1981

The Psycho-physiological Effects of Volume, Pitch, Harmony and Rhythm in the Development of Western Art Music Implications for a Philosophy of Music History

Wolfgang Hans Stefani
Andrews University

This research is a product of the graduate program in Music MA at Andrews University. Find out more about the program.

Follow this and additional works at: https://digitalcommons.andrews.edu/theses

Recommended Citation
https://digitalcommons.andrews.edu/theses/26
Thank you for your interest in the

Andrews University Digital Library
of Dissertations and Theses.

Please honor the copyright of this document by not duplicating or distributing additional copies in any form without the author’s express written permission. Thanks for your cooperation.
Andrews University
School of Graduate Studies

THE PSYCHO-PHYSIOLOGICAL EFFECTS OF VOLUME, PITCH, HARMONY
AND RHYTHM IN THE DEVELOPMENT OF WESTERN ART MUSIC
IMPLICATIONS FOR A PHILOSOPHY OF MUSIC HISTORY

A Thesis
Presented in Partial Fulfillment
of the Requirements for the Degree
Master of Arts

by
Wolfgang Hans Martin Stefani
August 1981
THE PSYCHO-PHYSIOLOGICAL EFFECTS OF VOLUME, PITCH, HARMONY AND RHYTHM IN THE DEVELOPMENT OF WESTERN ART MUSIC
IMPLICATIONS FOR A PHILOSOPHY OF MUSIC HISTORY

A Thesis present
in partial fulfillment of the requirements
for the degree
Master of Arts

by
Wolfgang Hans Martin Stefani

APPROVAL BY THE COMMITTEE:

Paul E. Hamel, Chairman

Charles J. Hall

E. Harold Lickley

July 31, 1981

Date approved

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
ABSTRACT

THE PSYCHO-PHYSILOGICAL EFFECTS OF VOLUME, PITCH, HARMONY
AND RHYTHM IN THE DEVELOPMENT OF WESTERN ART MUSIC
IMPLICATIONS FOR A PHILOSOPHY OF MUSIC HISTORY

by

Wolfgang Hans Martin Stefani

Chairman: Paul E. Hamel
Title: THE PSYCHO-PHYSIOLOGICAL EFFECTS OF VOLUME, PITCH, HARMONY AND RHYTHM: IMPLICATIONS FOR A PHILOSOPHY OF MUSIC HISTORY

Name of researcher: Wolfgang Hans Martin Stefani

Name and degree of faculty adviser: Paul E. Hamel, D.Mus.Ed.

Date completed: August 1981

Problem

Contemporary Christian churches have a growing concern over music ethics. A more objective standard than personal taste and opinion is needed to evaluate and assess both art music and popular music. The purpose of this present study was to determine a philosophy of music history on which an objective standard can be based. The study also investigated the expressive function of music.

Method

Two fields of investigation in music scholarship were correlated—the history of stylistic and instrumental development
in Western art music and the scientific study of the psycho-physiological effects of music on the human organism.

Results

Scientific research demonstrates that the musical elements of pitch, volume, harmony, and rhythm elicit psycho-physiological responses in the human organism. Throughout the history of stylistic and instrumental development in Western art music these elements have been developed in such a way as to have an increasingly potent impact on the human organism. Thus, a definite trend to increase the stimulative potential of Western art music was traced.

This trend permeates the entire fabric of Western art music development and evidence for it is exhibited on both the micro and macro levels of music development. Consistently linked to this trend is a desire for greater emotional expression, a move toward increased individualism and freedom in musical composition, and a gradual shift in orientation from sacred to secular music.

Conclusion

The history of musical development in Western culture is not a static system in which all elements maintain a dynamic equilibrium. The historical facts and scientific data only allow for a directional philosophy of music history. When aligned with similar trends in the music of two ancient cultures, the process of desensitization, scientific research into the psycho-physiological effects of music, and the Biblical account of the nature of man, the weight
of evidence suggests that the trend is indicative of a decline. It is therefore proposed that the historical trend itself becomes a guideline for judging the relative quality of particular stylistic features. As such it provides a consistent and objective standard by which to evaluate all music.
# TABLE OF CONTENTS

LIST OF FIGURES ................................................................. v
LIST OF TABLES ................................................................. vi
ACKNOWLEDGEMENTS ............................................................... vii

