are combined, these two intervals account for over one-fourth of total dyadic usage. The perfect fifth is another important dyadic interval occupying approximately one-sixth the total dyadic content. See the following table for percentages of dyadic intervals in Berlioz's examples.

TABLE XXXI

DYAD INTERVALS OF HECTOR BERLIOZ

Intervals	Percentages	Group Percentages	
Perfect Unison.	00.00		
Minor Second.	0.51		
Major Second.	4.46		
Minor Third	10.10	76.39	
Major Third	16.83		
Perfect Fourth.	5.31		
Augmented Fourth.	1.42		
Diminished Fifth.	3.75		
Perfect Fifth	13.47		
Augmented Fifth	0.77		
Minor Sixth	6.73		13.59
Major Sixth	6.86		
Minor Seventh	3.88		
Major Seventh	1.81		
Perfect Octave.	22.40		

Music of Anton Bruckner

In the soprano lines of Anton Bruckner, the following intervals are used frequently: perfect unison, and minor and major seconds. These intervals account for three-fourths of the total monadic content (see Table XXXII). If, however, the intervals of minor and major thirds, and perfect fourths

are combined with the three aforementioned intervals, these six intervals account for the great majority (93.02%) of the total monadic content.

TABLE XXXII

THE SOPRANO INTERVALS OF ANTON BRUCKNER

Intervals	Percentages	Group Percentages
Perfect Unison	24.51	93.02
Minor Second	23.04	
Major Second	29.26	
Minor Third	6.95	
Major Third	3.41	
Perfect Fourth	5.85	
Augmented Fourth	0.24	
Diminished Fifth	0.24	
Perfect Fifth	2.07	
Augmented Fifth	0.00	
Minor Sixth	0.85	
Major Sixth	0.36	
Minor Seventh	0.48	
Major Seventh	0.00	
Perfect Octave	2.19	

The monadic intervals content of Bruckner's bass lines is different from that of his soprano lines. The perfect unison is used slightly more, and the minor second is used considerably less often than his soprano lines (see Table XXXIII). The major and minor seconds are used less, while the major third occurs in almost equal frequency to that in the soprano line. The perfect fourth as well as perfect fifth and octave are used considerably more in Bruckner's bass line as opposed to his soprano lines. The increased

occurrence of these three perfect intervals is due primarily to their increased occurrence at cadence points. Another interesting factor in Bruckner's bass lines is the higher occurrence of the perfect fourth as opposed to the perfect fifth, which is in contrast to the monadic content of his soprano lines. This is due to increased use of these intervals at cadential points. The perfect fourth is associated with the dominant-tonic progression.

TABLE XXXIII

THE BASS INTERVALS OF ANTON BRUCKNER

Intervals	Percentages	Group Percentages
Perfect Unison	26.25	86.71
Minor Second	16.44	
Major Second	25.86	
Minor Third	5.70	
Major Third	3.84	
Perfect Fourth	8.62	86.71
Augmented Fourth	0.26	
Diminished Fifth	0.53	
Perfect Fifth	7.02	
Augmented Fifth	0.00	
Minor Sixth	0.26	
Major Sixth	0.92	
Minor Seventh	0.13	
Major Seventh	0.26	
Perfect Octave	3.31	

The dyadic content in Bruckner's examples reveals a number of important factors which are in contrast to that of other Romantic composers. Dyadic motions in Bruckner's examples indicate that the perfect octave occurs most

frequently, comprising approximately one-half of the total dyadic content (see Table XXXIV). The interval of the next highest frequency occurrence is the perfect fifth (11.6%). The major and minor thirds account for 17.40% of the dyadic intervals and the major and minor sixths account for a nearly equal percentage (14.86%). When these above interval percentages are combined, they comprise a great majority of the dyads in Bruckner's examples (84.97%). The major second, perfect fourth, and minor seventh account for a great majority of the remaining intervals in frequency occurrence.

TABLE XXXIV

THE DYAD INTERVALS OF ANTON BRUCKNER

Intervals	Percentages	Group Percentages
Perfect Unison	00.12	
Minor Second	0.12	
Major Second	3.38	
Minor Third	8.22	84.97
Major Third	9.18	
Perfect Fourth	5.80	
Augmented Fourth	1.08	
Diminished Fifth	0.60	
Perfect Fifth	11.60	
Augmented Fifth	0.12	
Minor Sixth	6.04	14.86
Major Sixth	8.82	
Minor Seventh	2.53	
Major Seventh	0.48	
Perfect Octave	41.11	

Music of Johannes Brahms

An analysis of Brahms' melodic examples reveals that the use of perfect unison occurs considerably less often

than other Romanic examples. The use of major second accounts for approximately one-third of the monadic content of Brahm's soprano lines (see Table XXXV). The minor second, however, is used considerably less and accounts for approximately one-fourth (22.79%) of Brahm's monadic content. An interesting factor in the soprano lines of these Brahm's examples is the identical percentage occurrence of major thirds and perfect fourths (8.23%). The use of these six intervals (perfect unison, minor and major seconds, minor and major thirds, and perfect fourth) comprises the great majority (96.12%) of the monadic content in Brahm's soprano lines. The perfect fifth occupies half of the remaining percentage. Augmented fourth, augmented fifth, minor seventh and perfect octave do not occur.

TABLE XXXV

THE SOPRANO INTERVALS OF JOHANNES BRAHMS

Intervals	Percentages	Group Percentages	
Perfect Unison	13.30	70.03	
Minor Second	22.76		
Major Second	33.97		
Minor Third	9.63		96.12
Major Third	8.23		
Perfect Fourth	8.23		
Augmented Fourth	0.00		
Diminished Fifth	0.17		
Perfect Fifth	2.10		
Augmented Fifth	0.00		
Minor Sixth	1.22		
Major Sixth	0.17		
Minor Seventh	0.17		
Major Seventh	0.00		
Perfect Octave	0.00		

The monadic content of Brahms's bass lines is considerably different than that of his soprano lines. A significant difference is the increased use of the perfect intervals (unison, fourth, fifth, and octave). Particularly perfect fifth occupies approximately one-sixth of the total monadic content of the bass line. These intervals, when combined, account for half of the monadic content in Brahms' bass lines (50.26%), as compared to only one-fourth in the monadic content of the soprano lines (23.63%). Another significant difference is the use of perfect unison, major and minor seconds, major and minor thirds, and perfect fourths (see Table XXXVI).

TABLE XXXVI

THE BASS INTERVALS OF JOHANNES BRAHMS

Intervals	Percentages	Group Percentages
Perfect Unison	19.67	50.08
Minor Second	10.38	
Major Second	20.03	76.84
Minor Third	11.47	
Major Third	3.82	
Perfect Fourth	11.47	
Augmented Fourth	0.36	
Diminished Fifth	0.36	
Perfect Fifth	16.39	
Augmented Fifth	0.00	
Minor Sixth	1.63	
Major Sixth	0.18	
Minor Seventh	0.36	
Major Seventh	0.00	
Perfect Octave	2.73	

These six intervals, when combined, account for approximately three-fourths of the monads in Brahms's bass lines, which is considerably less than the soprano lines (i.e., 76.84% for bass and 96.12% for soprano). Noteworthy is the decreased use of the minor and major seconds and the minor third, as compared to the frequency use of these intervals in his soprano lines.

The dyadic content in Brahms's examples reveals that, as in examples of other Romantic composers, the perfect octave is the most frequently employed; it accounts for approximately one-fourth of the total dyadic usage (see Table XXXVII). The major third is the next most frequently used interval (20.72%). The combined occurrence of minor and major thirds comprises one-third of the total dyadic usage in Brahms's examples. The perfect fifth also is frequently employed in the dyadic motions of Brahms's examples and accounts for 16.94% usage, while the minor and major sixths are nearly equal in use (i.e., 6.9% and 7.56% respectively). When the percentage occurrence of the above intervals are combined, they occupy a large percentage (88.13%) of the total dyadic usage in Brahms's examples. The remaining percentages (12%) are occupied by the other intervals, mostly major seconds, perfect fourths and minor sevenths.

TABLE XXXVII

THE DYAD INTERVALS OF JOHANNES BRAHMS

Intervals	Percentages	Group Percentages
Perfect Unison	0.00	
Minor Second	0.00	
Major Second	3.61	
Minor Third	11.51	
Major Third	20.72	
Perfect Fourth	4.27	
Augmented Fourth	0.16	
Diminished Fifth	0.32	
Perfect Fifth	16.94	88.13
Augmented Fifth	0.16	
Minor Sixth	6.90	14.46
Major Sixth	7.56	
Minor Seventh	2.46	
Major Seventh	0.32	
Perfect Octave	24.50	

Correlations and Conclusions

The differences of these Romantic examples are more marked than the differences in the classical or Baroque examples. Monadically, the soprano lines of these Romantic examples reveal that there is a steady decline in the use of the perfect unison (see Table XXXVIII). While the minor second is approximately equal in use among these composers, the major second and minor third increases in use from Berlioz to Bruckner to Brahms. The major third is used by Brahms more than any other Romantic composer (8.23%), while Bruckner used it least (3.41%). The use of the same interval in Brahms' examples is considerably more than any other composer in any of the three historical periods. This will be elaborated upon more in the final chapter. The use of

perfect fourth shows a steady increase from Berlioz to Brahms while the perfect fifth is nearly equal in use in all examples of the three composers. The use of the perfect octave, however, occurs considerably more often in Bruckner's soprano lines than that of Berlioz and Brahms. This interval does not occur in Brahms' examples and occurs only twice in Berlioz's examples.

TABLE XXXVIII

THE SOPRANO INTERVALS OF BERLIOZ, BRUCKNER,
AND BRAHMS

Intervals	Berlioz Percentages	Bruckner Percentages	Brahms Percentages
Perfect Unison	37.09	24.51	13.30
Minor Second	22.33	23.04	22.76
Major Second	21.05	29.26	33.97
Minor Third	6.67	6.95	9.63
Major Third	4.49	3.41	8.23
Perfect Fourth	4.10	5.85	8.23
Augmented Fourth	0.12	0.24	0.00
Diminished Fifth	0.12	0.24	0.17
Perfect Fifth	1.92	2.07	2.10
Augmented Fifth	0.00	0.00	0.00
Minor Sixth	0.38	0.85	1.22
Major Sixth	0.89	0.36	0.17
Minor Seventh	0.38	0.48	0.17
Major Seventh	0.00	0.00	0.00
Perfect Octave	0.25	2.19	0.00

The direction of these monadic motions suggests additional information on certain trends of these Romantic composers.

The ascending minor third shows a decrease in use from

Berlioz to Brahms, while the descending minor third shows an increase. It is significant to point out that the ascending minor third occupies a considerable portion of Berlioz's melodic motion while the descending minor third comprises an important monadic movement in Brahms' melodic lines. The descending major third, however, is used in great majority among all three composers. Another important feature is that, while the perfect fourth in the soprano lines of Bruckner and Berlioz moves upward, the same interval is mostly in a downward motion in Brahms examples. The perfect fifth in the soprano lines of Berlioz and Brahms is more often ascending while Bruckner uses descending perfect fifths a majority of the time. Note also that Brahms' use of fifth occurs mostly in an ascending direction (91.7%); this is a significantly higher frequency of occurrence, as compared to that in other composers melodies. The augmented fourth is generally in ascending motion. The minor sixth is used predominantly in an ascending direction in all these examples. There is, however, a decline in the frequency of occurrence of ascending minor sixths from Berlioz to Brahms. While Berlioz uses ascending sixths exclusively, Bruckner uses the same over three-fourths and Brahms over two-thirds.

The monadic content of the bass lines in these Romantic examples reveals certain differences and similarities when compared to the soprano lines. The use of the perfect unison is greater in Berlioz examples than Bruckner or

TABLE XXXIX

SOPRANO INTERVAL MOVEMENT OF BERLIOZ,
BRUCKNER, AND BRAHMS

Intervals	Berlioz Percentages		Bruckner Percentages		Brahms Percentages	
	Up	Down	Up	Down	Up	Down
Minor Third	59.6	40.4	56.1	43.9	47.3	52.7
Major Third	42.8	57.2	42.9	57.1	44.7	55.3
Perfect Fourth	59.4	40.6	70.8	29.2	46.8	53.2
Augmented Fourth	100.0	0.0	50.0	50.0	----	----
Diminished Fifth	100.0	0.0	0.0	100.0	0.0	100.0
Perfect Fifth	66.7	33.3	35.3	64.7	91.7	8.3
Augmented Fifth	----	----	----	----	----	----
Minor Sixth	100.0	0.0	85.7	14.3	71.4	28.6
Major Sixth	57.1	42.9	66.7	33.3	100.0	0.0
Minor Seventh	33.3	66.7	100.0	0.0	0.0	100.00
Major Seventh	----	----	----	----	----	----
Perfect Octave	50.0	50.0	27.8	72.2	----	----

Brahms (see Table XL). The minor second exhibits a similar trend (i.e., greater in Berlioz lesser in Bruckner and least in Brahms). The major second, however, is used the most in Bruckner's examples than Berlioz or Brahms. The minor third occurs approximately the same frequency in Berlioz and Bruckner examples (i.e., 5.21% and 5.7%) but in Brahms' examples the same interval occurs slightly more than twice the frequency (11.47%). The major third is used approximately twice as much in the Berlioz examples as compared to Bruckner's and Brahms'. While the use of perfect fourth shows little distinguishing features among these composers, the perfect

fifth reveals marked traits: the percentage occurrence is twice as much in Bruckner's than in Berlioz's (i.e., 7.02% and 4.32% respectively), and it is twice as much in Brahms' than in Bruckner (i.e., 16.39% and 7.02% respectively). All other intervals occur very frequently; no comparison of any significance can be made.

TABLE XL
BASS INTERVALS OF BERLIOZ, BRUCKNER,
AND BRAHMS

Intervals	Berlioz Percentages	Bruckner Percentages	Brahms Percentages
Perfect Unison	43.21	26.25	19.67
Minor Second	17.28	16.44	10.38
Major Second	11.02	25.86	20.03
Minor Third	5.21	5.70	11.47
Major Third	6.40	3.84	3.82
Perfect Fourth	9.09	8.62	11.47
Augmented Fourth	0.00	0.26	0.36
Diminished Fifth	0.00	0.53	0.36
Perfect Fifth	4.32	7.02	16.39
Augmented Fifth	0.00	0.00	0.00
Minor Sixth	0.59	0.26	1.63
Major Sixth	0.89	0.92	0.18
Minor Seventh	0.59	0.13	0.36
Major Seventh	0.00	0.26	0.00
Perfect Octave	0.80	3.31	2.73

The interval direction of the monads in the bass lines of these Romantic examples as compared with that in the soprano lines, contains certain differences that note mention. The minor third is used predominantly in a descending direction in the bass lines of these Romantic examples (see Table XLI).

Although major thirds occur equally often in ascending as well as in descending motion when all these romantic examples are combined, individual differences deserve notice: descending motion is predominant in the Berlioz and Bruckner examples, while ascending motion is predominant in Brahms' examples.

The motion of perfect fourth is generally equally divided between ascending and descending. The augmented fourth is found primarily in an ascending direction, while the diminished fifth is always descending. The perfect fifth and octave are generally in the descending direction. However, octave is employed primarily in the ascending motion in the Brahms' example (86.7%) as opposed to the same interval in the other composers.

TABLE XLI

BASS INTERVAL MOVEMENT OF BERLIOZ, BRUCKNER,
AND BRAHMS

Intervals	Berlioz Percentages		Bruckner Percentages		Brahms Percentages	
	Up	Down	Up	Down	Up	Down
Minor Third	40.0	60.0	41.9	58.1	20.6	79.4
Major Third	48.8	51.2	48.3	51.7	52.4	47.6
Perfect Fourth	54.1	45.9	60.0	40.0	52.4	47.6
Augmented Fourth	----	----	50.0	50.0	100.0	0.0
Diminished Fifth	----	----	0.0	100.0	0.0	100.0
Perfect Fifth	27.6	72.4	28.3	71.7	37.8	62.2
Augmented Fifth	----	----	----	----	----	----
Minor Sixth	100.0	0.0	100.0	0.0	11.1	88.9
Major Sixth	33.3	66.7	57.1	42.9	100.0	0.0
Minor Seventh	75.0	25.0	100.0	0.0	100.0	0.0
Major Seventh	----	----	0.0	100.0	----	----
Perfect Octave	16.7	83.3	28.0	72.0	86.7	13.3

The usage of dyadic intervals in the examples of these Romantic composers exhibit the common historical traits and, at the same time, individual characteristic of each composer. The dyadic perfect unison, not found in the Baroque and Classical examples, seldom occurs (once in Bruckner's example). The dyadic minor second, though infrequently, appears in the examples of Bruckner and Berlioz. The dyadic major second is found in all three composers' examples, with approximately equal frequency (see Table XLII). These composers also use approximately the same amount of dyadic perfect fourths and major and minor sixths. Although the use of major and minor sevenths exhibits a decline from Berlioz to Brahms, the difference is too small to warrant any consideration. However, comparison of occurrence of the dyadic minor and major thirds in these examples reveal certain individual differences that deserve mention. While these dyads occupy a significant portion in the total dyadic content in Berlioz's examples (26.93%) and even more so in Brahms (32.23%), they are given a comparatively secondary importance in Bruckner's examples (17.4%). The dyadic interval of perfect octave in these examples reveals that while it occupies nearly half of the total dyadic content in Bruckner's examples (41.11%), the same dyad occurs approximately only half as often in the examples of Berlioz and Brahms (22.4% and 25.5% respectively). It should also be noted that the dyadic interval of augmented sixth appears

considerably more often in these examples, as compared to examples from Baroque and Classical periods.

TABLE XLII

DYAD INTERVALS IN THE MUSIC OF BERLIOZ, BRUCKNER,
AND BRAHMS

Intervals	Berlioz Percentages	Bruckner Percentages	Brahms Percentages
Perfect Unison	00.00	0.12	0.00
Minor Second	0.51	0.12	0.00
Major Second	4.46	3.38	3.61
Minor Third	10.10	8.22	11.51
Major Third	16.83	9.18	20.72
Perfect Fourth	5.31	5.80	4.27
Augmented Fourth	1.42	1.08	0.16
Diminished Fifth	3.75	0.60	0.32
Perfect Fifth	13.47	11.60	16.94
Augmented Fifth	0.77	0.12	0.16
Minor Sixth	6.73	6.04	6.90
Major Sixth	6.86	8.82	7.56
Minor Seventh	3.88	2.53	2.46
Major Seventh	1.81	0.48	0.32
Perfect Octave	22.40	41.11	24.50

While the frequency of occurrence of dyadic intervals manifests certain stylistic tendencies, the manner of dyadic succession is an aspect which is more indicative of stylistic differences. This aspect will be dealt with later in a greater detail; it will suffice to mention here the following observations in these Romantic examples. The major and minor consonant dyadic intervals (i.e., major and minor thirds and sixths) are preceded or followed by any other intervals with no predominance of any particular

dyadic motion. The perfect consonant dyadic intervals (fourths, fifths, and octaves) are preceded or followed by any interval, with a slight preference for major and minor consonant intervals and augmented or diminished intervals. However, noteworthy is the fact that these perfect consonant intervals are often preceded or followed by other perfect consonant intervals. This is in contrast to that in examples of Baroque and Classical eras. The augmented dyadic intervals are generally preceded by any intervals and followed by a larger consonant interval, either perfect, major or minor (for example, from major third to augmented fourth to perfect fifth). The diminished dyadic intervals are generally preceded by any interval and followed by a smaller consonant interval, either perfect, major, or minor (for example, from minor sixth to diminished fifth to perfect fourth). The dyadic motions of major and minor dissonant intervals (seconds and sevenths) show no particular manner of succession; they are preceded or followed by any interval. In general, the dyadic successions in these Romantic examples reveal that any interval can be preceded or followed by any other interval, with no particular preference in their succession. This can be viewed as a phenomenon indicating a general lack of any controlled contrapuntal movements between soprano and bass lines.

One additional aspect which needs examining is the relationship between certain dyadic intervals and their

corresponding harmonies. It is to be noted that certain harmonies are more frequently associated with certain dyads in these Romantic examples and, through this relationship, certain conclusions may be drawn which in turn, may be applied in a stylistic study. The major and minor consonant intervals (thirds and sixths) are more frequently associated with major and minor chords. The perfect consonant intervals (fifths, fourths, and octaves) are often found to be associated with all chord types but more often with major and minor chords. The major and minor dissonant intervals (seconds and sevenths) as well as the perfect fourth, are more often associated with dominant function chords. The augmented intervals (augmented fourth, augmented fifth, augmented sixth, and augmented seconds) are more often associated with dominant function harmonies (i.g., dominant seventh chords, augmented dominant triad, enharmonic dominant, and "nondominant"¹ diminished seventh chords). The only exception to the above dyadic-harmonic association is the dyadic augmented sixth which often implies some altered subdominant function harmonies (i.e., augmented sixth chords). The diminished intervals (fifths and sevenths) are often associated with dominant function harmonies.

¹The term describes the particular manner in which a fully diminished seventh chord is "resolved." That is, while a diminished seventh chord is regularly implying a dominant function (i.e., $vii^{\circ}7$ of the resultant harmony), this particular manner employs it as a decorative chord--non-essential harmony--containing two chromatic appoggiaturas. Examples are $\#vi^{\circ}7$ and $\#ii^{\circ}7$, "resolving" to V and I respectively. (Cf. R. Ottman, Advanced Harmony, pp.169-170).

CHAPTER V

CONCLUSIONS

This study has attempted to show another aspect of parametric analysis that may contribute to further clarification of stylistic differences in music. This study has proposed that, through a careful analysis of the two-part framework, along with analytical comparison of monadic and dyadic content and their manner of employment, an additional perspective can be offered in a stylistic study. It is not the intent of this study to suggest that dyadic and monadic analysis replace harmonic analysis; rather, it is to propose that such an approach will supplement harmonic and other parametric analyses in understanding stylistic differences.

This study has examined dyadic and monadic interval content, dyadic succession, and direction of monadic interval motion in selected works from the Baroque, Classical, and Romantic periods. More specifically, works by different composers in a given historical era have been analyzed and compared. However, little has been said regarding the stylistic differences of these historical periods. This chapter will summarize the main points of observation of musical style in each era, and discuss the validity of the two-part framework as an aspect of stylistic comparison. A comparison

of the three style periods will then be made. Finally, the validity of the two-part framework as an analytic criteria will be demonstrated through analysis of other examples of choral and instrumental music from the three style periods, and the stylistic features thus validated will then be applied through imaginary pedagogical settings.

In the preceding chapters, the monadic content and succession in selected examples of three representative composers from each of the three historical eras have been tabulated and the results analyzed. The "mean" frequency of occurrence of monadic and dyadic intervals may then be taken as representing general stylistic features of the historical period, while the differences of such intervallic usages among these composers may be taken as an indication of certain characteristics marking the individuality of each composer's "personal style". A brief summary of the stylistic features pertaining to each historical period and significant personal compositional styles seems appropriate here.

Music of the Baroque Period

The soprano lines in these Baroque examples show certain consistency with regard to the usage of the six "melodic monads": perfect unison, minor and major seconds, minor and major thirds, and perfect fourth. These intervals occupy more than 90% of all intervallic content in the melodic (soprano) lines. However, some differences in the usage of

these, and other, intervals show certain individual traits of these composers. For example, the perfect unison (i.e., repeated notes) is used much less frequently in Bach's melodies than in Rameau's or Vivaldi's examples. This may, perhaps, be regarded as a manifestation of the intrinsic contrapuntal nature (i.e., linearly controlled motion) of Bach's melodies, as opposed to a more "harmonically" oriented writing of the latter two. An examination of the minor thirds reveals a gradual decline in use from Rameau to Vivaldi to Bach while the major third declines in use from Rameau to Bach to Vivaldi. All trends in interval usage may be linked to contrapuntal writing or the lack of it in these composers' examples. Interestingly, however, the perfect fourth and fifth monads are used more in the Bach examples than in the Rameau and Vivaldi examples. This may, perhaps, contribute to the so called "non-vocal" nature of Bach's melodic writing.

The monadic content of the bass lines in these Baroque examples are considerably different than that of the soprano lines, due primarily to the "harmonic" intervals of perfect fifth and octave. The combined percentage of the six "melodic" intervals, however, still constitutes a great majority (more than 80%) of the intervallic content in the bass lines. Differences in the use of certain intervals have been noted: these may be regarded as contributing to the personal stylistic traits of the composers. For example, the perfect unison

(i.e., repeated notes) is used much less frequently in Bach's bass lines than in Rameau or Vivaldi, supporting the more linear and contrapuntally independent or less harmonically static quality of Bach's part writing. The perfect fourth exhibits no particular differences among the three composers examples; the frequency of occurrence is approximately twice as much as compared to the soprano lines. This is indicative of the more "harmonic" nature of the Baroque bass lines, as compared to the more "melodic" nature of the soprano lines. The perfect fifth and perfect octave are also used in a greater frequency, due to the same "harmonic" nature of the bass lines as mentioned above.

The general consistency in the direction of monadic interval motion in both the soprano and bass lines of these Baroque examples can be observed: minor and major thirds are predominantly descending; perfect fourths are generally ascending, while perfect fifths are most often used in a descending direction. The direction of octave motions in soprano and bass lines show certain differing preferences: it is more often descending in soprano lines while ascending in bass lines. A notable exception to this octave movement may be found in Bach and Vivaldi's examples: the descending movement is more prevalent in the bass lines of Vivaldi, while it is the ascending movement in Bach's soprano lines.

The dyadic content of these Baroque examples, like the soprano and bass lines, primarily consists of six intervals

(more than 75%). These six "harmonic" intervals are major and minor thirds, perfect fifth, major and minor sixths, and perfect octave. It goes without saying that these intervals are the primary intervals in the formation of tertian harmony. There are, however, noteworthy differences in the use of individual intervals with regard to percentage occurrences. Major seconds and minor thirds are used considerably more often in Rameau and Bach's examples than in Vivaldi's. The major third is used more often in Vivaldi and Bach's examples than Rameau which, perhaps, is indicative of a more dissonant nature in the dyadic examples of Vivaldi and Bach's music.

The combined occurrence of the perfect fifth and perfect octave in all these Baroque examples constitutes a very high percentage in the total dyadic content. Interestingly, the combined percentage occurrence of minor and major thirds (nearly equal to the combined percentage occurrence of the perfect fifth and perfect octave in all these Baroque dyadic examples) is nearly twice that of the combined percentage occurrence of minor and major sixths.

The consistency in the manner of the dyadic succession (movement from one dyad to another) is to be observed in the examples of all these Baroque composers. Particularly, certain dyadic successions are found to be common in these Baroque examples and are, at the same time, stylistically characteristic to the Baroque period. Major and minor

consonant intervals may be preceded or followed by any interval with the only exception that an interval is seldom followed by another of the same size and quality such as a major third to another major third, or a perfect consonant to another perfect consonant (of either the same or different size). A perfect interval is usually preceded or followed by a major or minor consonant interval. Major and minor dissonant intervals may be preceded or followed by any interval except one of the same size and quality.

Music of the Classical Period

The soprano lines of these classical examples show certain consistency with regard to the combined usage of the six "melodic" monads. These intervals occupy more than (90%) of all intervallic content in melodic (soprano) writing. The usage of each interval, however, varies from composer to composer. In general it may be said that, with few exceptions, Haydn's and Mozart's soprano lines are very similar with regard to individual interval content. Beethoven, however, is strikingly different in the use of each interval. For example, the use of repeated note (perfect unison) and perfect octave is considerably more in Beethoven's examples than Mozart or Haydn. This may be due, at least in part, to two factors: a greater amount of contrapuntal writing in the examples of Mozart and Haydn, and the use of the repeated notes for emphasis of certain

important notes in Beethoven's examples. Other examples of different interval usages in Beethoven soprano lines are as follows: more major and minor sixths, less minor seconds, less major and minor thirds, more augmented fourths, and less perfect fourths. All of these factors combine to make Beethoven's melodies less lyrical in character and more instrumental than vocal in nature.

The bass lines of these classical examples, like the soprano lines, show certain consistencies among composers with regard to the combined usage of the six "melodic" monads. These intervals occupy more than 80% of all intervallic content in Haydn and Beethoven's examples and more than 90% in Mozart's examples. The chief difference of the bass lines as opposed to the soprano lines lies in the increased usage of the so called "harmonic" intervals of the perfect fourth, perfect fifth and perfect octave, particularly at cadence points. Interestingly, Mozart used the intervals of minor and major third considerably less than in his soprano lines. This is due primarily to an increased usage of perfect unison and perfect octave. The differences of Beethoven as compared to Haydn and Mozart are essentially the same as mentioned regarding the soprano lines.

The dyadic content of these classical examples show certain consistencies among the composers with regard to the combined usage of the six "harmonic" intervals (dyads).

These intervals occupy approximately 80% of the total dyadic content in Mozart's and Haydn's examples, while only approximately 70% in Beethoven's examples. The lower percentage of "harmonic" examples in Beethoven's examples is due primarily to the increased usage of the more dissonant intervals: major second, minor seventh, and perfect fourth. These intervals are usually associated with the dominant seventh chord and consequently provide Beethoven's music with a harmonically less stable, more active sound.

Another interesting factor in the examples of Mozart is the use of minor and major thirds and their inversions, major and minor sixths. The difference between this two groups of intervals is negligible (.19%), which is in direct contrast to Haydn's and Beethoven's examples where the percentage occurrence of major and minor sixths is almost half that of minor and major thirds. In fact the use of major third and its inversion of minor sixth and minor third and its inversion of major sixth are nearly equal. This use of thirds and sixths gives Mozart's examples a more attractive character that is distinctly different from that of Haydn or Beethoven.

The direction of interval movement in the soprano lines of these classical composers reveals certain consistencies that may be taken as indicative of the historical style, while certain differences may be noted that are indicative of "personal" style. For example: minor thirds

are more frequently descending in all these examples, while the major third is more frequently descending in Haydn's and Beethoven's examples while it is more frequently in ascending motion in Mozart's examples.

Other differences that are noted are: Mozart's use of ascending perfect octaves as compared to Beethoven and Haydn's use of descending octaves, and the descending tritone (both augmented fourth and diminished fifth) in the examples of Beethoven as compared to the ascending in Mozart and Haydn's examples.

The direction of interval movement in the bass lines of these classical examples are as follows: major and minor thirds are predominantly descending while the majority of perfect fourths are in the ascending direction. All tritones and the majority of perfect fifths are descending. Perfect octaves are predominantly descending, except for Mozart examples where ascending octaves are the norm. In general, the movement of the so-called harmonic interval (perfect fourth and perfect fifth) are directly related in both the soprano lines and bass lines to the dominant-tonic relationship: perfect fourths move up and perfect fifths move down.

Dyadic succession of these classical examples is consistent in the manner in which it is employed. Major and minor consonant intervals are preceded or followed by any interval. As a general rule, however, intervals of

the same size and quality are seldom preceded or followed by each other: for example, major third to major third. There are, however, some occurrences of this kind of succession, but it is decidedly a rare case. Perfect consonant intervals are almost always preceded and/or followed by any intervals other than perfect consonant intervals. Major and minor dissonant intervals and augmented and diminished intervals are generally preceded and followed by any consonant intervals, with a few exceptions: most notably, minor dissonant intervals are preceded or followed by augmented or diminished intervals.

Music of the Romantic Period

The soprano lines of these Romantic examples show certain consistencies among composers with regard to the combined percentage occurrence of the six "melodic" monads. These intervals occupy more than 90% of the total intervallic content in the soprano lines of these Romantic examples. This, however, is where the similarity ends among these composers; for, of the three periods studied, the Romantic period exhibits the most marked differences among composers with regard to the percentage occurrence of intervals. For example: the repeated note (perfect unison) in Berlioz's soprano lines occurs quite frequently while it occurs considerably less frequently in the examples of Bruckner and Brahms. The intervals of major second, major and minor

thirds, and perfect fourth occur considerably more often in Brahms' soprano lines than in Berlioz or Bruckner. This is indicative of a more disjunct approach to melody in Brahms' soprano lines as opposed to the more conjunct (step-wise motion) in Berlioz and Bruckner's melodies. Bruckner, however, uses the perfect octave more often than Berlioz or Brahms.

The direction of interval movement is, perhaps, more indicative of personal differences among these Romantic composers. For example, while minor thirds are predominantly ascending in Berlioz and Bruckner's examples, they are descending in Brahms' examples. Interestingly, both Berlioz and Brahms used ascending perfect fifths a majority of the time, this is the contrast to the accepted practice of perfect fifth downward motion in Baroque and Classical soprano lines. In addition, Brahms employed the movement of perfect fourths of descending direction in a far greater frequency than ascending. Bruckner, on the other hand, used the more traditional (Classical and Baroque) fashion of ascending perfect fourth up and descending perfect fifth in his soprano lines. The conclusion that may be drawn from this observation is that Romantic composers largely discard the need to adhere to the established interval motions as shown in the earlier tradition.

The interval contents of the bass lines in these Romantic examples are, like the soprano lines, markedly

different between each individual composer's practice. For example, the amount of the perfect unison in Berlioz's examples is nearly twice that of Bruckner and Brahms. This extremely high occurrence of repeated notes in Berlioz's examples accounts for the very stagnant, "non-melodic" character of his bass lines. Some other extreme differences in interval usage in the bass lines of these examples are as follows: occurrence of minor thirds in Brahms' examples is twice that in Berlioz and Bruckner's examples, more than twice the percentage occurrence of perfect fifths in Brahms' as compared to that in Berlioz and Bruckner's, and Berlioz's considerably lower frequency of occurrence of major seconds and perfect octaves as compared to Bruckner and Brahms'. It would appear, from these observations, that Berlioz and Brahms are extremely different from each other with regard to interval content, while Bruckner's usages stand somewhere in between those two.

The direction of interval movement in the bass lines of these Romantic examples is comparatively more consistent among these composers, with certain exceptions. For example: perfect octave is primarily in descending motion in Berlioz and Bruckner's examples, while it is primarily ascending in Brahms'. Major thirds are almost equally divided between ascending and descending motion in all examples (with Brahms using slightly more ascending and

Berlioz and Bruckner using slightly more descending). Minor sixths are always ascending in Berlioz and Bruckner's examples while it is primarily descending in Brahms' examples.

The consistency with which certain intervals occur in the dyadic content of these examples has been previously noted. There are, however, certain differences among these composers that may indicate certain "personal" stylistic traits. For example, Bruckner's use of the perfect octave (which occupies approximately half of the total dyadic content) is nearly twice that of Brahms and Berlioz. The use of major thirds is considerably greater in Brahms' examples than Bruckner or Berlioz. The use of dissonant intervals (major and minor seconds, major and minor sevenths, augmented fourth and fifth, and diminished fifth) is considerably greater in the examples of Berlioz as compared to Brahms and Bruckner. The above usages contribute to the general musical impression of these composers; that is, in terms of dyadic interval content, Berlioz's music may be described as of a dissonant nature, while Bruckner's is of a more open and more stagnant sound, and Brahms' more consonant.

Dyadic succession in these Romantic examples is unlike that of the Baroque and Classical stylistic periods. In the Baroque and Classical examples there is a general avoidance of successive intervals of the same size and quality. In the Romantic examples studied, however, there are found

many instances of successive perfect fifths and octaves and successive intervals of the same size and quality. Although these instances are not in the majority, they are nonetheless frequent enough to indicate that the use of successive intervals of the same size and quality is not as carefully avoided as was in the previous stylistic eras, and that these Romantic composers were not as concerned about the parallel interval motions between the two outer parts as were Baroque and Classical composers. In some instances, it would seem that Romantic composers used these successive-parallel intervals deliberately to create a different chordal color and texture to music.

Soprano Lines of the Baroque, Classical and Romantic Periods

The interval content for each historical period is obtained by averaging the occurrences of each interval in the works of the three composers in the period. The following table illustrates these "mean" percentages and may be used for a comparison of three stylistic periods in terms of the monadic content in the melody (i.e., soprano lines).

As indicated in Table XLIII, the use of repeated notes (perfect unison) is considerably greater in the Classical examples than in the Baroque or Romantic examples. This is due largely to Beethoven's frequent use of repeated notes. While the use of minor second is nearly equal among

TABLE XLIII
THE SOPRANO INTERVALS OF BAROQUE, CLASSICAL,
AND ROMANTIC MUSIC

Intervals	Baroque Percentages	Classical Percentages	Romantic Percentages
Perfect Unison	21.53	30.53	26.08
Minor Second	22.57	20.30	22.71
Major Second	33.99	25.48	27.55
Minor Third	6.30	6.65	7.55
Major Third	4.71	4.80	5.06
Perfect Fourth	5.43	5.34	5.85
Augmented Fourth	0.09	0.12	0.13
Diminished Fifth	0.49	0.24	0.18
Perfect Fifth	2.44	2.54	2.02
Augmented Fifth	----	----	----
Minor Sixth	0.54	0.86	0.78
Major Sixth	0.72	0.90	0.50
Minor Seventh	0.13	0.41	0.36
Major Seventh	0.18	0.08	0.00
Perfect Octave	0.49	1.52	0.92

all three style periods (only 2.41% difference from lowest to highest); the major second is used considerably more in the Baroque examples and occupies one-third of the total monadic content, as compared to only one-fourth in the Classical and Romantic periods. Upon closer examination, certain historical trends may also be noticed in soprano interval use. For example, the usage of minor and major thirds increases slightly from Baroque to Classical to Romantic, while the tritone decreases in use from Baroque to Classical to Romantic. It is also interesting to note that the frequency of usage of the perfect fourth and fifth intervals is almost equal in all three style periods (approximately half of one percent separates the lowest

and highest percentage occurrence of each interval. Lastly, it is to be noted that the use of the six melodic monads is nearly equal in all three periods (94.53% Baroque, 93.10% Classical, and 94.80% Romantic.)

The direction of interval movement in the soprano lines exhibits more clearly than the monadic content the stylistic differences of these historical periods. For example, Romantic composers are more inclined to use ascending minor thirds, while Baroque and Classical composers prefer descending minor thirds (see Table XLIV). It

TABLE XLIV

THE SOPRANO INTERVAL MOVEMENT OF BAROQUE, CLASSICAL,
AND ROMANTIC MUSIC

Intervals	Baroque Percentage		Classical Percentage		Romantic Percentage	
	Up	Down	Up	Down	Up	Down
Minor Third	34.4	65.6	32.4	67.6	54.3	45.7
Major Third	22.2	77.8	46.5	53.5	43.5	56.5
Perfect Fourth	73.0	27.0	68.3	31.7	59.0	41.0
Augmented Fourth	33.3	66.7	33.3	66.7	75.0	25.0
Diminished Fifth	33.3	66.7	54.6	44.4	33.3	66.7
Perfect Fifth	31.5	68.5	38.1	61.0	64.6	35.4
Augmented Fifth	----	----	----	----	----	----
Minor Sixth	54.6	45.4	40.0	60.0	85.7	14.3
Major Sixth	60.0	40.0	59.2	40.8	74.6	25.4
Minor Seventh	20.0	80.0	62.5	37.5	44.4	55.6
Major Seventh	00.0	100.0	100.0	00.0	----	----
Perfect Octave	17.6	82.4	63.0	37.0	38.9	61.1

is also worth notice that, while all three periods frequently use major thirds in descending motion, the Baroque period uses

descending major thirds more than the Classical or Romantic period. Certain trends in interval movement can be noticed also: the use of ascending perfect fourths decreases (from the Baroque) in Classical and further in the Romantic period (73%, 68.3%, and 59% respectively). Among these three periods, the differences in the Romantic period is most noticeable with more ascending minor thirds, more descending perfect fourths, more ascending augmented fourths, and more ascending major and minor sixths.