Chapter

I. INTRODUCTION .......................................................... 1

The Problem ................................................................. 1
Survey of Related Literature and Justification
for the Study ................................................................. 3
Music Ethics and Contemporary Christian
Churches ................................................................. 3
The Interrelationship between the Psychology of
Music and Historical Musicology ......................... 10
Philosophies of Music History ................................. 14

II. THE PSYCHO-PHYSIOLOGICAL EFFECTS OF PITCH, VOLUME
HARMONY, AND RHYTHM ON THE HUMAN ORGANISM .......... 30

Volume ................................................................. 39
Pitch ................................................................. 46
Harmony ................................................................. 51
Rhythm ................................................................. 58
Some General Considerations ................................. 65
Music and the Conscious Decision-Making Process ..... 66
The Effect of Music on Professional Musicians ........ 68
Music and the Relative Importance of Melody, Harmony,
and Rhythm ................................................................. 69
The Relative Effect of Instrumental and
Vocal Music ................................................................. 69
Music and Cultural Differences ................................. 70
Music and Its Effect on the Individual ......................... 73
Perception Changes in Music ......................................... 74
Summary ................................................................. 78
Volume ................................................................. 79
Pitch ................................................................. 79
Harmony ................................................................. 80
Rhythm ................................................................. 81
Some General Considerations ......................................... 82
III. STYLISTIC CHANGE AND DEVELOPMENT IN WESTERN ART MUSIC AS RELATED TO PSYCHO-PHYSIOLOGICAL IMPACT ........................... 84

Melody ................................................... 85
Harmony .................................................. 111
Rhythm ................................................... 136
The Use of Dynamics in Western Art Music .................. 171
The Desire for Greater Emotional Expression .............. 182
The Attitude to Principles of Musical Composition ........ 186
Classicism versus Romanticism ............................. 191
Secular and Sacred Music in Western Art Music .......... 193
Summary ................................................ 196
Melody ................................................... 196
Harmony .................................................. 197
Rhythm ................................................... 197
Other Factors ......................................... 199

IV. THE DEVELOPMENT OF INSTRUMENTS AND PERFORMANCE PRACTICES AS RELATED TO PSYCHO-PHYSIOLOGICAL IMPACT ............ 201

Stringed Instruments .................................. 207
Wind Instruments .................................... 214
Brass Instruments .................................... 219
Percussion Instruments ............................... 223
Keyboard Instruments ................................ 228
Instrumental Development in the Twentieth Century .... 235
Performance Practices ................................ 236
Standard Pitch ........................................ 237
Vibrato .................................................. 238
The Ensemble ........................................ 239
Summary ................................................ 243

V. IMPLICATIONS TOWARD A PHILOSOPHY OF MUSIC HISTORY ..................... 246

A Philosophy of Music History ....................... 250
The Contribution to the "Unexplored Field of Musicology" .......... 264
Implications for a Philosophy of Ethics in Music for the Christian ........ 268

APPENDIX ...................................................... 279

Appendix A: Hevner Adjective Circle (Revised Version) .... 280
Appendix B: Explanation of Pitches ...................... 281

BIBLIOGRAPHY ............................................. 282
LIST OF FIGURES

1. Music History Shows a Progression ....................... 15
2a. Music History Shows a Degeneration ....................... 15
2b. Music History Shows a Degeneration ....................... 16
3. Music History Shows neither a Progression nor a Degeneration ....................... 16
4. The Trend to Increase Psycho-physiological Impact throughout Western Art Music History ....................... 182
5. The Interaction between Classical and Romantic Periods throughout Western Art Music History ....................... 193
LIST OF TABLES

1. Approximate Decibel Ratings of Different Sound Sources ..................................... 42
2. Approximate Decibel Ratings of Musical Dynamic Markings as Experienced by the Listener 43
3. Approximate Decibel Ratings of Musical Dynamic Markings as Experienced by Orchestral Musicians 43
4. A Comparison of Instrumental Ensemble Sizes from the Seventeenth to the Twentieth Century 240
ACKNOWLEDGMENTS

The writer is deeply appreciative of the guidance and cooperation received during the course of study. He wishes to particularly thank Dr. Hans-Jörgen Holman for his help in the preparation and editing of the manuscript and regrets that due to illness he was prevented from helping in the completion of the study. The researcher also wishes to acknowledge the editorial assistance of Nan Tucker. Most of all he wishes to express deepest gratitude to his wife Julie, without whose encouragement, patience, and untiring help this study would not have been possible.
CHAPTER I

INTRODUCTION

This study seeks to correlate two fields of investigation in music scholarship--the history of stylistic development in Western art music and the more recently developed scientific study of the psycho-physiological effects of music on the human organism. The purpose of this correlation is to determine to what extent those elements in music that affect the human organism, such as pitch, volume, harmony, and rhythm, have had an impact on the development of Western art music. If it can be established that historically there has been a gradual tendency to increase the potential psycho-physiological effect of Western art music on the human organism, then this trend could be a new basis for a philosophy of music history.