Bass Lines of Baroque, Classical, and Romantic Periods

The intervallic usage in the bass line reveals the marked differences of not only monadic content but also the implied harmonic practices of these three historical eras. For example, the frequency of use of the repeated note (perfect unison) in the Classical and Romantic examples is far greater (twice as frequent) than that in the Baroque examples (see Table XLV). At the same time, the Baroque examples use more minor and major seconds (50.11%) of the total intervallic content than the Classical or Romantic examples (35.2% and 34.23%). These factors (e.g., more frequent use of major and minor seconds and less frequent use of perfect unisons in the Baroque bass lines) are indeed a manifestation of the more contrapuntal nature of Baroque music, as opposed to the more harmonic or homophonic nature of the Classical and Romantic periods.

TABLE XLV
THE BASS INTERVALS OF BAROQUE, CLASSICAL,
AND ROMANTIC MUSIC

Intervals	Baroque Percentages	Classical Percentages	Romantic Percentages
Perfect Unison	17.36	35.33	30.19
Minor Second	21.78	17.01	15.04
Major Second	28.33	18.81	19.19
Minor Third	6.25	5.11	7.14
Major Third	4.41	4.23	4.71
Perfect Fourth	9.13	8.17	9.57
Augmented Fourth	0.54	0.12	0.20
Diminished Fifth	0.44	0.16	0.30
Perfect Fifth	5.80	5.23	8.71
Augmented Fifth	----	----	----
Minor Sixth	0.54	0.50	0.75
Major Sixth	0.59	0.41	0.70
Minor Seventh	0.24	0.29	0.35
Major Seventh	0.14	0.12	0.10
Perfect Octave	4.16	4.23	2.33

As Table XLV further reveals, the one noticeable difference in the bass line monadic contents of the three periods is the more frequent use of the perfect fifth and less frequent use of the perfect octave in the Romantic period. The increased use of the perfect fifth, particularly that in the descending motion (see Table XLVI) in these Romantic bass lines, is attributable to a greater use of subdominant function harmonies which is characteristic of Romantic harmony. These include not only the diatonic subdominant harmonies but also subdominant substitutes and altered subdominants (i.e., neopolitan sixths and augmented sixths). While interval direction of the perfect fourth in

all these examples is generally ascending, the percentage occurrence of such ascending motion also indicates a steady decrease from Baroque to Classical to Romantic. It is interesting to note that while the harmonic relationships of dominant to tonic and tonic to dominant prevails throughout the entire common practice period, this relation occurs in greatest frequency in the Baroque period, less frequent in Classical, and even less so in the Romantic period. In other words, the use of interval directions of the perfect fourth and fifth coincides with the general trend of employing subdominant and dominant function harmonies in these style periods.

TABLE XLVI

BASS INTERVAL MOVEMENT OF BAROQUE, CLASSICAL,
AND ROMANTIC MUSIC

Intervals	Baroque Percentage		Classical Percentage		Romantic Percentage	
	Up	Down	Up	Down	Up	Down
Minor Third	23.6	76.4	36.5	63.5	34.2	65.8
Major Third	18.7	81.3	24.7	75.3	49.8	50.2
Perfect Fourth	75.9	24.1	59.6	40.4	55.5	44.5
Augmented Fourth	91.7	8.3	00.0	100.0	25.0	75.0
Diminished Fifth	00.0	100.0	00.0	100.0	00.0	100.0
Perfect Fifth	26.8	73.2	23.2	76.8	31.2	68.8
Augmented Fifth	----	----	----	----	----	----
Minor Sixth	00.0	100.0	66.7	33.3	70.4	29.6
Major Sixth	33.3	66.7	48.9	51.1	63.5	36.5
Minor Seventh	60.0	40.0	70.0	30.0	91.7	8.3
Major Seventh	00.0	100.0	33.3	66.7	00.0	100.0
Perfect Octave	48.2	51.8	56.4	43.6	43.8	56.2

With regard to the direction of monadic movement in the bass lines, certain consistencies can be observed. For example, major and minor thirds are primarily used in the descending direction, minor sevenths are primarily ascending, and major sevenths are primarily descending. Perfect fourths are primarily ascending and perfect fifths descending (see above). Aside from these consistencies, there are stylistic differences and trends in interval direction that deserve mentioning. For example, the descending major thirds decrease in use from Baroque to Classical to Romantic (81.3%, 75.3%, and 50.2% respectively.) The augmented fourth is nearly always in ascending direction in the Baroque period but the practice is completely reversed (i.e., in descending motion) in the Classical and Romantic periods. The minor sixth always appears in ascending motion in the Baroque bass lines, while this interval is predominantly in ascending motion in the Classical and Romantic examples. The use of descending major sixth decreases from a substantial majority in the Baroque period (66.7%), to a slight majority in the Classical period (51.1%), to a definite minority in the Romantic period (36.5%). The use of minor seventh, while remaining mostly in the ascending motion in all three style periods, increases from the Baroque to Classical to Romantic periods (60%, 70%, and 91.7% respectively).

The Two-part Framework of Baroque,
Classical, and Romantic Music

The dyadic content of examples in all three historical periods reveals certain consistencies as well as some noticeable differences. While the consistencies can be viewed as indicative of the features which bind the music of these periods into "common practice", the differences are indeed manifestations of stylistic changes in compositional practices among these periods. It should be noted, however, that most of the percentages are not extremely different between the three style periods. The degree of difference diminishes when the dyadic occurrences of all composers' examples in each stylistic period are averaged (i.e., showing mean percentages). That is, while percentage occurrences of individual composers may differ substantially among style periods, when all occurrences within each period are averaged, the resulting mean averages reduce the degree of difference.

The use of major second and perfect fourth is nearly equal in all three historical periods (see Table XLVII). The percentage occurrence of minor second shows a steady decline from the Baroque to Classical to Romantic era. The use of minor thirds also exhibits a consistent decline from the Baroque to Classical to Romantic periods, with the largest difference occurring between the Baroque and Classical periods. The use of the major third, while nearly equal

between the Baroque and Romantic period, is somewhat less in the Classical period. While the steady decline of the augmented fourth and diminished fifth (tritone) from the Baroque to Classical to Romantic periods is noteworthy, it should be pointed out that the diminished fifth is used more frequently than the augmented fourth in each of the style periods. The higher incidence of the tritone in the Baroque period is due, perhaps, to the greater frequency occurrence of tritone in Vivaldi's examples (see Table XIV, p. 28). The perfect fifth occurs more frequently in the Baroque examples than the Classical or Romantic, the latter two having nearly equal frequency of usage. The use of major and minor sixths is greatest in classical music than Baroque or Romantic. The minor seventh exhibits a steady decline of usage from Baroque to Classical to Romantic, with the Romantic period having the lowest percentage occurrence.

As Table XLVII shows, the greatest difference between the three stylistic periods is seen in the use of the perfect octave. The dyadic octave increases in frequency from the Baroque to Classical to Romantic period, the increase being approximately two-fold from the Baroque to Romantic (15.14% Baroque, 22.19% Classical, and 29.99% Romantic). It is, however, in the manners of dyadic succession that significant stylistic features of these historical periods can be observed.

TABLE XLVII

THE DYAD INTERVALS OF BAROQUE, CLASSICAL,
AND ROMANTIC MUSIC

Intervals	Baroque Percentages	Classical Percentages	Romantic Percentages
Perfect Unison	0.00	0.11	0.04
Minor Second	0.76	0.52	0.22
Major Second	3.46	3.09	3.89
Minor Third	15.41	10.87	9.78
Major Third	15.10	13.74	15.04
Perfect Fourth	5.39	6.25	5.21
Augmented Fourth	1.75	1.63	0.95
Diminished Fifth	2.60	2.19	1.63
Perfect Fifth	16.31	13.78	13.72
Augmented Fifth	0.22	0.07	0.36
Minor Sixth	7.95	8.30	6.52
Major Sixth	9.48	10.09	7.79
Minor Seventh	4.71	4.28	2.99
Major Seventh	0.80	0.48	0.90
Perfect Octave	15.14	22.19	29.99

In the Baroque period, intervals are rarely preceded or followed by intervals of the same size and quality: for example, perfect fifths and octaves are very seldom preceded or followed by perfect fifths and octaves respectively. In the Classical period, major and minor consonant intervals are preceded and followed by any interval including those of same size and quality (e.g., major and minor intervals). Perfect consonant intervals are generally preceded or followed by intervals of different size or quality; however, intervallic successions of the same size and quality may be occasionally found, as opposed to the obvious avoidance of such in the Baroque period. The

Romantic period, on the other hand, indicates a considerable freedom with regard to dyadic successions, and intervals of the same size and quality may frequently be found preceding or following each other. Although not in the majority, perfect consonant intervals may also frequently be found to precede or follow other perfect consonant intervals. In short, the Baroque practice shows a high degree of rigidity in the employment of dyadic successions, while the Classical practice indicates a loosening of adherence to linear rules, and the Romantic practice is marked by freedom, not bound by any of the restrictions adhered to in the Baroque or Classical period with regard to dyadic successions.

Applications and Demonstrations

This study has primarily been concerned with the quantitative calculation of the frequency of occurrence of monadic and dyadic intervals and their movements. While it is not the intent of this study to replace musical analysis with quantitative information, it is believed that such information provides another perspective in the study of stylistic comparison of music. Particularly, the quantitative data of the dyadic content and succession (the "two-part framework") sheds a new insight to the understanding of harmonic-linear practices as a criterion in stylistic differentiation. That is, the quantitative information of dyadic progression further enhances the concept toward the stylistic discernment of polyphony, homophony, and anphony in the historical context, (i.e., Baroque, Classical, and Romantic respectively).

From the pedagogical point of view this offers itself as a useful vehicle in the course of teaching theory, particularly melody harmonization. For example, "how would Baroque, Classical, and Romantic composers harmonize the same melody but using different linear harmonic idioms?" should be regarded a valid question posed in a sophomore theory class. For the purpose of demonstrating the validity of the findings of this study and their practical applications, the following examples are given. Melodic materials are selected from a Bach chorale and a Beethoven piano sonata. In harmonizing these same melodies in different styles, the process of composing the various bass lines attempts to incorporate information from the three style periods regarding their bass lines and dyadic contents. Some of the percentage occurrences may not exactly correspond with the "ideal" criteria (e.g., as found in Tables XLV and XLVII), they are nonetheless kept to the closest possible approximations.

"O Sacred Head Now Wounded" (passion chorale) of Bach's chorale harmonizations represents a nearly "ideal" example incorporating a very close approximation of monadic content in soprano and bass, and dyadic content, observed in the Baroque examples.

The image displays three systems of musical notation for Chorale #72, each featuring a grand staff with treble and bass clefs. The first system is in 4/4 time and one flat, with Roman numerals: F: vi, IV I ii I, IV V^d: I^I III V i V. The second system is in 4/4 time and one flat, with Roman numerals: i i, F: vii^o I IV vii^o I, V⁷/IV ii V⁷/ii ii -. The third system is in 4/4 time and one flat, with Roman numerals: V⁷/ii V⁷/IV V IV vi V I ii IV I.

Figure 2: The Baroque Example, Chorale #72

The following arrangements, based on the same soprano line, incorporate different bass lines and dyadic content to exemplify Classical and Romantic stylistic criteria. Different harmonic progressions are also employed to further strengthen the stylistic differences.

By varying the monadic content of the bass line and the resulting dyadic content, this version manifests Classical traits of harmonization. Different bass line and the resultant dyadic progression necessitates a different harmonic progression; it is, however, not the intent of this study to make comparative study of harmonic idioms in these historical eras. This version illustrates the interval content of the vass line and dyadic content of the Classical example which are different from that of the Baroque period. The same melody can be further modified by incorporating Romantic traits with regard to the monadic content of the bass line and the dyadic content.

The image displays three systems of musical notation for a Bach Chorale. Each system consists of a treble staff and a bass staff, with chord symbols and Roman numerals written below the notes. The first system is in F major (one flat) and 4/4 time. The second system is in D minor (two flats) and 4/4 time. The third system is in D minor (two flats) and 4/4 time. The chord symbols and Roman numerals are as follows:

System 1 (F major):
 Treble: F: I IV I ii I V I vii° I i ii° V
 Bass: (no symbols)

System 2 (D minor):
 Treble: vi V/ii V/IV V I IV V I I - vi I ii V?
 Bass: (no symbols)

System 3 (D minor):
 Treble: I V/IV V V/IV I V/ii vi V/IV V I IV V/ii V/IV V I
 Bass: (no symbols)

Figure 3: The Classical Example, Bach Chorale

As the following version illustrates, the mere change of bass line content and dyadic content bring about changes in the character of the music which differs from that of the Baroque and Classical period. It goes without saying that the Romantic harmonic language is considerably different from that of the Baroque and Classical periods.

The image displays three systems of musical notation for a Bach Chorale. Each system consists of a grand staff with a treble clef and a bass clef. Roman numeral chord symbols are written below the notes. The first system starts with a key signature of one flat (B-flat) and a 4/4 time signature. The second system continues the piece. The third system concludes with a double bar line. The chord symbols include various forms such as I, vi, ii, iii, V, V⁷, V⁷/vi, IV, V⁷/vi, V⁷/ii, ii⁷, V⁷/IV, V, vi, vi⁷/ii, ii⁷, Dom. Aug. 6th, i, V⁷/vi, vi, ii⁷, V⁷/vi, V⁷/IV, iv, I, ii⁷, Dom. Aug. 6th, and I.

Figure 4: The Romantic Example, Bach Chorale

The following examples are used to further illustrate the application of the procedure and demonstrate that stylistic consideration of monadic and dyadic content and their successions has a certain degree of validity whether it is vocal or instrumental music. The melody is from Beethoven's Piano Sonata, Opus 13, second movement.

The image displays two musical systems, each consisting of a treble and bass staff. The key signature is three flats (B-flat, E-flat, A-flat) and the time signature is 2/4. The melody in the treble staff is identical in both systems. The first system shows a bass line with the following chord progression: A-flat major (I), E-flat major (V⁷), A-flat major (I), E-flat major (V), A-flat major (I), E-flat major (V), F major (vi), and A-flat major (V⁷/E-flat). The second system shows a different bass line with the following chord progression: F major (vii⁰), E-flat major (V⁷), A-flat major (I), F major (V⁷/A-flat), F major (ii), E-flat major (V), and A-flat major (I).

Figure 5: Beethoven's Piano Sonata, Opus 13 (excerpt)

The following two versions, using the same melody with some modifications, have different bass lines and dyadic contents from the original example in order to simulate the Baroque and Romantic styles. This was done by following the interval contents of the bass line and dyad as closely as possible to the quantitative information in Tables XLV (for bass line) and XLVII (for dyadic content).

The image displays four systems of handwritten musical notation for a piano piece in A-flat major (three flats) and 3/4 time. Each system consists of a grand staff with treble and bass clefs. The notes are mostly half notes and quarter notes, with some eighth notes in the final system. Roman numerals and chord symbols are written below the notes to indicate harmonic structure.

System 1: Treble clef has a whole note chord, then a half note chord, then a half note chord, then a half note chord. Bass clef has a whole note chord, then a half note chord, then a half note chord, then a half note chord. Chord symbols: $A\flat:$ I, V, V^7/ii , - ii.

System 2: Treble clef has a half note chord, then a quarter note chord, then a quarter note chord, then a quarter note chord, then a quarter note chord. Bass clef has a half note chord, then a half note chord, then a half note chord, then a half note chord, then a half note chord. Chord symbols: I, V, vi (Aux 6TH), V^7/V , V, Aux. 6TH.

System 3: Treble clef has a half note chord, then a half note chord, then a half note chord, then a half note chord. Bass clef has a half note chord, then a half note chord, then a half note chord, then a half note chord. Chord symbols: V, ii, i , V^7/iv , iv, i_4 , V^7/ii .

System 4: Treble clef has a half note chord, then a half note chord, then a half note chord, then a half note chord. Bass clef has a half note chord, then a half note chord, then a half note chord, then a half note chord. Chord symbols: ii, vi, ii, vi, V^7 , I.

Figure 6: The Romantic Setting, Beethoven's Piano Sonata

Figure 7: The Baroque Example, Beethoven's Piano Sonata

It should be added that since the soprano lines that are used in these reharmonizations are "Baroque" and "Classical" in nature, there is an inherent problem in the process of rewriting the bass lines and dyads to simulate the Baroque, Classical, and Romantic styles. As mentioned earlier, the soprano lines differ somewhat from one style period to another and, therefore, the process of reharmonizing the same melody in different styles can not be expected to be totally cohesive. However, the pedagogical implications and benefits from such a procedure should be apparent from these demonstrations.

Epilogue

"Style" perhaps more than any other commonly used musical (and art in general) terminology, defies any attempt at a concise definition. The term has been in general use since early seventeenth century (e.g., stile antico vs. stile moderno), or even earlier if one considers the fact that early composers had attempted to distinguish the compositional "style" of the immediate era from the preceding one (e.g., ars nova vs. ars antiqua). However, in spite of its long history and wide usage, a concise definition of style is all but impossible; consider, for example, the long list of criteria for stylistic determinant as found in various works expressly addressing to the problem of style, (La Rue, Dickinson, and Ratner). This problem of defining style is further complicated by the fact that the term may connote any number of aspects, from a historical (such as Baroque style vs. Classical style), formal (e.g., Symphonic style vs. Opera style), textural (e.g., Polyphonic style vs. Homophonic style), national (German style vs. French style), to personal (Haydn vs. Mozart) or even within one composer's changes in personal style (three style periods of Beethoven).¹

It is not difficult to find in many current theory textbooks some references to style, whether or not such reference

¹Willi Apel, "Style," Harvard Dictionary of Music Second Edition, Harvard University Press, Cambridge, Massachusetts, 1969, pp. 811-812.

is a conscientious or implicit one. For example, in illustrating the use of "borrowed chords," one finds the majority of examples excerpted from late Classical or Romantic works, but not from the Baroque; or the augmented sixth from the same eras but seldom from the Baroque. Or, consider also, the textbook definition of non-harmonic tones; seldom are the illustrative excerpts from post-romantic works. From such observation, one may conclude that the discussion of style and its multi-faceted manifestations deal primarily in the generalization of musical practices which are seen as the prevailing norm. That is, if a certain practice is employed frequently in the majority of works of the same historical period, that practice becomes one aspect of the musical style of that particular historical era.

In this sense, the term style pertains, to a certain extent, to any aspect of musical practice (or the manner of employing certain musical parameters) which, due to its significant frequency of occurrence, is regarded as a norm. Or, the frequency of its occurrence is considerably great to the extent that the degree of surprise (the bits of information) is small. The inclusion of this aspect in a rigorous stylistic study entails a quantitative comparison, which is an aspect of information theory. Although this branch of study is of recent emergence, many earlier treatises foreshadowed the approach: McHose's study of harmonic vocabulary in Bach's chorales is one such work. There are indeed many

significant studies in recent years which approach the problem of stylistic study by way of quantitative analysis (Baker, 1963; Bean, 1961; Choen, 1952; Fuller, 1965).

It is imperative to remember that the quantitative analysis or the employment of information theory in a stylistic study is not intended to replace the traditional approaches. The quantitative approach is but one additional vehicle to further supplement the conventional analytic studies whereby the complexity of style can be more concisely defined and the resultant data more graphically used to support the stylistic differences.

The present study is, in essence, an examination of the monadic and dyadic practices of the common practice period by way of quantitative analysis. The data itself, however, offers little significance; particularly in the light of the fact that the material, both in terms of the number of musical works and their medium, is limited. The data could not and should not be taken as representative or revealing criteria. This study is intended only to call attention to one aspect of comparative analysis which heretofore has escaped consideration. That is, the use of intervals and the directions of their movement in the soprano and bass lines and, perhaps more importantly, the use of dyads and dyadic successions illustrate stylistic changes which occur during the common practice period. Indeed the examination of the manner of intervallic employment in stylistic study can be traced

back to medieval times, such as the manners of employing fourths, thirds, sixths, etc. The importance of intervals in the examination of music as narrated in many historical treatises from the Renaissance to the present time reflects such a concern.

Finally, it should be noted that, while the monadic/dyadic intervals in the two-part framework are important in the determination of style, they may also be used in connection with harmonic vocabulary in stylistic analysis. In this sense, it is found that dyads and dyadic succession either control the harmony or are controlled by harmony. The musical examples used in this study reveal certain consistencies with regard to dyads and their coexisting harmonies. For example, the harmony of musical examples in the Baroque period are primarily determined by the linear motions of the melodic soprano and bass lines. The harmony, then, is controlled by the dyads and dyadic successions. In the Classical period, harmony is the controlling factor in dyadic successions, as exemplified in the great majority of examples. Because of greater freedom in dyadic succession and an expanded harmonic vocabulary in the Romantic period, it is found that dyads and harmony are of equal importance, thereby making it difficult to judge which is the prominent determinant. This aspect indeed deserves further study and is worthy of future investigation.

APPENDIX

APPENDIX A

```

00001: //MIKF JOB (2002-4143,150,1),*SMITH M*,CLASS=A,MSGLEVEL=(1,1)
00002: // EXEC PGM=IEFBR14
00003: //SYSPRINT DD SYSOUT=A
00004: //DD1 DD DSN=USER2.D2002.P4181.TURNER,
00005: // DISP=(OLD,DELETE),UNIT=2314,VOL=SER=USRPAK
00006: //STEP1 EXEC PGM=ILGUPDIE,PARM=NEW
00007: //SYSOUT2 DD DSN=USER2.D2002.P4181.TURNER,
00008: // DISP=(NEW,KEEP),UNIT=2314,VOL=SER=USRPAK,SPACE=(200,(100,10,3)),
00009: // DCB=(LRECL=80,BLKSIZE=80,RECFM=FB,DSORG=PO)
00010: //SYSPRINT DD SYSOUT=A
00011: //SYSIN DD *
00012: ./ AGD NAME=MUSIC,LIST=ALL
00013: ./ NUMBER NEW=10,INCR=10
00014: IDENTIFICATION DIVISION.
00015: PROGRAM-ID. MUSIC.
00016: DATE-WRITTEN. FEB 21,1980.
00017: DATE-COMPILED.
00018: ENVIRONMENT DIVISION.
00019: CONFIGURATION SECTION.
00020: SOURCE-COMPUTER. IBM-360-H50.
00021: OBJECT-COMPUTER. IBM-360-H50.
00022: INPUT-OUTPUT SECTION.
00023: FILE-CONTROL.
00024: SELECT MEL-FILE ASSIGN TO UT-S-MELODY.
00025: SELECT BASS-FILE ASSIGN TO UT-S-BASS.
00026: SELECT CHORD-FILE ASSIGN TO UT-S-CHORD.
00027: SELECT PRT-FILE ASSIGN TO UT-S-PRINTER.
00028: DATA DIVISION.
00029: FILE SECTION.
00030: FD MEL-FILE
00031: LABEL RECORDS ARE STANDARD
00032: RECORD CONTAINS 80 CHARACTERS
00033: DATA RECORD IS MEL-IN.
00034: 01 MEL-IN.
00035: 02 MEL-I PIC XX OCCURS 40 TIMES.
00036: FD PRT-FILE
00037: LABEL RECORDS ARE OMITTED
00038: DATA RECORD IS PRT-REC.
00039: 01 PRT-REC.
00040: 02 FILLER PIC X.
00041: 02 MUSIC PIC X(8).
00042: 02 DETAIL-LN.
00043: 03 FILLER PIC X.
00044: 03 LEFT-OVER PIC X(125).
00045: FD BASS-FILE
00046: LABEL RECORDS ARE STANDARD
00047: RECORD CONTAINS 80 CHARACTERS
00048: DATA RECORD IS BASS-IN.
00049: 01 BASS-IN.
00050: 02 BASS-I PIC XX OCCURS 40 TIMES.
00051: FD CHORD-FILE
00052: LABEL RECORDS ARE STANDARD
00053: RECORD CONTAINS 80 CHARACTERS
00054: DATA RECORD IS CHORD-IN.
00055: 01 CHORD-IN.
00056: 02 CHORD-I PIC XX OCCURS 40 TIMES.
00057: WORKING-STORAGE SECTION.
00058: 01 MOUNT PIC 99 VALUE ZEROS.
00059: 01 TOT-CT PIC 9(4) VALUE ZEROS.
00060: 01 CONTROL-CARD PIC X(80) VALUE SPACES.
00061: 01 ERP PIC 9(4) VALUE ZERO.
00062: 01 FOF PIC 9 VALUE ZERO.
00063: 01 PER-CT PIC 999999 VALUE ZEROS.

```

APPENDIX A--Continued

			PIC XX	VALUE	SPACES
00064:	01	IN-REC			
00065:	01	DETAIL1.			
00066:	02	UN	PIC 9(4)	VALUE	ZERGES.
00067:	02	FILLER	PIC X(4)	VALUE	SPACES.
00068:	02	N2	PIC 9(4)	VALUE	ZERGES.
00069:	02	FILLER	PIC X(4)	VALUE	SPACES.
00070:	02	M2	PIC 9(4)	VALUE	ZERGES.
00071:	02	FILLER	PIC X(4)	VALUE	SPACES.
00072:	02	N3	PIC 9(4)	VALUE	ZERGES.
00073:	02	FILLER	PIC X(4)	VALUE	SPACES.
00074:	02	M3	PIC 9(4)	VALUE	ZERGES.
00075:	02	FILLER	PIC X(4)	VALUE	SPACES.
00076:	02	P4	PIC 9(4)	VALUE	ZERGES.
00077:	02	FILLER	PIC X(5)	VALUE	SPACES.
00078:	02	A4	PIC 9(4)	VALUE	ZERGES.
00079:	02	FILLER	PIC X(5)	VALUE	SPACES.
00080:	02	D5	PIC 9(4)	VALUE	ZERGES.
00081:	02	FILLER	PIC X(5)	VALUE	SPACES.
00082:	02	P5	PIC 9(4)	VALUE	ZERGES.
00083:	02	FILLER	PIC X(5)	VALUE	SPACES.
00084:	02	A5	PIC 9(4)	VALUE	ZERGES.
00085:	02	FILLER	PIC X(5)	VALUE	SPACES.
00086:	02	N6	PIC 9(4)	VALUE	ZERGES.
00087:	02	FILLER	PIC X(5)	VALUE	SPACES.
00088:	02	M6	PIC 9(4)	VALUE	ZERGES.
00089:	02	FILLER	PIC X(5)	VALUE	SPACES.
00090:	02	N7	PIC 9(4)	VALUE	ZERGES.
00091:	02	FILLER	PIC X(5)	VALUE	SPACES.
00092:	02	M7	PIC 9(4)	VALUE	ZERGES.
00093:	02	FILLER	PIC X(5)	VALUE	SPACES.
00094:	02	P8	PIC 9(4)	VALUE	ZERGES.
00095:	01	DETAIL2.			
00096:	02	UNW	PIC Z9.99	VALUE	ZERGES.
00097:	02	FILLER	PIC X(2)	VALUE	SPACES.
00098:	02	N2W	PIC Z29.99	VALUE	ZERGES.
00099:	02	FILLER	PIC X(2)	VALUE	SPACES.
00100:	02	M2W	PIC Z29.99	VALUE	ZERGES.
00101:	02	FILLER	PIC X(2)	VALUE	SPACES.
00102:	02	N3W	PIC Z29.99	VALUE	ZERGES.
00103:	02	FILLER	PIC X(2)	VALUE	SPACES.
00104:	02	M3W	PIC Z29.99	VALUE	ZERGES.
00105:	02	FILLER	PIC X(2)	VALUE	SPACES.
00106:	02	P4W	PIC Z29.99	VALUE	ZERGES.
00107:	02	FILLER	PIC X(3)	VALUE	SPACES.
00108:	02	A4W	PIC Z29.99	VALUE	ZERGES.
00109:	02	FILLER	PIC X(3)	VALUE	SPACES.
00110:	02	D5W	PIC Z29.99	VALUE	ZERGES.
00111:	02	FILLER	PIC X(3)	VALUE	SPACES.
00112:	02	P5W	PIC Z29.99	VALUE	ZERGES.
00113:	02	FILLER	PIC X(3)	VALUE	SPACES.
00114:	02	A5W	PIC Z29.99	VALUE	ZERGES.
00115:	02	FILLER	PIC X(3)	VALUE	SPACES.
00116:	02	N6W	PIC Z29.99	VALUE	ZERGES.
00117:	02	FILLER	PIC X(3)	VALUE	SPACES.
00118:	02	M6W	PIC Z29.99	VALUE	ZERGES.
00119:	02	FILLER	PIC X(3)	VALUE	SPACES.
00120:	02	N7W	PIC Z29.99	VALUE	ZERGES.
00121:	02	FILLER	PIC X(3)	VALUE	SPACES.
00122:	02	M7W	PIC Z29.99	VALUE	ZERGES.
00123:	02	FILLER	PIC X(3)	VALUE	SPACES.
00124:	02	P8W	PIC Z29.99	VALUE	ZERGES.
00125:	01	HEADER1.			
00126:	02	FILLER	PIC X(6)	VALUE	SPACES.
00127:	02	FILLER	PIC X(9)	VALUE	*PERFECT*.
00128:	02	FILLER	PIC X(8)	VALUE	*MINOR*.
00129:	02	FILLER	PIC X(8)	VALUE	*MAJOR*.

APPENDIX A--Continued

00130:	02	FILLER	PIC X(8)	VALUE *MINOR*.
00131:	02	FILLER	PIC X(7)	VALUE *MAJOR*.
00132:	02	FILLER	PIC X(8)	VALUE *PERFECT*.
00133:	02	FILLER	PIC X(10)	VALUE *AUGMENTED*.
00134:	02	FILLER	PIC X(9)	VALUE *DIMINISH*.
00135:	02	FILLER	PIC X(8)	VALUE *PERFECT*.
00136:	02	FILLER	PIC X(11)	VALUE *AUGMENTED*.
00137:	02	FILLER	PIC X(9)	VALUE *MINOR*.
00138:	02	FILLER	PIC X(8)	VALUE *MAJOR*.
00139:	02	FILLER	PIC X(9)	VALUE *MINOR*.
00140:	02	FILLER	PIC X(7)	VALUE *MAJOR*.
00141:	02	FILLER	PIC X(7)	VALUE *PERFECT*.
00142:	01	HEADER2.		
00143:	02	FILLER	PIC X(7)	VALUE SPACES.
00144:	02	FILLER	PIC X(8)	VALUE *UNISON*.
00145:	02	FILLER	PIC X(8)	VALUE *SECOND*.
00146:	02	FILLER	PIC X(8)	VALUE *SECOND*.
00147:	02	FILLER	PIC X(8)	VALUE *THIRD*.
00148:	02	FILLER	PIC X(8)	VALUE *THIRD*.
00149:	02	FILLER	PIC X(9)	VALUE *FOURTH*.
00150:	02	FILLER	PIC X(10)	VALUE *FOURTH*.
00151:	02	FILLER	PIC X(9)	VALUE *FIFTH*.
00152:	02	FILLER	PIC X(9)	VALUE *FIFTH*.
00153:	02	FILLER	PIC X(8)	VALUE *FIFTH*.
00154:	02	FILLER	PIC X(9)	VALUE *SIXTH*.
00155:	02	FILLER	PIC X(8)	VALUE *SIXTH*.
00156:	02	FILLER	PIC X(9)	VALUE *SEVENTH*.
00157:	02	FILLER	PIC X(9)	VALUE *SEVENTH*.
00158:	02	FILLER	PIC X(6)	VALUE *OCTAVE*.
00159:		PROCEDURE DIVISION.		
00160:		MAIN-PAR.		
00161:		CALL *COBPSW*.		
00162:		OPEN INPUT MEL-FILE, BASS-FILE, CHORD-FILE, OUTPUT PRT-FILE.		
00163:		ACCEPT CONTROL-CARD.		
00164:		MOVE SPACES TO PRT-REC.		
00165:		WRITE PRT-REC FROM CONTROL-CARD AFTER ADVANCING 1 LINES.		
00166:		WRITE PRT-REC FROM HEADER1 AFTER ADVANCING 2 LINES.		
00167:		WRITE PRT-REC FROM HEADER2 AFTER ADVANCING 1 LINES.		
00168:		PERFORM MEL-PAR THRU MEL-EXIT UNTIL EOF = 1.		
00169:		MOVE 0 TO EOF.		
00170:		PERFORM PER-CENT THRU EXIT-PAR.		
00171:		PERFORM BASS-PAR THRU BAS-EXIT UNTIL EOF = 1.		
00172:		MOVE 0 TO EOF.		
00173:		PERFORM PER-CENT THRU EXIT-PAR.		
00174:		PERFORM CHORD-PAR THRU CHD-EXIT UNTIL EOF = 1.		
00175:		PERFORM PER-CENT THRU EXIT-PAR.		
00176:		CLOSE MEL-FILE, BASS-FILE, CHORD-FILE, PRT-FILE.		
00177:		STOP RUN.		
00178:		MEL-PAR.		
00179:		READ MEL-FILE AT END MOVE 1 TO EOF, GO TO MEL-EXIT.		
00180:		MOVE ZEROES TO KOUNT.		
00181:		PERFORM MEL-PAR2 UNTIL KOUNT = 40.		
00182:		EXHIBIT NAMED IN-REC.		
00183:		MOVE *MELODY* TO MUSIC.		
00184:		MEL-EXIT.		
00185:		EXIT.		
00186:		BASS-PAR.		
00187:		READ BASS-FILE AT END MOVE 1 TO EOF, GO TO BAS-EXIT.		
00188:		MOVE ZEROES TO KOUNT.		
00189:		PERFORM BASS-PAR2 UNTIL KOUNT = 40.		
00190:		EXHIBIT NAMED IN-REC.		
00191:		MOVE *BASS * TO MUSIC.		
00192:		BAS-EXIT.		
00193:		EXIT.		
00194:		CHORD-PAR.		

APPENDIX A--Continued

```

00196:      MOVE ZEROES TO KOUNT.
00197:      PERFORM CHORD-PAR2 UNTIL KOUNT = 40.
00198:      EXHIBIT NAMED IN-REC.
00199:      MOVE 'CHORD ' TO MUSIC.
00200:      CHD-EXIT.
00201:      EXIT.
00202:      MEL-PAR2.
00203:      ADD 1 TO KOUNT, TOT-CT.
00204:      MOVE MEL-I (KOUNT) TO IN-REC.
00205:      IF IN-REC = ' ' SUBTRACT 1 FROM TOT-CT.
00206:      PERFORM CALCULATE.
00207:      BASS-PAR2.
00208:      ADD 1 TO KOUNT, TOT-CT.
00209:      MOVE BASS-I (KOUNT) TO IN-REC.
00210:      IF IN-REC = ' ' SUBTRACT 1 FROM TOT-CT.
00211:      PERFORM CALCULATE.
00212:      CHORD-PAR2.
00213:      ADD 1 TO KOUNT, TOT-CT.
00214:      MOVE CHORD-I (KOUNT) TO IN-REC.
00215:      IF IN-REC = ' ' SUBTRACT 1 FROM TOT-CT.
00216:      PERFORM CALCULATE.
00217:      CALCULATE.
00218:      IF IN-REC = 'UN' ADD 1 TO UN ELSE,
00219:      IF IN-REC = 'N2' ADD 1 TO N2 ELSE,
00220:      IF IN-REC = 'M2' ADD 1 TO M2 ELSE,
00221:      IF IN-REC = 'N3' ADD 1 TO N3 ELSE,
00222:      IF IN-REC = 'M3' ADD 1 TO M3 ELSE,
00223:      IF IN-REC = 'P4' ADD 1 TO P4 ELSE,
00224:      IF IN-REC = 'A4' ADD 1 TO A4 ELSE,
00225:      IF IN-REC = 'D5' ADD 1 TO D5 ELSE,
00226:      IF IN-REC = 'P5' ADD 1 TO P5 ELSE,
00227:      IF IN-REC = 'A5' ADD 1 TO A5 ELSE,
00228:      IF IN-REC = 'N6' ADD 1 TO N6 ELSE,
00229:      IF IN-REC = 'M6' ADD 1 TO M6 ELSE,
00230:      IF IN-REC = 'N7' ADD 1 TO N7 ELSE,
00231:      IF IN-REC = 'M7' ADD 1 TO M7 ELSE,
00232:      IF IN-REC = 'P8' ADD 1 TO P8 ELSE,
00233:      IF IN-REC = ' ' THEN NEXT SENTENCE ELSE,
00234:      ADD 1 TO ERR.
00235:      PER-CENT.
00236:      EXHIBIT NAMED UN, N2, M2, N3, M3, P4,
00237:      A4, D5, P5, N6, M6, N7, M7, P8.
00238:      MOVE SPACES TO DETAIL-LN.
00239:      MOVE DETAIL1 TO LEFT-OVER.
00240:      WRITE PRT-REC AFTER ADVANCING 2 LINES.
00241:      COMPUTE PER-CT ROUNDED = (UN / TOT-CT) * 100.
00242:      MOVE PER-CT TO UNW.
00243:      COMPUTE PER-CT ROUNDED = (N2 / TOT-CT) * 100.
00244:      MOVE PER-CT TO N2W.
00245:      COMPUTE PER-CT ROUNDED = (M2 / TOT-CT) * 100.
00246:      MOVE PER-CT TO M2W.
00247:      COMPUTE PER-CT ROUNDED = (N3 / TOT-CT) * 100.
00248:      MOVE PER-CT TO N3W.
00249:      COMPUTE PER-CT ROUNDED = (M3 / TOT-CT) * 100.
00250:      MOVE PER-CT TO M3W.
00251:      COMPUTE PER-CT ROUNDED = (P4 / TOT-CT) * 100.
00252:      MOVE PER-CT TO P4W.
00253:      COMPUTE PER-CT ROUNDED = (A4 / TOT-CT) * 100.
00254:      MOVE PER-CT TO A4W.
00255:      COMPUTE PER-CT ROUNDED = (D5 / TOT-CT) * 100.
00256:      MOVE PER-CT TO D5W.
00257:      COMPUTE PER-CT ROUNDED = (P5 / TOT-CT) * 100.
00258:      MOVE PER-CT TO P5W.
00259:      COMPUTE PER-CT ROUNDED = (A5 / TOT-CT) * 100.
00260:      MOVE PER-CT TO A5W.
00261:      COMPUTE PER-CT ROUNDED = (N6 / TOT-CT) * 100.