The Problem

This research has been motivated by the issues arising from three different areas of discussion involving the musical art.

1. There is a growing concern in contemporary Christian churches over the issue of ethics in music. Discussion of this rather sensitive subject have up to now largely centered around personal opinion. In essence, the subject of ethics in music has become a confused jumble of thought with professional musicians, clergy, and laity justifying their own tastes and attitudes. This thesis is written to
outline a more objective approach upon which to base the whole discussion.

2. The communicative powers and expressive function of music have been called "an unexplored field in musicology." Only recently have the fields of psychology of music and historical musicology been interrelated to expedite further exploration. This thesis aims to make a contribution to this new area of research.

3. In recent years much specialized research and documentation has been done in regard to music, but little has been done to observe the development of music as a whole.

One is impressed in perusing the literature . . . at the amount of investigation, of observation and speculation, reported in many books and papers on the subject of music. However, it seems one does not see the forest for the trees. . . . Many isolated facts and facets in regard to music are well observed and documented; but it seems that nobody yet has put them together.

This comment by Rudolf Dreikurs along with concepts expressed in W. D. Allen's book Philosophies of Music History has prompted the desire to look at the "forest" and to attempt to interconnect many of the isolated facts. In the process, a new basis for a philosophy of music history seems to emerge.

Several other fields of investigation would also appear to benefit from this research. These include music analysis, the nature of the creative process involved in music composition, and music therapy.

---


Survey of Related Literature and Justification for the Study

According to the best knowledge of the writer, it appears that there has been no comprehensive previous attempt to correlate historical musicology and the psychology of music in quite this way. The related literature is therefore limited and fairly scattered. However, studies done in each of the three main areas delineated above as the motivation for the study have given direction and impetus to the proposed thesis.

Music Ethics and Contemporary Christian Churches

The growing concern in contemporary Christian churches over the issue of ethics in both religious and secular music has prompted a surge of written material on the subject within the last ten to fifteen years. A recent article in Church Music, entitled "Music: A Universal Church Problem as Viewed by a Catholic Musician," highlights the need for "proper standards in devotional music." The appropriateness of popular music styles making inroads into contemporary Christian churches in general is questioned. The author addresses himself particularly to the situation in the Lutheran and Roman Catholic churches. Another article, "Now It's Rockin' Time at Jewish Services," comments favorably on the introduction of rock music into Jewish worship.

---


4 Ibid., p. 58.

services. In Christian Century a call is made to "reassert standards of excellence in the selection and performance of church music" in churches of all denominations. The Moody Monthly comments on the issue with an article by Robert Cook entitled "That New Religious Music." Christianity Today has published a steady stream of articles on the subject in the past few years. One example is "There Is More to Redemption Than Meets the Ear" by Harold Best, Dean of the Wheaton Conservatory of Music. Best inquires into the Christian's responsibility in music. "Music: Offerings of Creativity," published as an interview with Harold Best, portrays his philosophy of both secular and sacred music for the Christian. Donald P. Hustad, Professor of Church Music and Organ at Southern Baptist Theological Seminary, in "Music Speaks . . . but What Language?" comments on the need for the Minister of Music in each church to uphold a standard. Bruce H. Leaflad, a Congregational church Minister of Music, analyzes different approaches to the role and standards of church music in "What Sound Church Music?" He enunciates a philosophy that he feels should

---

control a Christian musician in his choice of Music. The Christian attitude to secular music is discussed in an interview with Robert Hale, an opera singer, in the article "When You Care Enough to Sing the Very Best."12

Indexes of both religious and music literature contain references to many articles in a wide cross-section of periodicals and journals. Each article expresses a different point of view on this subject. Some prescribe very decided views, others plead for tolerance and balance, while still others proclaim a laissez-faire attitude. Authors such as Austin C. Lovelace, Erik Routley, Archibald T. Davidson, Elwyn A. Wienandt, and many others are well known for their books written on this subject. High standards of performance are encouraged and only the "best" music is upheld as fit for use in church worship. The fact that the issue is discussed so consistently suggests that people are still not satisfied with the answers that have been given. Many see it as an issue that still demands some probing discussion and penetrating answers.