```

APPENDIX A--Continued

```

00262: MOVE PER-CT TO N6W.
00263: COMPUTE PER-CT ROUNDED = (M6 / TOT-CT) * 100.
00264: MOVE PER-CT TO M6W.
00265: COMPUTE PER-CT ROUNDED = (N7 / TOT-CT) * 100.
00266: MOVE PER-CT TO N7W.
00267: COMPUTE PER-CT ROUNDED = (M7 / TOT-CT) * 100.
00268: MOVE PER-CT TO M7W.
00269: COMPUTE PER-CT ROUNDED = (P8 / TOT-CT) * 100.
00270: MOVE PER-CT TO P8W.
00271: MOVE *PERCENT* TO MUSIC.
00272: MOVE SPACES TO DETAIL-LN.
00273: MOVE DETAIL2 TO DETAIL-LN.
00274: WRITE PRT-REC AFTER ADVANCING 2 LINES.
00275: EXHIBIT NAMED ERR.
00276: MOVE ZERCS TO UN, N2, M2, N3, M3, P4, A4, D5, A5, N6, M6, N7,
00277: M7, P5, P8, TOT-CT.
00278: EXIT-PAR.
00279: EXIT.
00280: // ENDUP
00281: /*
00282: // EXEC COBCLG
00283: //COB.SYSIN DD DSN=USER2.D2002.P4181.TURNER(MUSIC),
00284: // UNIT=2314,VOL=SER=USRPAK,DISP=(OLD,KEEP)
00285: //LKED.SYSLMOD DD DSN=USER2.D2002.P4181.TURNER(MUSICAL),
00286: // UNIT=2314,VOL=SER=USRPAK,DISP=(OLD,KEEP)
00287: //GO.MELODY DD *
00288: UNN2M2N3M3P4A4D5P5A5N6N7M7P8M6
00289: /*
00290: //GO.BASS DD *
00291: UNN2M2N3M3P4A4D5P5A5N6N7M7P8M6
00292: /*
00293: //GO.CHORD DD *
00294: UNN2M2N3M3P4A4D5P5A5N6N7M7P8M6
00295: /*
00296: //GO.PRINTER DD SYSOUT=A
00297: //

```

STUDENT

APPENDIX B

JOB 323

//MIKE JOB (2032-4182;50,1),*TURNER *,CLASS=A,MSGLEVEL=(1,1)

// EXEC PGM=IEFBR14
//SYSPRINT DD SYSOUT=A
//DD1 DD DSN=USER2.D2002.P4181.TURNER,
// DISP=(OLD,DELETE),UNIT=2314,VOL=SER=USRPAK

JOB MIKE

DATE = 807164 TIME = 13.53.35.87 NTSUID = 8016413521596

STEP 1 INITIATION

IEF2361 ALLOC. FOR MIKE
IEF2371 533 ALLOCATED TO SYSPRINT
IEF2371 125 ALLOCATED TO DD1
IEF1421 - STEP WAS EXECUTED - COND CODE 0000
IEF2831 USER2.D2002.P4181.TURNER
IEF2831 VOL SER NOS= USRPAK 1.

.01 SEC CPU TIME

TERMINATION

NOT DELETED 8

//STEP1 EXEC PGM=IEBUPDTE,PARM=NEW
//SYSUT2 DD DSN=USER2.D2002.P4181.TURNER,
// DISP=(NEW,KEEP),UNIT=2314,VOL=SER=USRPAK,SPACE=(800,(100,10,3)),
// DCB=(LRECL=80,BLKSIZE=80,RECFM=FB,DSORG=PO)
//SYSPRINT DD SYSOUT=A
//SYSIN DD *

JOB MIKE

STEP 2 INITIATION DATE = 807164 TIME = 13.53.45.86 NTSUID = 8016413521596

IEF2361 ALLOC. FOR MIKE STEP1
IEF2371 125 ALLOCATED TO SYSUT2
IEF2371 531 ALLOCATED TO SYSPRINT
IEF2371 502 ALLOCATED TO SYSIN
IEF1421 - STEP WAS EXECUTED - COND CODE 0000
IEF2851 USER2.D2002.P4181.TURNER
IEF2851 VOL SER NOS= USRPAK*

.64 SEC CPU TIME

TERMINATION

KEPT

EXEC COBCLG
XXCOBCLG PROC MLIB=MACCOB
XXCOB EXEC PGM=IKFCBL00,PARM=CLIST,REGION=90K
XXSYSPRINT DD SYSOUT=A
XXSYSPUNCH DD SYSOUT=B
XXSYSLIB DD DSN=SYS2.00683.P8580.&MLIB,DISP=SHR
IEF6531 SUBSTITUTION JCL - DSN=SYS2.00683.P8580.MACCOB,DISP=SHR
XXSYSUT1 DD UNIT=SYSDA,SPACE=(460,(700,100))
XXSYSUT2 DD UNIT=SYSDA,SPACE=(460,(700,100))
XXSYSUT3 DD UNIT=SYSDA,SPACE=(460,(700,100))
XXSYSUT4 DD UNIT=SYSDA,SPACE=(460,(700,100))
XXSYSLIN DD DSN=8&LOADSET,DISP=(MOD,PASS),UNIT=SYSDA,
SPACE=(80,(500,100))
XX
//COB.SYSIN DD DSN=USER2.D2002.P4181.TURNER (MUSIC),
// UNIT=2314,VOL=SER=USRPAK,DISP=(OLD,KEEP)

00000050
00000100
00000200
00000300
00000310
00000400
00000500
00000600
00000700
X00000800
00000900

APPENDIX B--Continued

```

*****
***** JOB MIKE *****
***** STEP 3 INITIATION DATE = 80/164 TIME = 13.54.26.39 NTSUID = 8016413521596 *****
IEF2361 ALLOC. FOR MIKE COB
IEF2371 533 ALLOCATED TO SYSPRINT
IEF2371 572 ALLOCATED TO SYSPPUNCH
IEF2371 130 ALLOCATED TO SYSLIB
IEF2371 332 ALLOCATED TO SYSUT1
IEF2371 333 ALLOCATED TO SYSUT2
IEF2371 331 ALLOCATED TO SYSUT3
IEF2371 332 ALLOCATED TO SYSUT4
IEF2371 333 ALLOCATED TO SYSLIN
IEF2371 125 ALLOCATED TO SYSIN
IEF1421 - STEP WAS EXECUTED - COND CODE 0004
*****
IEF2851 SYS2.D0683.P8580.MACCOB KEPT
IEF2851 VOL SER NOS= MFILIB.
IEF2851 SYS80163.T220213.RV000.MIKE.R0003392 DELETED
IEF2851 VOL SER NOS= DMN101.
IEF2851 SYS80163.T220213.RV000.MIKE.R0003393 DELETED
IEF2851 VOL SER NOS= SIMSCI.
IEF2851 SYS80163.T220213.RV000.MIKE.R0003394 DELETED
IEF2851 VOL SER NOS= MFTRES.
IEF2851 SYS80163.T220213.RV000.MIKE.R0003395 DELETED
IEF2851 VOL SER NOS= DMN101.
IEF2851 SYS80163.T220213.RV000.MIKE.LOADSET PASSED
IEF2851 VOL SER NOS= SIMSCI.
IEF2851 USER2.D2002.P4181.TURNER KEPT
IEF2851 VOL SER NOS= USRPAK.
*****
***** 3.29 SEC CPU TIME *****
***** TERMINATION *****
(X)LKED EXEC PGM=IEVL,PARM={XREF,LIST,LET},COND={5,LT,COB},
(X)XSYSLIN DD DSNNAME=88LOADSET,DISP=(OLD,DELETE)
(X)XSYSLIN DD DSNNAME=SYSIN
(X)XSYSLMOD DD DSN=USER2.D2002.P4181.TURNER(MUSICAL),
(X)XSYSLMOD DD DSNNAME=88CODATA(RUN),DISP=(NEW,PASS),
(X)XSYSLIB DD DSNNAME=SYS1.COBLIB,DISP=SHR
(X)XSYSDA DD DSN=SYS2.D0683.P8580.NTSUBRIN.LOAD,DISP=SHR
(X)XSYSDA DD DSN=USRCH.D0683.P8603.SUBLIB,DISP=SHR
(X)XSYSDA DD UNIT=SYSDA,SPACE=(1024,(50,20))
(X)XSYSPRINT DD SYSOUT=A
*****
***** JOB MIKE *****
***** STEP 4 INITIATION DATE = 80/164 TIME = 13.55.45.70 NTSUID = 8016413521596 *****

```

APPENDIX B--Continued

```

IEF236J ALLOC. FOR MIKE. LKED
IEF237I 333 ALLOCATED TO SYSLIN
IEF237I 125 ALLOCATED TO SYSLMOD
IEF237I 330 ALLOCATED TO SYSLIB
IEF237I 331 ALLOCATED TO
IEF237I 135 ALLOCATED TO
IEF237I 332 ALLOCATED TO SYSUT1
IEF237I 533 ALLOCATED TO SYSPRINT
IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I SYS80163.I220213.RV000.MIKE.LOADSET DELETED
IEF285I VOL SER NOS= SIMSCI. KEPT
IEF285I USER2.D2002.P4181.TURNER KEPT
IEF285I VOL SER NOS= USRPAK. KEPT
IEF285I SYS1.C06LIB KEPT
IEF285I VOL SER NOS= MFTPAK. KEPT
IEF285I SYS2.00683.P8580.NTSUBRTN.LOAD KEPT
IEF285I VOL SER NOS= MFTRES. KEPT
IEF285I RSRCH.D0683.P8603.SUBLIB KEPT
IEF285I VOL SER NOS= LODLIB. KEPT
IEF285I SYS80163.I220213.RV000.MIKE.R0003396 DELETED
IEF285I VOL SER NOS= DMNT01. DELETED
*****
***** .69 SEC CPU TIME *****
***** TERMINATION *****
XXGO EXEC PGM=*.LKED.SYSLMOD,COND=(15,LT,C0B),15,LT,LKED) *****
XXSYSPRINT DD SYSOUT=A ***** 00001900 *****
XXSYSOUT DD SYSOUT=A ***** 00002000 *****
//GO.MELODY DD * ***** 00002100 *****
//GO.BASS DD *
//GO.CHORD DD *
//GO.PRINTER DD SYSOUT=A
//

```

STUDENT

```

*****
***** JOB MIKE *****
***** STEP 5 INITIATION DATE = 80/164 TIME = 13.56.29.21 NTSUID = 8016413521596 *****
IEF236J ALLOC. FOR MIKE 60 *****
IEF237I 125 ALLOCATED TO PGM=*.DD *****
IEF237I 533 ALLOCATED TO SYSPRINT *****
IEF237I 537 ALLOCATED TO SYSOUT *****
IEF237I 503 ALLOCATED TO MELODY *****
IEF237I 504 ALLOCATED TO BASS *****
IEF237I 505 ALLOCATED TO CHORD *****
IEF237I 538 ALLOCATED TO PRINTER *****
IEF142I - STEP WAS EXECUTED - COND CODE 0000 *****
IEF285I USER2.D2002.P4181.TURNER *****
IEF285I VOL SER NOS= USRPAK. *****
*****
***** .20 SEC CPU TIME *****
***** TERMINATION *****
***** TERMINATION *****
***** JOB MIKE *****
***** DATE = 80/164 TIME = 13.56.43.09 NTSUID = 8016413521596 *****
***** 4.83 SEC CPU TIME *****
***** 1925 EXCP COUNT *****
*****

```

SYSIN

```
./ ADD NAME=MUSIC,LIST=ALL
./ NUMBER NEW1=10,INCR=10
```

NEW MASTER

IEBUPOTE LOG PAGE 0001

APPENDIX B--Continued

IDENTIFICATION DIVISION.		00000010
PROGRAM-ID. MUSIC.		00000020
DATE-WRITTEN. FEB 21,1980.		00000030
DATE-COMPILED.		00000040
ENVIRONMENT DIVISION.		00000050
CONFIGURATION SECTION.		00000060
SOURCE-COMPUTER. IBM-360-H50.		00000070
OBJECT-COMPUTER. IBM-360-H50.		00000080
INPUT-OUTPUT SECTION.		00000090
FILE-CONTROL.		00000100
SELECT MEL-FILE ASSIGN TO UT-S-MELODY.		00000110
SELECT BASS-FILE ASSIGN TO UT-S-BASS.		00000120
SELECT CHORD-FILE ASSIGN TO UT-S-CHORD.		00000130
SELECT PRT-FILE ASSIGN TO UT-S-PRINTER.		00000140
DATA DIVISION.		00000150
FILE SECTION.		00000160
FD MEL-FILE		00000170
LABEL RECORDS ARE STANDARD		00000180
RECORD CONTAINS 80 CHARACTERS		00000190
DATA RECORD IS MEL-IN.		00000200
01 MEL-IN.		00000210
02 MEL-I PIC XX OCCURS 40 TIMES.		00000220
FD PRT-FILE		00000230
LABEL RECORDS ARE OMITTED		00000240
DATA RECORD IS PRT-REC.		00000250
01 PRT-REC.		00000260
02 FILLER PIC X.		00000270
02 MUSIC PIC X(6).		00000280
02 DETAIL-LN.		00000290
03 FILLER PIC X.		00000300
03 LEFT-OVER PIC X(125).		00000310
FD BASS-FILE		00000320
LABEL RECORDS ARE STANDARD		00000330
RECORD CONTAINS 80 CHARACTERS		00000340
DATA RECORD IS BASS-IN.		00000350
01 BASS-IN.		00000360
02 BASS-I PIC XX OCCURS 40 TIMES.		00000370
FD CHORD-FILE		00000380
LABEL RECORDS ARE STANDARD		00000390
RECORD CONTAINS 80 CHARACTERS		00000400
DATA RECORD IS CHORD-IN.		00000410
01 CHORD-IN.		00000420
02 CHORD-I PIC XX OCCURS 40 TIMES.		00000430
WORKING-STORAGE SECTION.		00000440
01 KOUNT PIC 99 VALUE ZEROES.		00000450
01 TOT-CT PIC 9(4) VALUE ZEROES.		00000460
01 CONTROL-CARD PIC X(80) VALUE SPACES.		00000470
01 ERR PIC 9(4) VALUE ZERO.		00000480
01 EOF PIC 9 VALUE ZERO.		00000490
01 PER-CT PIC 999V999 VALUE ZEROES.		00000500

APPENDIX B--Continued

NEW MASTER

IEBUPDTE LOG PAGE 0002

01	IN-REC	PIC XX	VALUE SPACES.	00000510
01	DETAIL1.			00000520
02	UN	PIC 9(4)	VALUE ZEROES.	00000530
02	FILLER	PIC X(4)	VALUE SPACES.	00000540
02	N2	PIC 9(4)	VALUE ZEROES.	00000550
02	FILLER	PIC X(4)	VALUE SPACES.	00000560
02	M2	PIC 9(4)	VALUE ZEROES.	00000570
02	FILLER	PIC X(4)	VALUE SPACES.	00000580
02	N3	PIC 9(4)	VALUE ZEROES.	00000590
02	FILLER	PIC X(4)	VALUE SPACES.	00000600
02	M3	PIC 9(4)	VALUE ZEROES.	00000610
02	FILLER	PIC X(4)	VALUE SPACES.	00000620
02	P4	PIC 9(4)	VALUE ZEROES.	00000630
02	FILLER	PIC X(5)	VALUE SPACES.	00000640
02	A4	PIC 9(4)	VALUE ZEROES.	00000650
02	FILLER	PIC X(5)	VALUE SPACES.	00000660
02	D5	PIC 9(4)	VALUE ZEROES.	00000670
02	FILLER	PIC X(5)	VALUE SPACES.	00000680
02	P5	PIC 9(4)	VALUE ZEROES.	00000690
02	FILLER	PIC X(5)	VALUE SPACES.	00000700
02	A5	PIC 9(4)	VALUE ZEROES.	00000710
02	FILLER	PIC X(5)	VALUE SPACES.	00000720
02	N6	PIC 9(4)	VALUE ZEROES.	00000730
02	FILLER	PIC X(5)	VALUE SPACES.	00000740
02	M6	PIC 9(4)	VALUE ZEROES.	00000750
02	FILLER	PIC X(5)	VALUE SPACES.	00000760
02	N7	PIC 9(4)	VALUE ZEROES.	00000770
02	FILLER	PIC X(5)	VALUE SPACES.	00000780
02	M7	PIC 9(4)	VALUE ZEROES.	00000790
02	FILLER	PIC X(5)	VALUE SPACES.	00000800
02	P8	PIC 9(4)	VALUE ZEROES.	00000810
01	DETAIL2.			00000820
02	UNW	PIC Z9.99	VALUE ZEROES.	00000830
02	FILLER	PIC X(2)	VALUE SPACES.	00000840
02	N2W	PIC Z29.99	VALUE ZEROES.	00000850
02	FILLER	PIC X(2)	VALUE SPACES.	00000860
02	M2W	PIC Z29.99	VALUE ZEROES.	00000870
02	FILLER	PIC X(2)	VALUE SPACES.	00000880
02	N3W	PIC Z29.99	VALUE ZEROES.	00000890
02	FILLER	PIC X(2)	VALUE SPACES.	00000900
02	M3W	PIC Z29.99	VALUE ZEROES.	00000910
02	FILLER	PIC X(2)	VALUE SPACES.	00000920
02	P4W	PIC Z29.99	VALUE ZEROES.	00000930
02	FILLER	PIC X(3)	VALUE SPACES.	00000940
02	A4W	PIC Z29.99	VALUE ZEROES.	00000950
02	FILLER	PIC X(3)	VALUE SPACES.	00000960
02	D5W	PIC Z29.99	VALUE ZEROES.	00000970
02	FILLER	PIC X(3)	VALUE SPACES.	00000980
02	P5W	PIC Z29.99	VALUE ZEROES.	00000990
02	FILLER	PIC X(3)	VALUE SPACES.	00001000
02	A5W	PIC Z29.99	VALUE ZEROES.	00001010
02	FILLER	PIC X(3)	VALUE SPACES.	00001020

APPENDIX B--Continued

NEW MASTER

IEBUPDTE LOG PAGE 0003

02	N6W	PIC Z29.99	VALUE ZEROES.	00001030
02	FILLER	PIC X(3)	VALUE SPACES.	00001040
02	M6W	PIC Z29.99	VALUE ZEROES.	00001050
02	FILLER	PIC X(3)	VALUE SPACES.	00001060
02	N7W	PIC Z29.99	VALUE ZEROES.	00001070
02	FILLER	PIC X(3)	VALUE SPACES.	00001080
02	M7W	PIC Z29.99	VALUE ZEROES.	00001090
02	FILLER	PIC X(3)	VALUE SPACES.	00001100
02	P6W	PIC Z29.99	VALUE ZEROES.	00001110
01	HEADER1.			00001120
02	FILLER	PIC X(6)	VALUE SPACES.	00001130
02	FILLER	PIC X(9)	VALUE *PERFECT*.	00001140
02	FILLER	PIC X(8)	VALUE *MINOR*.	00001150
02	FILLER	PIC X(8)	VALUE *MAJOR*.	00001160
02	FILLER	PIC X(8)	VALUE *MINOR*.	00001170
02	FILLER	PIC X(7)	VALUE *MAJOR*.	00001180
02	FILLER	PIC X(8)	VALUE *PERFECT*.	00001190
02	FILLER	PIC X(10)	VALUE *AUGMENTED*.	00001200
02	FILLER	PIC X(9)	VALUE *DIMINISH*.	00001210
02	FILLER	PIC X(8)	VALUE *PERFECT*.	00001220
02	FILLER	PIC X(11)	VALUE *AUGMENTED*.	00001230
02	FILLER	PIC X(9)	VALUE *MINOR*.	00001240
02	FILLER	PIC X(9)	VALUE *MAJOR*.	00001250
02	FILLER	PIC X(9)	VALUE *MINOR*.	00001260
02	FILLER	PIC X(7)	VALUE *MAJOR*.	00001270
02	FILLER	PIC X(7)	VALUE *PERFECT*.	00001280
01	HEADER2.			00001290
02	FILLER	PIC X(7)	VALUE SPACES.	00001300
02	FILLER	PIC X(8)	VALUE *UNISON*.	00001310
02	FILLER	PIC X(8)	VALUE *SECOND*.	00001320
02	FILLER	PIC X(8)	VALUE *SECOND*.	00001330
02	FILLER	PIC X(8)	VALUE *THIRD*.	00001340
02	FILLER	PIC X(8)	VALUE *THIRD*.	00001350
02	FILLER	PIC X(9)	VALUE *FOURTH*.	00001360
02	FILLER	PIC X(10)	VALUE *FOURTH*.	00001370
02	FILLER	PIC X(9)	VALUE *FIFTH*.	00001380
02	FILLER	PIC X(9)	VALUE *FIFTH*.	00001390
02	FILLER	PIC X(8)	VALUE *FIFTH*.	00001400
02	FILLER	PIC X(9)	VALUE *SIXTH*.	00001410
02	FILLER	PIC X(8)	VALUE *SIXTH*.	00001420
02	FILLER	PIC X(9)	VALUE *SEVENTH*.	00001430
02	FILLER	PIC X(9)	VALUE *SEVENTH*.	00001440
02	FILLER	PIC X(6)	VALUE *OCTAVE*.	00001450
	PROCEDURE DIVISION.			00001460
	MAIN-PAR.			00001470
	CALL *COBPSW*.			00001480
	OPEN INPUT MEL-FILE, BASS-FILE, CHORD-FILE, OUTPUT PRT-FILE.			00001490
	ACCEPT CONTROL-CARD.			00001500
	MOVE SPACES TO PRT-REC.			00001510
	WRITE PRT-REC FROM CONTROL-CARD AFTER ADVANCING 1 LINES.			00001520
	WRITE PRT-REC FROM HEADER1 AFTER ADVANCING 2 LINES.			00001530
	WRITE PRT-REC FROM HEADER2 AFTER ADVANCING 1 LINES.			00001540

APPENDIX B--Continued

NEW MASTER

IEBUPDTE LOG PAGE 0004

PERFORM MEL-PAR THRU MEL-EXIT UNTIL EOF = 1.	00001550
MOVE 0 TO EOF.	00001560
PERFORM PER-CENT THRU EXIT-PAR.	00001570
PERFORM BASS-PAR THRU BAS-EXIT UNTIL EOF = 1.	00001580
MOVE 0 TO EOF.	00001590
PERFORM PER-CENT THRU EXIT-PAR.	00001600
PERFORM CHORD-PAR THRU CHD-EXIT UNTIL EOF = 1.	00001610
PERFORM PER-CENT THRU EXIT-PAR.	00001620
CLOSE MEL-FILE, BASS-FILE, CHORD-FILE, PRT-FILE.	00001630
STOP RUN.	00001640
MEL-PAR.	00001650
READ MEL-FILE AT END MOVE 1 TO EOF, GO TO MEL-EXIT.	00001660
MOVE ZEROES TO KOUNT.	00001670
PERFORM MEL-PAR2 UNTIL KOUNT = 40.	00001680
EXHIBIT NAMED IN-REC.	00001690
MOVE *MELODY* TO MUSIC.	00001700
MEL-EXIT.	00001710
EXIT.	00001720
BASS-PAR.	00001730
READ BASS-FILE AT END MOVE 1 TO EOF, GO TO BAS-EXIT.	00001740
MOVE ZEROES TO KOUNT.	00001750
PERFORM BASS-PAR2 UNTIL KOUNT = 40.	00001760
EXHIBIT NAMED IN-REC.	00001770
MOVE *BASS * TO MUSIC.	00001780
BAS-EXIT.	00001790
EXIT.	00001800
CHORD-PAR.	00001810
READ CHORD-FILE AT END MOVE 1 TO EOF, GO TO CHD-EXIT.	00001820
MOVE ZEROES TO KOUNT.	00001830
PERFORM CHORD-PAR2 UNTIL KOUNT = 40.	00001840
EXHIBIT NAMED IN-REC.	00001850
MOVE *CHORD * TO MUSIC.	00001860
CHD-EXIT.	00001870
EXIT.	00001880
MEL-PAR2.	00001890
ADD 1 TO KOUNT, TOT-CT.	00001900
MOVE MEL-I (KOUNT) TO IN-REC.	00001910
IF IN-REC = * ' SUBTRACT 1 FROM TOT-CT.	00001920
PERFORM CALCULATE.	00001930
BASS-PAR2.	00001940
ADD 1 TO KOUNT, TOT-CT.	00001950
MOVE BASS-I (KOUNT) TO IN-REC.	00001960
IF IN-REC = * ' SUBTRACT 1 FROM TOT-CT.	00001970
PERFORM CALCULATE.	00001980
CHORD-PAR2.	00001990
ADD 1 TO KOUNT, TOT-CT.	00002000
MOVE CHORD-I (KOUNT) TO IN-REC.	00002010
IF IN-REC = * ' SUBTRACT 1 FROM TOT-CT.	00002020
PERFORM CALCULATE.	00002030
CALCULATE.	00002040
IF IN-REC = *UN* ADD 1 TO UN ELSE,	00002050
IF IN-REC = *N2* ADD 1 TO N2 ELSE,	00002060

APPENDIX B--Continued

NEW MASTER

IEBUPDTE LOG PAGE 0005

IF IN-REC = *M2* ADD 1 TO M2 ELSE,	00002070
IF IN-REC = *N3* ADD 1 TO N3 ELSE,	00002080
IF IN-REC = *M3* ADD 1 TO M3 ELSE,	00002090
IF IN-REC = *P4* ADD 1 TO P4 ELSE,	00002100
IF IN-REC = *A4* ADD 1 TO A4 ELSE,	00002110
IF IN-REC = *D5* ADD 1 TO D5 ELSE,	00002120
IF IN-REC = *P5* ADD 1 TO P5 ELSE,	00002130
IF IN-REC = *A5* ADD 1 TO A5 ELSE,	00002140
IF IN-REC = *N6* ADD 1 TO N6 ELSE,	00002150
IF IN-REC = *M6* ADD 1 TO M6 ELSE,	00002160
IF IN-REC = *N7* ADD 1 TO N7 ELSE,	00002170
IF IN-REC = *M7* ADD 1 TO M7 ELSE,	00002180
IF IN-REC = *P8* ADD 1 TO P8 ELSE,	00002190
IF IN-REC = * ' THEN NEXT SENTENCE ELSE,	00002200
ADD 1 TO ERR.	00002210
PER-CENT.	00002220
EXHIBIT NAMED UN, N2, M2, N3, M3, P4,	00002230
A4, D5, P5, N6, M6, N7, M7, P8.	00002240
MOVE SPACES TO DETAIL-LN.	00002250
MOVE DETAIL1 TO LEFT-OVER.	00002260
WRITE PRT-REC AFTER ADVANCING 2 LINES.	00002270
COMPUTE PER-CT ROUNDED = (UN / TOT-CT) * 100.	00002280
MOVE PER-CT TO UNW.	00002290
COMPUTE PER-CT ROUNDED = (N2 / TOT-CT) * 100.	00002300
MOVE PER-CT TO N2W.	00002310
COMPUTE PER-CT ROUNDED = (M2 / TOT-CT) * 100.	00002320
MOVE PER-CT TO M2W.	00002330
COMPUTE PER-CT ROUNDED = (N3 / TOT-CT) * 100.	00002340
MOVE PER-CT TO N3W.	00002350
COMPUTE PER-CT ROUNDED = (M3 / TOT-CT) * 100.	00002360
MOVE PER-CT TO M3W.	00002370
COMPUTE PER-CT ROUNDED = (P4 / TOT-CT) * 100.	00002380
MOVE PER-CT TO P4W.	00002390
COMPUTE PER-CT ROUNDED = (A4 / TOT-CT) * 100.	00002400
MOVE PER-CT TO A4W.	00002410
COMPUTE PER-CT ROUNDED = (D5 / TOT-CT) * 100.	00002420
MOVE PER-CT TO D5W.	00002430
COMPUTE PER-CT ROUNDED = (P5 / TOT-CT) * 100.	00002440
MOVE PER-CT TO P5W.	00002450
COMPUTE PER-CT ROUNDED = (A5 / TOT-CT) * 100.	00002460
MOVE PER-CT TO A5W.	00002470
COMPUTE PER-CT ROUNDED = (N6 / TOT-CT) * 100.	00002480
MOVE PER-CT TO N6W.	00002490
COMPUTE PER-CT ROUNDED = (M6 / TOT-CT) * 100.	00002500
MOVE PER-CT TO M6W.	00002510
COMPUTE PER-CT ROUNDED = (N7 / TOT-CT) * 100.	00002520
MOVE PER-CT TO N7W.	00002530
COMPUTE PER-CT ROUNDED = (M7 / TOT-CT) * 100.	00002540
MOVE PER-CT TO M7W.	00002550
COMPUTE PER-CT ROUNDED = (P8 / TOT-CT) * 100.	00002560
MOVE PER-CT TO P8W.	00002570
MOVE *PERCENT* TO MUSIC.	00002580

APPENDIX B--Continued

NEW MASTER

IEBUPDTE LOG PAGE 0006

MOVE SPACES TO DETAIL-LN.	00002590
MOVE DETAIL2 TO DETAIL-LN.	00002600
WRITE PRT-REC AFTER ADVANCING 2 LINES.	00002610
EXHIBIT NAMED ERR.	00002620
MOVE ZEROES TO UN, N2, M2, N3, M3, P4, A4, D5, A5, N6, M6, N700002630	
M7, P5, P8, TOT-CT.	00002640
EXIT-PAR.	00002650
EXIT.	00002660

./ ENDUP

IEB817I MEMBER NAME (MUSIC) NOT FOUND IN NM DIRECTORY. STOWED WITH TTR.
 IEB818I HIGHEST CONDITION CODE WAS 00000000
 IEB819I END OF JOB IEBUPDTE.

CB545 V2 LVL78 01MAY72

IBM OS AMERICAN NATIONAL STANDARD COBOL

1

00001	IDENTIFICATION DIVISION.	00000010
00002	PROGRAM-ID. MUSIC.	00000020
00003	DATE-WRITTEN. FEB 21,1980.	00000030
00004	DATE-COMPILED. JUN 12,1980	00000040
00005	ENVIRONMENT DIVISION.	00000050
00006	CONFIGURATION SECTION.	00000060
00007	SOURCE-COMPUTER. IBM-360-H50.	00000070
00008	OBJECT-COMPUTER. IBM-360-H50.	00000080
00009	INPUT-OUTPUT SECTION.	00000090
00010	FILE-CONTROL.	00000100
00011	SELECT MEL-FILE ASSIGN TO UT-S-MELODY.	00000110
00012	SELECT BASS-FILE ASSIGN TO UT-S-BASS.	00000120
00013	SELECT CHORD-FILE ASSIGN TO UT-S-CHORD.	00000130
00014	SELECT PRT-FILE ASSIGN TO UT-S-PRINTER.	00000140
00015	DATA DIVISION.	00000150
00016	FILE SECTION.	00000160
00017	FD MEL-FILE	00000170
00018	LABEL RECORDS ARE STANDARD	00000180
00019	RECORD CONTAINS 80 CHARACTERS	00000190
00020	DATA RECORD IS MEL-IN.	00000200
00021	01 MEL-IN.	00000210
00022	02 MEL-I PIC XX OCCURS 40 TIMES.	00000220
00023	FD PRT-FILE	00000230
00024	LABEL RECORDS ARE OMITTED	00000240
00025	DATA RECORD IS PRT-REC.	00000250
00026	01 PRT-REC.	00000260
00027	02 FILLER PIC X.	00000270
00028	02 MUSIC PIC X(6).	00000280
00029	02 DETAIL-LN.	00000290
00030	03 FILLER PIC X.	00000300
00031	03 LEFT-OVER PIC X(125).	00000310
00032	FD BASS-FILE	00000320
00033	LABEL RECORDS ARE STANDARD	00000330
00034	RECORD CONTAINS 80 CHARACTERS	00000340
00035	DATA RECORD IS BASS-IN.	00000350
00036	01 BASS-IN.	00000360
00037	02 BASS-I PIC XX OCCURS 40 TIMES.	00000370

APPENDIX B--Continued

00038	FD	CHORD-FILE			00000380
00039		LABEL RECORDS ARE STANDARD			00000390
00040		RECORD CONTAINS 80 CHARACTERS			00000400
00041		DATA RECORD IS CHORD-IN.			00000410
00042	01	CHORD-IN.			00000420
00043	02	CHORD-I PIC XX OCCURS 40 TIMES.			00000430
00044		WORKING-STORAGE SECTION.			00000440
00045	01	KOUNT	PIC 99	VALUE ZEROES.	00000450
00046	01	TDT-CT	PIC 9(4)	VALUE ZEROES.	00000460
00047	01	CONTROL-CARD	PIC X(80)	VALUE SPACES.	00000470
00048	01	ERR	PIC 9(4)	VALUE ZERO.	00000480
00049	01	EDF	PIC 9	VALUE ZERO.	00000490
00050	01	PER-CT	PIC 999V999	VALUE ZEROES.	00000500
00051	01	IN-REC	PIC XX	VALUE SPACES.	00000510
00052	01	DETAIL1.			00000520
00053	02	UN	PIC 9(4)	VALUE ZEROES.	00000530
00054	02	FILLER	PIC X(4)	VALUE SPACES.	00000540
00055	02	N2	PIC 9(4)	VALUE ZEROES.	00000550
00056	02	FILLER	PIC X(4)	VALUE SPACES.	00000560
00057	02	M2	PIC 9(4)	VALUE ZEROES.	00000570
00058	02	FILLER	PIC X(4)	VALUE SPACES.	00000580
00059	02	N3	PIC 9(4)	VALUE ZEROES.	00000590
00060	02	FILLER	PIC X(4)	VALUE SPACES.	00000600
00061	02	M3	PIC 9(4)	VALUE ZEROES.	00000610
00062	02	FILLER	PIC X(4)	VALUE SPACES.	00000620
00063	02	P4	PIC 9(4)	VALUE ZEROES.	00000630
00064	02	FILLER	PIC X(5)	VALUE SPACES.	00000640
00065	02	A4	PIC 9(4)	VALUE ZEROES.	00000650
00066	02	FILLER	PIC X(5)	VALUE SPACES.	00000660
00067	02	D5	PIC 9(4)	VALUE ZEROES.	00000670
00068	02	FILLER	PIC X(5)	VALUE SPACES.	00000680
00069	02	P5	PIC 9(4)	VALUE ZEROES.	00000690
00070	02	FILLER	PIC X(5)	VALUE SPACES.	00000700
00071	02	A5	PIC 9(4)	VALUE ZEROES.	00000710
00072	02	FILLER	PIC X(5)	VALUE SPACES.	00000720
00073	02	N6	PIC 9(4)	VALUE ZEROES.	00000730
00074	02	FILLER	PIC X(5)	VALUE SPACES.	00000740
00075	02	M6	PIC 9(4)	VALUE ZEROES.	00000750
00076	02	FILLER	PIC X(5)	VALUE SPACES.	00000760
00077	02	N7	PIC 9(4)	VALUE ZEROES.	00000770
00078	02	FILLER	PIC X(5)	VALUE SPACES.	00000780
00079	02	M7	PIC 9(4)	VALUE ZEROES.	00000790
00080	02	FILLER	PIC X(5)	VALUE SPACES.	00000800
00081	02	P8	PIC 9(4)	VALUE ZEROES.	00000810
00082	01	DETAIL2.			00000820
00083	02	UNW	PIC 29.99	VALUE ZEROES.	00000830
00084	02	FILLER	PIC X(2)	VALUE SPACES.	00000840
00085	02	N2W	PIC 229.99	VALUE ZEROES.	00000850
00086	02	FILLER	PIC X(2)	VALUE SPACES.	00000860
00087	02	M2W	PIC 229.99	VALUE ZEROES.	00000870
00088	02	FILLER	PIC X(2)	VALUE SPACES.	00000880
00089	02	N3W	PIC 229.99	VALUE ZEROES.	00000890
00090	02	FILLER	PIC X(2)	VALUE SPACES.	00000900
00091	02	M3W	PIC 229.99	VALUE ZEROES.	00000910
00092	02	FILLER	PIC X(2)	VALUE SPACES.	00000920
00093	02	P4W	PIC 229.99	VALUE ZEROES.	00000930
00094	02	FILLER	PIC X(3)	VALUE SPACES.	00000940
00095	02	A4W	PIC 229.99	VALUE ZEROES.	00000950
00096	02	FILLER	PIC X(3)	VALUE SPACES.	00000960
00097	02	D5W	PIC 229.99	VALUE ZEROES.	00000970
00098	02	FILLER	PIC X(3)	VALUE SPACES.	00000980
00099	02	P5W	PIC 229.99	VALUE ZEROES.	00000990
00100	02	FILLER	PIC X(3)	VALUE SPACES.	00001000
00101	02	A5W	PIC 229.99	VALUE ZEROES.	00001010
00102	02	FILLER	PIC X(3)	VALUE SPACES.	00001020