Of particular interest to the present study is the work of Bob Larson, whose name since the mid-1960s has been associated with the anti-rock music campaign. His concentration on the psycho-physiological effect of music opened up a new area for discussion in the on-going debate. By means of both the public platform and published books and articles, he has warned against the psycho-physiological and spiritual dangers of listening to rock music. His

appeals are directed particularly at teenagers and their parents. He stresses the incompatibility of Christian lifestyle with rock music. Frank Garlock has worked in a similar area.

Since the late 1960s interest in the area of music ethics has also increased in the Seventh-day Adventist Church. Articles in various church journals and magazines have commented on the issue. Some articles have been quite specific in their comments, for example, "What Is Good Music?" by Milton G. Crane. In October 1972 the General Conference Committee of the Seventh-day Adventist Church took an official action at the Autumn Council in Mexico City, Mexico, to publish an eight-page leaflet entitled "Guidelines toward a Seventh-day Adventist Philosophy of Music." In this brochure, several guidelines to be used in evaluating music in both sacred and secular contexts were suggested. There was a call for the individual Christian to "exercise a high degree of discrimination and individual responsibility" in the selection of both sacred and secular music to be used in conjunction with a Christian lifestyle. The question that was and is still debated concerns the basis for discrimination in the selection process.

In the second chapter of his book, The Christian and His Music

---

13 See, for example, Larson, Bob, The Day Music Died, 213 pp.
16 Obtainable from B. E. Seton, General Conference of Seventh-day Adventists, 6840 Eastern Avenue, NW, Washington, D.C., 20012, U.S.A.
(1973), Paul Hamel focused his attention on the effects of music on behavior. This injected a new element into the discussion of ethics in music for the Christian. The purpose for this is made clear in the preface to the book.

This volume has been prepared with the hope that it may stimulate thinking and study concerning the influence of music on behavior. Although not all the effects of music can be completely understood, I feel that the material presented here will be helpful to the Christian as he seeks to live his life in harmony with God's plan for him.18

I recognize that opinions vary widely as to what constitutes the best in music, both for pleasure and for worship. I do not attempt to speak for the church, neither is it my purpose to impose a personal set of values on others. Rather, I have sought to present information that will make the reader more keenly aware of music's power and importance, and that will assist him in developing a personal Christian philosophy regarding its use.19

This was the first time that a book on music ethics for the Christian incorporating a discussion of the effects of music on human behavior, was published within the Seventh-day Adventist Church.

Since that time a steady stream of opinions and approaches have been advanced. However, the problem of subjectivity remains. Personal taste and opinion are still largely the basis of discussion and dialogue. Even when discussion has been based on the effects of music on behavior, it has been almost solely directed at dismissing contemporary popular styles. It would almost seem that an arbitrary standard had been previously set and that the effect of music on behavior was merely furnished as proof of the validity of that standard.

19 Ibid., p. 9.
History attests to the fact that the ethical properties of music and the effect of music on the character and consciousness of man have been debated for millenia. From Confucious, Plato, and Aristotle to Vatican councils as recently as 1903 and 1963, the discussion has continued both inside and outside the church. Regrettably, however, the discussions have often been suppressed with an authoritarian statement made by some person or hierarchical body. Arbitrary decisions have been made according to some standard set up either by professional musicians or critics or by some church body acting as the conscience of its members—or by some self-styled group or individual professing competence for making the decision. But a problem arises when such arbitrary decisions are handed down to be accepted by "the people" to whom the standard used in making the decision is meaningless. The problem is compounded by the teaching of contemporary psychological theory and philosophy that regards standards as mere cultural conditioning. Thus, what the musicologist or churchman or anyone else may lay down as a standard is disputed on the basis of his or her conditioning.

Increasingly it would seem that only empirical experimentation and demonstration will command and maintain attention as a valid basis for evaluation and proof. Scientific evidence appeals to both the layman and the scholar because in many ways it is seen as the "last word." It is, at least, a more objective type of evidence.