APPENDIX B--Continued

00103	02	N6W	PIC Z29.99	VALUE ZEROES.	00001030
00104	02	FILLER	PIC X(3)	VALUE SPACES.	00001040
00105	02	M6W	PIC Z29.99	VALUE ZEROES.	00001050
00106	02	FILLER	PIC X(3)	VALUE SPACES.	00001060
00107	02	N7W	PIC Z29.99	VALUE ZEROES.	00001070
00108	02	FILLER	PIC X(3)	VALUE SPACES.	00001080
00109	02	M7W	PIC Z29.99	VALUE ZEROES.	00001090
00110	02	FILLER	PIC X(3)	VALUE SPACES.	00001100
00111	02	P8W	PIC Z29.99	VALUE ZEROES.	00001110
00112	01	HEADER1.			00001120
00113	02	FILLER	PIC X(6)	VALUE SPACES.	00001130
00114	02	FILLER	PIC X(9)	VALUE *PERFECT*.	00001140
00115	02	FILLER	PIC X(8)	VALUE *MINOR*.	00001150
00116	02	FILLER	PIC X(8)	VALUE *MAJOR*.	00001160
00117	02	FILLER	PIC X(8)	VALUE *MINOR*.	00001170
00118	02	FILLER	PIC X(7)	VALUE *MAJOR*.	00001180
00119	02	FILLER	PIC X(8)	VALUE *PERFECT*.	00001190
00120	02	FILLER	PIC X(10)	VALUE *AUGMENTED*.	00001200
00121	02	FILLER	PIC X(9)	VALUE *DIMINISH*.	00001210
00122	02	FILLER	PIC X(8)	VALUE *PERFECT*.	00001220
00123	02	FILLER	PIC X(11)	VALUE *AUGMENTED*.	00001230
00124	02	FILLER	PIC X(9)	VALUE *MINOR*.	00001240
00125	02	FILLER	PIC X(9)	VALUE *MAJOR*.	00001250
00126	02	FILLER	PIC X(9)	VALUE *MINOR*.	00001260
00127	02	FILLER	PIC X(7)	VALUE *MAJOR*.	00001270
00128	02	FILLER	PIC X(7)	VALUE *PERFECT*.	00001280
00129	01	HEADER2.			00001290
00130	02	FILLER	PIC X(7)	VALUE SPACES.	00001300
00131	02	FILLER	PIC X(8)	VALUE *UNISON*.	00001310
00132	02	FILLER	PIC X(8)	VALUE *SECOND*.	00001320
00133	02	FILLER	PIC X(8)	VALUE *SECOND*.	00001330
00134	02	FILLER	PIC X(8)	VALUE *THIRD*.	00001340
00135	02	FILLER	PIC X(8)	VALUE *THIRD*.	00001350
00136	02	FILLER	PIC X(9)	VALUE *FOURTH*.	00001360
00137	02	FILLER	PIC X(10)	VALUE *FOURTH*.	00001370
00138	02	FILLER	PIC X(9)	VALUE *FIFTH*.	00001380
00139	02	FILLER	PIC X(9)	VALUE *FIFTH*.	00001390
00140	02	FILLER	PIC X(8)	VALUE *FIFTH*.	00001400
00141	02	FILLER	PIC X(9)	VALUE *SIXTH*.	00001410
00142	02	FILLER	PIC X(8)	VALUE *SIXTH*.	00001420
00143	02	FILLER	PIC X(9)	VALUE *SEVENTH*.	00001430
00144	02	FILLER	PIC X(9)	VALUE *SEVENTH*.	00001440
00145	02	FILLER	PIC X(6)	VALUE *OCTAVE*.	00001450
00146		PROCEDURE DIVISION.			00001460
00147		MAIN-PAR.			00001470
00148		CALL *COBPSW*.			00001480
00149		OPEN INPUT MEL-FILE, BASS-FILE, CHORD-FILE, OUTPUT PRT-FILE.			00001490
00150		ACCEPT CONTROL-CARD.			00001500
00151		MOVE SPACES TO PRT-REC.			00001510
00152		WRITE PRT-REC FROM CONTROL-CARD AFTER ADVANCING 1 LINES.			00001520
00153		WRITE PRT-REC FROM HEADER1 AFTER ADVANCING 2 LINES.			00001530
00154		WRITE PRT-REC FROM HEADER2 AFTER ADVANCING 1 LINES.			00001540
00155		PERFORM MEL-PAR THRU MEL-EXIT UNTIL EOF = 1.			00001550
00156		MOVE 0 TO EOF.			00001560
00157		PERFORM PER-CENT THRU EXIT-PAR.			00001570
00158		PERFORM BASS-PAR THRU BAS-EXIT UNTIL EOF = 1.			00001580
00159		MOVE 0 TO EOF.			00001590
00160		PERFORM PER-CENT THRU EXIT-PAR.			00001600
00161		PERFORM CHORD-PAR THRU CHD-EXIT UNTIL EOF = 1.			00001610
00162		PERFORM PER-CENT THRU EXIT-PAR.			00001620
00163		CLOSE MEL-FILE, BASS-FILE, CHORD-FILE, PRT-FILE.			00001630
00164		STOP RUN.			00001640
00165		MEL-PAR.			00001650
00166		READ MEL-FILE AT END MOVE 1 TO EOF, GO TO MEL-EXIT.			00001660
00167		MOVE ZEROES TO KOUNT.			00001670
00168		PERFORM MEL-PAR2 UNTIL KOUNT = 40.			00001680

APPENDIX B--Continued

00169	EXHIBIT NAMED IN-REC.	00001690
00170	MOVE 'MELODY' TO MUSIC.	00001700
00171	MEL-EXIT.	00001710
00172	EXIT.	00001720
00173	BASS-PAR.	00001730
00174	READ BASS-FILE AT END MOVE 1 TO EOF, GO TO BAS-EXIT.	00001740
00175	MOVE ZEROES TO KOUNT.	00001750
00176	PERFORM BASS-PAR2 UNTIL KOUNT = 40.	00001760
00177	EXHIBIT NAMED IN-REC.	00001770
00178	MOVE 'BASS ' TO MUSIC.	00001780
00179	BAS-EXIT.	00001790
00180	EXIT.	00001800
00181	CHORD-PAR.	00001810
00182	READ CHORD-FILE AT END MOVE 1 TO EOF, GO TO CHD-EXIT.	00001820
00183	MOVE ZEROES TO KOUNT.	00001830
00184	PERFORM CHORD-PAR2 UNTIL KOUNT = 40.	00001840
00185	EXHIBIT NAMED IN-REC.	00001850
00186	MOVE 'CHORD ' TO MUSIC.	00001860
00187	CHD-EXIT.	00001870
00188	EXIT.	00001880
00189	MEL-PAR2.	00001890
00190	ADD 1 TO KOUNT, TOT-CT.	00001900
00191	MOVE MEL-I (KOUNT) TO IN-REC.	00001910
00192	IF IN-REC = ' ' SUBTRACT 1 FROM TOT-CT.	00001920
00193	PERFORM CALCULATE.	00001930
00194	BASS-PAR2.	00001940
00195	ADD 1 TO KOUNT, TOT-CT.	00001950
00196	MOVE BASS-I (KOUNT) TO IN-REC.	00001960
00197	IF IN-REC = ' ' SUBTRACT 1 FROM TOT-CT.	00001970
00198	PERFORM CALCULATE.	00001980
00199	CHORD-PAR2.	00001990
00200	ADD 1 TO KOUNT, TOT-CT.	00002000
00201	MOVE CHORD-I (KOUNT) TO IN-REC.	00002010
00202	IF IN-REC = ' ' SUBTRACT 1 FROM TOT-CT.	00002020
00203	PERFORM CALCULATE.	00002030
00204	CALCULATE.	00002040
00205	IF IN-REC = 'UN' ADD 1 TO UN ELSE,	00002050
00206	IF IN-REC = 'N2' ADD 1 TO N2 ELSE,	00002060
00207	IF IN-REC = 'M2' ADD 1 TO M2 ELSE,	00002070
00208	IF IN-REC = 'N3' ADD 1 TO N3 ELSE,	00002080
00209	IF IN-REC = 'M3' ADD 1 TO M3 ELSE,	00002090
00210	IF IN-REC = 'P4' ADD 1 TO P4 ELSE,	00002100
00211	IF IN-REC = 'A4' ADD 1 TO A4 ELSE,	00002110
00212	IF IN-REC = 'O5' ADD 1 TO O5 ELSE,	00002120
00213	IF IN-REC = 'P5' ADD 1 TO P5 ELSE,	00002130
00214	IF IN-REC = 'A5' ADD 1 TO A5 ELSE,	00002140
00215	IF IN-REC = 'N6' ADD 1 TO N6 ELSE,	00002150
00216	IF IN-REC = 'M6' ADD 1 TO M6 ELSE,	00002160
00217	IF IN-REC = 'N7' ADD 1 TO N7 ELSE,	00002170
00218	IF IN-REC = 'M7' ADD 1 TO M7 ELSE,	00002180
00219	IF IN-REC = 'P8' ADD 1 TO P8 ELSE,	00002190
00220	IF IN-REC = ' ' THEN NEXT SENTENCE ELSE,	00002200
00221	ADD 1 TO ERR.	00002210
00222	PER-CENT.	00002220
00223	EXHIBIT NAMED UN, N2, M2, N3, M3, P4,	00002230
00224	A4, O5, P5, N6, M6, N7, M7, P8.	00002240
00225	MOVE SPACES TO DETAIL-LN.	00002250

APPENDIX B--Continued

00226	MOVE DETAIL1 TO LEFT-OVER.	00002260
00227	WRITE PRT-REC AFTER ADVANCING 2 LINES.	00002270
00228	COMPUTE PER-CT ROUNDED = (UN / TOT-CT) * 100.	00002280
00229	MOVE PER-CT TO UNW.	00002290
00230	COMPUTE PER-CT ROUNDED = (N2 / TOT-CT) * 100.	00002300
00231	MOVE PER-CT TO N2W.	00002310
00232	COMPUTE PER-CT ROUNDED = (M2 / TOT-CT) * 100.	00002320
00233	MOVE PER-CT TO M2W.	00002330
00234	COMPUTE PER-CT ROUNDED = (N3 / TOT-CT) * 100.	00002340
00235	MOVE PER-CT TO N3W.	00002350
00236	COMPUTE PER-CT ROUNDED = (M3 / TOT-CT) * 100.	00002360
00237	MOVE PER-CT TO M3W.	00002370
00238	COMPUTE PER-CT ROUNDED = (P4 / TOT-CT) * 100.	00002380
00239	MOVE PER-CT TO P4W.	00002390
00240	COMPUTE PER-CT ROUNDED = (A4 / TOT-CT) * 100.	00002400
00241	MOVE PER-CT TO A4W.	00002410
00242	COMPUTE PER-CT ROUNDED = (D5 / TOT-CT) * 100.	00002420
00243	MOVE PER-CT TO D5W.	00002430
00244	COMPUTE PER-CT ROUNDED = (P5 / TOT-CT) * 100.	00002440
00245	MOVE PER-CT TO P5W.	00002450
00246	COMPUTE PER-CT ROUNDED = (A5 / TOT-CT) * 100.	00002460
00247	MOVE PER-CT TO A5W.	00002470
00248	COMPUTE PER-CT ROUNDED = (N6 / TOT-CT) * 100.	00002480
00249	MOVE PER-CT TO N6W.	00002490
00250	COMPUTE PER-CT ROUNDED = (M6 / TOT-CT) * 100.	00002500
00251	MOVE PER-CT TO M6W.	00002510
00252	COMPUTE PER-CT ROUNDED = (N7 / TOT-CT) * 100.	00002520
00253	MOVE PER-CT TO N7W.	00002530
00254	COMPUTE PER-CT ROUNDED = (M7 / TOT-CT) * 100.	00002540
00255	MOVE PER-CT TO M7W.	00002550
00256	COMPUTE PER-CT ROUNDED = (P8 / TOT-CT) * 100.	00002560
00257	MOVE PER-CT TO P8W.	00002570
00258	MOVE *PERCENT* TO MUSIC.	00002580
00259	MOVE SPACES TO DETAIL-LN.	00002590
00260	MOVE DETAIL2 TO DETAIL-LN.	00002600
00261	WRITE PRT-REC AFTER ADVANCING 2 LINES.	00002610
00262	EXHIBIT NAMED ERR.	00002620
00263	MOVE ZEROES TO UN, N2, M2, N3, M3, P4, A4, D5, A5, N6, M6, N7	00002630
00264	M7, P5, P8, TOT-CT.	00002640
00265	EXIT-PAR.	00002650
00266	EXIT.	00002660

APPENDIX B--Continued

CONDENSED LISTING

148	CALL	000B04	149	OPEN	000B10	150	ACCEPT	000B74
151	MOVE	000B86	152	WRITE	000B90	153	WRITE	000BD6
154	WRITE	000C12	155	PERFORM	000C4E	156	MOVE	000C7E
157	PERFORM	000C84	158	PERFORM	000CA2	159	MOVE	000CD2
160	PERFORM	000C08	161	PERFORM	000CF6	162	PERFORM	000D26
163	CLOSE	000D44	164	STOP	000E54	166	READ	000E5A
166	MOVE	000E7A	166	GO	000E80	167	MOVE	000E86
168	PERFORM	000E8C	169	EXHIBIT	000EBC	170	MOVE	000EE6
172	EXIT	000EEC	174	READ	000EF2	174	MOVE	000F12
174	GO	000F18	175	MOVE	000F1E	176	PERFORM	000F24
177	EXHIBIT	000F54	178	MOVE	000F7E	180	EXIT	000F84
182	READ	000F8A	182	MOVE	000FAA	182	GO	000F80
183	MOVE	000FB6	184	PERFORM	000FBC	185	EXHIBIT	000FEC
186	MOVE	001016	188	EXIT	00101C	190	ADD	001022
191	MOVE	00104E	192	IF	001074	192	SUBTRACT	001086
193	PERFORM	00109C	195	ADD	0010C0	196	MOVE	0010EC
197	IF	001112	197	SUBTRACT	001124	198	PERFORM	00113A
200	ADD	00115E	201	MOVE	00118A	202	IF	0011B0
202	SUBTRACT	0011C2	203	PERFORM	0011D8	205	IF	0011FC
205	ADD	001208	205	ELSE	00121E	206	IF	001224
206	ADD	001230	206	ELSE	001246	207	IF	00124C
207	ADD	001258	207	ELSE	00126E	208	IF	001274
208	ADD	001280	208	ELSE	001296	209	IF	00129C
209	ADD	0012A8	209	ELSE	0012DE	210	IF	0012CA
210	ADD	0012D0	210	ELSE	0012E6	211	IF	0012EC
211	ADD	0012F8	211	ELSE	00130E	212	IF	001314
212	ADD	001320	212	ELSE	001336	213	IF	00133C
213	ADD	001348	213	ELSE	00135E	214	IF	001364
214	ADD	001370	214	ELSE	001386	215	IF	00138C
215	ADD	001398	215	ELSE	0013AE	216	IF	001384
216	ADD	0013C0	216	ELSE	0013D6	217	IF	0013DC
217	ADD	0013E8	217	ELSE	0013FE	218	IF	001404
218	ADD	001410	218	ELSE	001426	219	IF	00142C
219	ADD	001438	219	ELSE	00144E	220	IF	001454
220	ELSE	00146C	221	ADD	00146C	223	EXHIBIT	001488
225	MOVE	001586	226	MOVE	0015C0	227	WRITE	0015C6
228	COMPUTE	0015FC	229	MOVE	00164E	230	COMPUTE	001672
231	MOVE	0016C4	232	COMPUTE	0016E2	233	MOVE	001734
234	COMPUTE	001752	235	MOVE	0017A4	236	COMPUTE	0017C2
237	MOVE	001814	238	COMPUTE	001832	239	MOVE	001884
240	COMPUTE	0018A2	241	MOVE	0018F4	242	COMPUTE	001912
243	MOVE	001964	244	COMPUTE	001982	245	MOVE	0019D4
246	COMPUTE	0019F2	247	MOVE	001A44	248	COMPUTE	001A62
249	MOVE	001AB4	250	COMPUTE	001AD2	251	MOVE	001B24
252	COMPUTE	001BA2	253	MOVE	001B94	254	COMPUTE	001BB2
255	MOVE	001C04	256	COMPUTE	001C22	257	MOVE	001C74
258	MOVE	001C92	259	MOVE	001C98	260	MOVE	001CA2
261	WRITE	001CAB	262	EXHIBIT	001CDE	263	MOVE	001D08
266	EXIT	001D68						

APPENDIX B--Continued

STATISTICS SOURCE RECORDS = 266 DATA DIVISION STATEMENTS = 117 PROCEDURE DIVISION STATEMENTS = 145
 OPTIONS IN EFFECT SIZE = 88064 BUF = 8912 LINECNT = 57 SPACE1, FLAGV, SEQ, SOURCE

F44-LEVEL LINKAGE EDITOR OPTIONS SPECIFIED XREF,LIST,LET
 DEFAULT OPTION(S) USED - SIZE=(71680,10240)

CROSS REFERENCE TABLE

CONTROL SECTION		ENTRY		LOCATION		NAME		LOCATION		NAME		LOCATION	
NAME	ORIGIN	LENGTH	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	NAME	LOCATION	
MUSIC	00	1E30											
COBPSW *	1E30	100											
ILB0ACP0*	1F30	1E7	TOABEND	1EE8									
ILB0DSP0*	2118	700											
ILB0STP0*	2818	35											
ABEND3 *	2850	534	ILB0STP1	282E									

LOCATION	REFERS TO SYMBOL	IN CONTROL SECTION	LOCATION	REFERS TO SYMBOL	IN CONTROL SECTION
8CB	ILB0STP0		8CC	COBPSW	COBPSW
8D0	ILB0ACP0		8D4	ILB0STP1	ILB0STP0
8D8	ILB0DSP0		1F28	ABEND3	ABEND3
ENTRY ADDRESS	00				
TOTAL LENGTH	2D88				

***MUSICAL DOES NOT EXIST BUT HAS BEEN ADDED TO DATA SET

APPENDIX B--Continued

PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
MELODY 0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
PERCEN 6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66
BASS 0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
PERCEN 6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66
CHORD 0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001	0001
PERCEN 6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66	6.66

IN-REC =
 UN = 0001 N2 = 0001 M2 = 0001 N3 = 0001 M3 = 0001 P4 = 0001 A4 = 0001 A4 = 0001 P5 = 0001 P5 = 0001 N6 = 0001 N6 = 0001 M6 = 0001 M6 = 0001 N7 = 0001
 M7 = 0001 P8 = 0001
 ERR = 0000
 IN-REC =
 UN = 0001 N2 = 0001 M2 = 0001 N3 = 0001 M3 = 0001 P4 = 0001 A4 = 0001 A4 = 0001 P5 = 0001 P5 = 0001 N6 = 0001 N6 = 0001 M6 = 0001 M6 = 0001 N7 = 0001
 M7 = 0001 P8 = 0001
 ERR = 0000
 IN-REC =
 UN = 0001 N2 = 0001 M2 = 0001 N3 = 0001 M3 = 0001 P4 = 0001 A4 = 0001 A4 = 0001 P5 = 0001 P5 = 0001 N6 = 0001 N6 = 0001 M6 = 0001 M6 = 0001 N7 = 0001
 M7 = 0001 P8 = 0001
 ERR = 0000

APPENDIX C

J. P. RAMEAU		ALL PIECES OF MUSIC										BAROQUE		
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
MELODY 0238	0157	0264	0066	0042	0037	0000	0005	0012	0000	0005	0001	0001	0000	0002
PERCEN28.60	18.87	31.73	7.93	5.04	4.44	0.00	0.60	1.44	0.00	0.60	0.12	0.12	0.00	0.24
BASS 0166	0116	0213	0068	0041	0055	0002	0004	0025	0000	0006	0001	0000	0000	0024
PERCEN23.02	16.08	29.54	9.43	5.68	7.62	0.27	0.55	3.46	0.00	0.83	0.13	0.00	0.00	3.32
CHORD 0000	0006	0033	0131	0110	0038	0013	0005	0123	0002	0050	0070	0023	0008	0128
PERCEN 0.00	0.81	4.45	17.70	14.86	5.13	1.75	0.67	16.62	0.27	6.75	9.45	3.10	1.08	17.25

ANTONIO VIVALDI		ALL PIECES OF MUSIC										BAROQUE		
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
MELODY 0133	0136	0117	0032	0023	0022	0001	0004	0013	0000	0006	0009	0001	0000	0001
PERCEN26.60	27.20	23.40	6.40	4.60	4.40	0.20	0.80	2.60	0.00	1.20	1.80	0.20	0.00	0.20
BASS 0120	0109	0080	0026	0013	0053	0008	0001	0040	0000	0001	0007	0000	0000	0024
PERCEN24.74	22.47	16.49	5.36	2.68	10.92	1.64	0.20	8.24	0.00	0.20	1.44	0.00	0.00	4.94
HORN 0000	0008	0010	0059	0112	0026	0012	0024	0095	0001	0049	0045	0038	0003	0084
PERCEN 0.00	1.38	1.73	10.20	19.37	4.49	2.07	4.15	16.43	0.17	8.47	7.78	6.57	0.51	14.53

APPENDIX C--Continued

JOHANN S. BACH		ALL PIECES OF MUSIC														BAROQUE													
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE	PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
ELODY 0104	0205	0369	0041	0039	0061	0001	0002	0029	0000	0001	0006	0001	0004	0008	ELODY 0475	0498	0750	0139	0104	0120	0002	0011	0054	0000	0012	0016	0003	0004	0011
ERCEN11.89	23.45	42.21	4.69	4.46	6.97	0.11	0.22	3.31	0.00	0.11	0.68	0.11	0.45	0.91	RCEN21.53	22.57	33.99	6.30	4.71	5.43	0.09	0.49	2.44	0.00	0.54	0.72	0.13	0.18	0.49
ASS 0064	0214	0278	0032	0035	0076	0001	0004	0052	0000	0004	0004	0005	0003	0036	ASS 0350	0439	0571	0126	0089	0184	0011	0009	0117	0000	0011	0012	0005	0003	0084
ERCEN 7.91	26.45	34.36	3.95	4.32	9.39	0.12	0.49	6.42	0.00	0.49	0.49	0.61	0.37	4.44	RCEN17.36	21.78	28.33	6.25	4.41	9.13	0.54	0.44	5.80	0.00	0.54	0.59	0.24	0.14	4.16
HORD 0000	0003	0034	0153	0114	0056	0014	0029	0145	0002	0078	0096	0044	0007	0125	HORD 0060	0017	0077	0343	0336	0120	0039	0058	0363	0005	0177	0211	0105	0018	0337
ERCEN 0.00	0.33	3.74	16.86	12.56	6.17	1.54	3.19	15.98	0.22	8.59	10.58	4.85	0.77	13.78	RCEN 0.00	0.76	3.46	15.41	15.10	5.39	1.75	2.60	16.31	0.22	7.95	9.48	4.71	0.80	15.14

BAROQUE COMPOSERS		ALL PIECES OF MUSIC														BAROQUE													
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE	PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
ELODY 0475	0498	0750	0139	0104	0120	0002	0011	0054	0000	0012	0016	0003	0004	0011	ELODY 0475	0498	0750	0139	0104	0120	0002	0011	0054	0000	0012	0016	0003	0004	0011
RCEN21.53	22.57	33.99	6.30	4.71	5.43	0.09	0.49	2.44	0.00	0.54	0.72	0.13	0.18	0.49	RCEN21.53	22.57	33.99	6.30	4.71	5.43	0.09	0.49	2.44	0.00	0.54	0.72	0.13	0.18	0.49
ASS 0350	0439	0571	0126	0089	0184	0011	0009	0117	0000	0011	0012	0005	0003	0084	ASS 0350	0439	0571	0126	0089	0184	0011	0009	0117	0000	0011	0012	0005	0003	0084
RCEN17.36	21.78	28.33	6.25	4.41	9.13	0.54	0.44	5.80	0.00	0.54	0.59	0.24	0.14	4.16	RCEN17.36	21.78	28.33	6.25	4.41	9.13	0.54	0.44	5.80	0.00	0.54	0.59	0.24	0.14	4.16
HORD 0060	0017	0077	0343	0336	0120	0039	0058	0363	0005	0177	0211	0105	0018	0337	HORD 0060	0017	0077	0343	0336	0120	0039	0058	0363	0005	0177	0211	0105	0018	0337
RCEN 0.00	0.76	3.46	15.41	15.10	5.39	1.75	2.60	16.31	0.22	7.95	9.48	4.71	0.80	15.14	RCEN 0.00	0.76	3.46	15.41	15.10	5.39	1.75	2.60	16.31	0.22	7.95	9.48	4.71	0.80	15.14

APPENDIX C--Continued

JOSEPH HAYDN		ALL PIECES OF MUSIC										CLASSICAL																	
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE	PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
MELODY 0252	0232	0247	0072	0052	0070	0000	0003	0018	0000	0005	0010	0006	0001	0011	PERFECT UNISON	0232	0247	0072	0052	0070	0000	0003	0018	0000	0005	0010	0006	0001	0011
PERCEN25.68	23.64	25.17	7.33	5.30	7.13	0.00	0.30	1.83	0.00	0.50	1.01	0.61	0.10	1.12	PERCEN25.68	23.64	25.17	7.33	5.30	7.13	0.00	0.30	1.83	0.00	0.50	1.01	0.61	0.10	1.12
BASS 0290	0198	0158	0061	0043	0074	0003	0001	0059	0000	0005	0003	0002	0000	0030	BASS 0290	0198	0158	0061	0043	0074	0003	0001	0059	0000	0005	0003	0002	0000	0030
PERCEN31.11	21.24	16.95	6.54	4.61	7.93	0.32	0.10	6.53	0.00	0.53	0.32	0.21	0.00	3.21	PERCEN31.11	21.24	16.95	6.54	4.61	7.93	0.32	0.10	6.53	0.00	0.53	0.32	0.21	0.00	3.21
CHORD 0001	0004	0019	0112	0151	0055	0017	0031	0143	0000	0097	0112	0028	0006	0292	CHORD 0001	0004	0019	0112	0151	0055	0017	0031	0143	0000	0097	0112	0028	0006	0292
PERCEN 0.09	0.37	1.76	10.38	14.00	5.10	1.57	2.87	13.26	0.00	8.99	10.38	2.59	0.55	27.08	PERCEN 0.09	0.37	1.76	10.38	14.00	5.10	1.57	2.87	13.26	0.00	8.99	10.38	2.59	0.55	27.08

WOLFGANG AMADEUS MOZART		ALL PIECES OF MUSIC										CLASSICAL																	
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE	PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
MELODY 0131	0118	0084	0037	0029	0031	0000	0002	0015	0000	0004	0000	0000	0000	0003	MELODY 0131	0118	0084	0037	0029	0031	0000	0002	0015	0000	0004	0000	0000	0000	0003
PERCEN28.85	25.99	18.50	8.14	6.38	6.82	0.00	0.44	3.30	0.00	0.88	0.00	0.00	0.00	0.66	PERCEN28.85	25.99	18.50	8.14	6.38	6.82	0.00	0.44	3.30	0.00	0.88	0.00	0.00	0.00	0.66
BASS 0152	0088	0089	0012	0014	0032	0000	0001	0017	0000	0002	0002	0000	0000	0009	BASS 0152	0088	0089	0012	0014	0032	0000	0001	0017	0000	0002	0002	0000	0000	0009
PERCEN36.36	21.05	21.29	2.87	3.34	7.65	0.00	0.23	4.06	0.00	0.47	0.47	0.00	0.00	2.15	PERCEN36.36	21.05	21.29	2.87	3.34	7.65	0.00	0.23	4.06	0.00	0.47	0.47	0.00	0.00	2.15
CHORD 0000	0004	0009	0072	0059	0030	0014	0015	0056	0002	0060	0070	0018	0002	0109	CHORD 0000	0004	0009	0072	0059	0030	0014	0015	0056	0002	0060	0070	0018	0002	0109
PERCEN 0.00	0.76	1.71	13.71	11.23	5.71	2.66	2.85	10.66	0.38	11.42	13.33	3.42	0.38	20.76	PERCEN 0.00	0.76	1.71	13.71	11.23	5.71	2.66	2.85	10.66	0.38	11.42	13.33	3.42	0.38	20.76

APPENDIX C--Continued

LUDWIG VON BEETHOVEN		ALL PIECES OF MUSIC										CLASSICAL		
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
MELODY 0360	0144	0289	0053	0036	0029	0003	0001	0029	0000	0012	0012	0004	0001	0023
PERCEN36.07	14.42	28.95	5.31	3.60	2.90	0.30	0.10	2.90	0.00	1.20	1.20	0.40	0.10	2.30
BASS 0401	0120	0202	0049	0044	0009	0000	0002	0049	0000	0005	0005	0005	0003	0062
PERCEN38.70	11.58	19.49	4.72	4.24	8.59	0.00	0.19	4.72	0.00	0.48	0.48	0.48	0.28	5.98
CHORD 0002	0006	0055	0108	0159	0083	0013	0013	0171	0000	0066	0089	0069	0005	0195
PERCEN 0.18	0.55	5.08	9.98	14.69	7.67	1.20	1.20	15.80	0.00	6.09	8.22	6.37	0.46	18.02

CLASSICAL COMPOSERS		ALL PIECES OF MUSIC										CLASSICAL		
PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE
MELODY 0743	0494	0620	0162	0117	0130	0003	0006	0062	0000	0021	0022	0010	0002	0037
PERCEN30.53	20.30	25.48	6.65	4.80	5.34	0.12	0.24	2.54	0.00	0.86	0.90	0.41	0.08	1.52
BASS 0843	0406	0449	0122	0101	0195	0003	0004	0125	0000	0012	0010	0007	0003	0101
PERCEN35.33	17.01	18.81	5.11	4.23	8.17	0.12	0.16	5.23	0.00	0.50	0.41	0.29	0.12	4.23
CHORD 0003	0014	0083	0292	0369	0168	0044	0059	0370	0002	0223	0271	0115	0013	0596
PERCEN 0.11	0.52	3.09	10.87	13.74	6.25	1.63	2.19	13.78	0.07	8.30	10.09	4.28	0.48	22.19

APPENDIX C--Continued

ECTOR BERLIOZ	ALL PIECES OF MUSIC												ROMANTIC											
	PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE									
ELDOY 6289	0174	0164	0052	0035	0032	0001	0001	0001	0015	0000	0003	0007	0003	0000	0002									
ERCEN37.09	22.33	21.05	6.67	4.49	4.10	0.12	0.12	0.12	1.92	0.00	0.38	0.89	0.38	0.00	0.25									
ASS 0290	0116	0074	0035	0043	0061	0000	0000	0000	0029	0000	0004	0006	0004	0000	0006									
ERKEN43.21	17.28	11.02	5.21	6.40	9.09	0.00	0.00	0.00	4.32	0.00	0.59	0.89	0.59	0.00	0.89									
HORD 0600	0304	0026	0078	0130	0041	0011	0011	0029	0104	0006	0052	0053	0030	0014	0173									
ERKEN 0.00	0.51	4.66	10.10	16.83	5.31	1.42	3.75	13.47	0.77	6.73	6.86	3.88	1.81	22.40										

LTON BRUCKNER	ALL PIECES OF MUSIC												ROMANTIC											
	PERFECT UNISON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE									
ELDOY 0201	0189	0240	0057	0028	0048	0002	0002	0002	0017	0000	0007	0003	0004	0000	0018									
ERCEN24.51	23.04	29.26	6.95	3.41	5.85	0.24	0.24	0.24	2.07	0.00	0.85	0.36	0.48	0.00	2.19									
ASS 0198	0124	0195	0043	0029	0065	0002	0004	0004	0053	0000	0002	0007	0001	0002	0025									
ERKEN26.25	16.44	25.86	5.70	3.84	8.62	0.26	0.53	7.02	0.00	0.26	0.92	0.13	0.26	3.31										
HORD 0601	0001	0028	0068	0076	0048	0009	0005	0096	0001	0050	0073	0021	0004	0340										
ERKEN 0.12	0.12	3.36	8.22	9.18	5.80	1.08	0.60	11.60	0.12	6.04	8.82	2.53	0.48	41.11										

APPENDIX C--Continued

BRAHMS		ALL PIECES OF MUSIC										ROMANTIC									
RECT SON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE							
176	0130	0194	0055	0047	0047	0000	0001	0012	0000	0007	0001	0001	0000	0000							
180	22.76	33.97	9.63	8.23	8.23	0.00	0.17	2.10	0.00	1.22	0.17	0.17	0.00	0.00							
188	0057	0110	0063	0021	0063	0002	0002	0090	0000	0009	0001	0002	0000	0015							
187	10.38	20.03	11.47	3.82	11.47	0.36	0.36	16.39	0.00	1.63	0.18	0.36	0.00	2.73							
190	0000	0022	0070	0126	0026	0001	0002	0103	0001	0042	0046	0015	0002	0149							
190	0.00	3.61	11.51	20.72	4.27	0.16	0.32	16.94	0.16	6.90	7.56	2.46	0.32	24.50							

LIEBOWITZ		ALL ROMANTIC MUSIC										ROMANTIC									
RECT SON	MINOR SECOND	MAJOR SECOND	MINOR THIRD	MAJOR THIRD	PERFECT FOURTH	AUGMENTED FOURTH	DIMINISH FIFTH	PERFECT FIFTH	AUGMENTED FIFTH	MINOR SIXTH	MAJOR SIXTH	MINOR SEVENTH	MAJOR SEVENTH	PERFECT OCTAVE							
66	0493	0598	0164	0110	0127	0003	0004	0044	0000	0017	0011	0008	0000	0020							
08	22.71	27.55	7.55	5.06	5.85	0.13	0.18	2.02	0.00	0.78	0.50	0.36	0.00	0.92							
96	0297	0379	0141	0093	0189	0004	0006	0172	0000	0015	0014	0007	0002	0046							
19	15.04	19.19	7.14	4.71	9.57	0.20	0.30	8.71	0.00	0.75	0.70	0.35	0.10	2.33							
01	0005	0086	0216	0332	0115	0021	0036	0303	0008	0144	0172	0066	0020	0662							
04	0.22	3.89	9.78	15.04	5.21	0.95	1.63	13.72	0.36	6.52	7.79	2.99	0.90	29.99							

APPENDIX D

Music Used in Tables

Baroque Period:

- J. S. Bach
 - St. John Passion (1723)
 - Mass in B Minor (1733)
 - Christ Lag in Todesbanden
- A. Vivaldi
 - Beatus Vir
 - Kyrie
 - Magnificat
- J. P. Rameau
 - Motet: Gai
 - Motet: Laboravi
 - Motet: Vivement

Classical Period:

- F. J. Haydn
 - Die Schöpfung (1796-1798)
 - Agnus Dei from the Theresa Mass (1799)
 - Te Deum Laudamus in C Major (1765)
- W. A. Mozart
 - Gloria from Mass in C Major K-317
 - Dies Irae from the Requiem K-626
 - Ave Verum K-618
- L. V. Beethoven
 - Last Movement of Symphony #9 Opus 125
 - Agnus Dei from Missa Solemnis Opus 123
 - Der Glorreiche Augenbluck #1 Opus 136

Romantic Period:

- H. Berlioz
 - Chorus of the Maji (1832)
 - Agnus Dei from the Requiem (1837)
 - Resurrexit (1824)

APPENDIX D--Continued

- J. Brahms
 - The Hunter
 - Requiem - 1st Movement (1857-1868)
 - Ach Lieber Herre Jesu Christ
- A. Bruckner
 - Agnus Dei From Mass #3 in F Minor (1868)
 - Gloria From Mass #1 in D Major (1864)
 - Credo From Mass #2 in E Minor (1866)

Other Works Consulted

- J. S. Bach
 - Brandenburg Concertos #5 & #6
 - Chorale #72 (Passion Chorale)
- L. V. Beethoven
 - Mass in C Major Opus 86
 - Excerpts From Fidelio Opus 72
 - Symphony #7 (2nd movement) Opus 92
 - Piano Sonata Opus 13 (2nd movement)
- H. Berlioz
 - Te Deum Opus 22 (1849)
 - Damnation of Faust Opus 24 (1846)
- J. Brahms
 - Ave Maria Opus 12 (1858)
 - Serenade in D Major Opus 11 (1857)
 - Symphony #4 Opus 98 (1885)
- A. Bruckner
 - Missa Solemnis (1854)
 - Requiem (1875)
- F. J. Haydn
 - Stabat Mater (1767)
 - Missa Brevis in F Major (1749)
- W. A. Mozart
 - Missa Brevis K140
 - Missa Solemnis K139
 - Piano Concerto #1

BIBLIOGRAPHY

BIBLIOGRAPHY

Books

- Apel, Willi. Harvard Dictionary of Music. Cambridge, Mass.: Harvard University Press, 1956.
- Atkisson, Harold F. Basic Counterpoint. New York: McGraw-Hill Book Co., 1956.
- Bukofzer, Manfred F. Music in the Baroque Era. New York: W. W. Norton and Co., 1947.
- Christ, William, Richard Delone, Vernon Kliever, Lewis Rowell, William Thomson. Materials and Structure of Music. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1972.
- Davis, Ferdinand and Donald Lybbert. The Essentials of Counterpoint. Norman, Oklahoma: University of Oklahoma Press, 1977.
- Davis, William S. Information Processing Systems. Reading, Massachusetts: Addison-Wesley Publishing Co., 1978.
- Dickinson, George S. A Handbook of Style in Music. New York: DaCapo Press, 1969.
- Forte, Allen. Tonal Harmony in Concept and Practice. New York: Holt, Rinehart, and Winston, 1974.
- Fux, Johann Joseph. The Study of Counterpoint, edited and translated by Alfred Mann. New York: W. W. Norton and Company, 1965.
- Grout, Donald Jay. A History of Western Music. New York: Holt, Rinehart, and Winston, 1960.
- Hindemith, Paul. Craft of Musical Composition Volume I, translated by Arthur Mendel. New York: Schott Inc., 1970.
- Jacobs, Arthur (editor). Choral Music. Baltimore, Maryland: Penquin Books, 1963.

- Kennan, Kent Wheeler. Counterpoint. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1972.
- LaRue, Jan. Guidelines for Style Analysis. New York: W. W. Norton and Company Inc., 1970.
- Mason, Neale B. Essentials of Eighteenth Century Counterpoint. Dubuque, Iowa: William C. Brown Co., 1968.
- Ottman, Robert W. Advanced Harmony. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1972.
- Palisca, Claude V. Baroque Music. Englewood Cliffs, New Jersey: Prentice-Hall Inc., 1968.
- Phillippakis, Andrea S. Structured Cobol. New York: McGraw-Hill Book Co., 1977.
- Piston, Walter. Counterpoint. New York: W. W. Norton and Company, 1947.
- Ratner, Leonard G. Music: Listener's Art. New York: McGraw-Hill Book Co., 1966.
- Scherman, Thomas K. and Louis Biancolli (editors). The Beethoven Companion. New York: Doubleday and Co., 1972.
- Scott, Samuel H. Tonal Counterpoint. Denton, Texas: The North Texas Printing Office, 1975.
- Stein, Leon. Structure and Style. Evanston, Illinois: Summy-Birchard Company, 1962.
- Tinctoris, Johannes. The Art of Counterpoint, translated and edited by Albert Seay. American Institute of Musicology, 1961.
- Zarlino, Gioseffo. The Art of Counterpoint, edited by Claude V. Palisca. New Haven, Connecticut: Yale University Press, 1968.

Articles

- Cohen, J.C., "Information Theory and Music," Behavioral Sciences, VII: 137, 1952.
- Quastler, H., "Studies of Human Channel Capacity" In E.C. Cherry (Ed.), Information Theory.- Third London Symposium, Academic Press, New York, 1955, p. 361.

Unpublished Material

Baker, R., A Statistical Analysis of the Harmonic Practice of the 18th and Early 19th Centuries. Unpublished doctoral dissertation, University of Illinois, 1963.

Bean, C., Jr., Information Theory Applied to the Analysis of a Particular Formal Process in Tonal Music. Unpublished doctoral dissertation, University of Illinois, 1961.