In 1976 H. Lloyd Leno published a series of articles entitled

20 See, for example, Lundin, R. W., An Objective, Psychology of Music, 345 pp. This book is a common textbook in American colleges and universities on the psychology of music.
"Music—Its Far-reaching Effects." In the first article of this series he made the following observation:

Rather than relying on majority opinion, personal tastes, or even the opinion of professionals in the field of music, it seems logical that we should develop a philosophy of music based on what effect music has upon people.

This statement has made a distinct impression on the present writer's thinking. At least two points are inferred:

1. The effect of music on people is not to be a peripheral adjunct to a previously derived philosophy of music, but rather, the basis for the philosophy. This cannot ultimately remove the necessity for personal interpretation. However, it puts the emphasis on allowing the evidence to rule the interpretation rather than the converse.

2. All music, not only popular, contemporary styles, can be and should be measured on the same scale—according to its effect upon people.

This approach demands investigation for two reasons. First, it provides a more objective basis for discussion. Second, it removes the arbitrariness of standards and provides a standard which is relevant to all individuals because it appears that music affects all people, and in at least one dimension it basically affects all people in a similar way. Thus, Leno's observation has prompted a desire to investigate this approach as a viable solution to the problem of ethics in music.

---


23 See pp. 71-73 for a discussion of this point.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
The decision to investigate the stylistic development of art music in Western culture together with the effects of music on people has been influenced by the following factors:

1. The body of Western art music is well documented throughout its history and is readily accessible.

2. A systematic study of the developments in Western art music in relation to its effect on the human organism will automatically comment on comparable developments in popular, contemporary styles of music.

3. By scrutinizing the developments in Western art music, the frequently justified accusation of arbitrary prejudice that comes when attacks are only made on contemporary, popular styles of music will be negated.

Hence, this study aims to establish the beginnings of a more objective platform that will consider all music from the same perspective. Rather than dealing with abstract philosophical evaluations, it is proposed that the investigation of ethics in music should center on a discussion of the historical development of factors that are traceable in the actual music and their demonstrable effects on the human organism. The writer does not hope to answer, or even attempt to answer, all questions and to stop all discussions, but rather to make a useful contribution to a continuing discussion.

The Interrelationship between the Psychology of Music and Historical Musicology

This interrelationship is a new field in musicological research. Only a few isolated references have been found to this approach being
previously employed. Ernest Kurth in 1903 observed: "the existence of a road of cooperation between the two interacting musicological disciplines, interacting though operating on widely differing premises."

In the article "An Unexplored Field in Musicology" Donald Ferguson suggests the need for a scientific exploration of the function of music as a "vehicle of expression." He demonstrates that music theory, music history, and psychology have not really answered many questions in this area. Ferguson appeals to scholars acquainted with physics, psychology, semantics, and philosophy of music to implement a more effective type of musical criticism based on a "reasoned analysis of its expressive function." He demonstrates this approach himself by the use of an illustration from Bach's Cantata No. 146. Ferguson's approach is a revival of an Affektenlehre-type analysis, though more comprehensive and detailed in its scope.

Howard Hanson, composer, writer, and teacher, has outlined his personal investigations into "the increase of emotional tension in music produced by a gradually increasing use of dissonance." He has included a study of music of different types and of different periods in his analysis. He has also investigated the use of rhythm

---

24 Kurth, Ernest, Musikpsychologie, 324 pp.
26 Ferguson, *op. cit.*, p. 47.
in Western music from the sixteenth to the twentieth century. He has found that increased complexity in rhythm has contributed to increased emotional tension and that twentieth century popular-music styles particularly reflect this trend. However, Hanson admits that he is speaking solely from the standpoint of a "composer and musical theorist." Although he mentions pulse rate and emotional tension in his studies, he does not specifically discuss and document the psycho-physiological effect of music on the human organism.

Zofia Lissa, in an article entitled "On the Evolution of Musical Perception," notes and discusses the changes in musical perception throughout Western art-music history. She shows how the study of the psychology of music clarifies the "relationship between the historical changes taking place in musical perception and the changes they generate in creativity." The article demonstrates how historical musicology had incorrectly considered musical perception to be a non-changing factor. This view had failed to take into account the psychological study of the history of receptivity. Zofia Lissa integrates the two fields of psychology and the history of music in an endeavor to examine and explain accurately the developments evident in Western art-music history.

Deryck Cooke, in his book The Language of Music, appeals for an increased understanding of the language of music. "If only we could come to understand the language better, we might well find

29Ibid., p. 364.
30Lissa, op. cit., p. 273.
31Ibid., p. 273.
ourselves agreeing more and more as to what any given piece expresses." Cooke calls music "the expression of man's deepest self." In his book he attempts to "isolate the various means of expression available to the composer—the various procedures in the dimensions of pitch, time and volume—and to discover what emotional effects these procedures can produce." Further, he tries "to pinpoint the inherent emotional characters of the various notes of the major, minor, and chromatic scales and of certain basic melodic patterns which have been used persistently throughout our musical history." Cooke's investigation extends from the music of Dufay to Stravinsky. Like Hanson, he talks of feelings, emotion, and tension, but not in terms of empirical research into the psycho-physiological effects of music. Although this study reveals many fascinating and valuable insights, its approach is again similar to that of the Affektenlehre in the Baroque and Rococo periods. It deals with the analysis of the musical communication of individual compositions in a rather more subjective, philosophical manner. Certain figures seem to have just been assigned certain abstract connotations. While he handles materials that are similar to those of the present study, his study is still being attacked on the basis of its subjectivity.

Nevertheless, there is a current interest in the effect of

---

32 Cooke, Deryck, The Language of Music, p. xi.
33 Ibid., p. x.
34 Ibid., p. xi.
35 Ibid., p. xii.
music on the human organism which is empirically based. For example, the film industry and business enterprises such as Muzak are creating specific types of music because their effect can be quite accurately predicted. Certain reactions and feelings can be deliberately aroused. The creation of these types of music has become a more exact and calculated science. Research indicates that music can definitely affect mood and thought and possibly decision and character formation. There simply must be some ramifications and implications for musicological research in these studies.

This thesis aims to make a useful contribution to this new field of research in musicology. It endeavors to contribute some new insights into the analysis and understanding of the historical development of the "language of music."

**Philosophies of Music History**

From an analysis of W. D. Allen's book, *Philosophies of Music History*, it would appear that there are three fundamental views of music history. It is evident that each of these basic views of music history, or variations and combinations of them, have been advanced at some time. The basic views are represented diagrammatically in figures 1, 2a, 2b, and 3. Each figure contains two

---

38 Ibid., p. 1.
representations. The first representation is a stylized portrayal. The second representation attempts to depict historical trends more realistically and to show that they are generally much more complex than a stylized representation.

View 1. Music history shows a progressive evolution from a "primitive" state to a "refined" and "sophisticated" state as shown in figure 1.

View 2. Music history shows a degeneration from a "pure" and "noble" state to a "contaminated" and "degenerated" state. This view is rarely if ever used as shown in figure 2a.
The usual form of this view is expressed as a rise followed by a decline as shown in figure 2b. This is really a combination of Views 1 and 2. However, because it appears with some regularity, especially in the twentieth century, it is outlined separately.

View 3. Music history displays neither a progression nor a regression. The developments have produced different means of expression, but they are all equally valuable. Expression may change, but the quality is always the same. Each period of music, each element in its development, has its own contribution to make, but its standing and value is not determined by what has gone before or what comes after. This view, as shown in figure 3, also incorporates the cyclic view in which alternating antipoles maintain a dynamic equilibrium.
In studying each of these basic views of music history as they have appeared at various times, either on their own as shown above or with variations or in combination, there are several assumptions and implications inferred which deserve attention and discussion. Allen makes a very detailed and comprehensive review and analysis of the philosophies of music history from 1600-1960. He notes that the processes of music history have often been explained by using the terms of other disciplines of learning such as theology, mathematics, biology, mechanics, and psychology. Consequently he has made an attempt "to point out the historical sources of these concepts and analogies and the fallacies involved." While Allen suggests many valuable insights, it appears that in his endeavor to highlight certain fallacies in the various philosophies of music history his own evaluation reveals some weaknesses.

One of the "fallacies" which Allen highlights involves an assumption common to the first two basic views of music history. This assumption is also a point of distinction between the first two views and the last one. When developments in music are described as progressive or regressive (as shown in figures 1 and 2) a connotation of worth or value is usually implied. For example, the ultimate conclusion to be drawn from the first view is that as music has progressed from the simple to the complex its worth has increased, that is, its essential quality has improved. The second view implies the opposite trend. This type of value judgment is severely questioned by

Allen as well as other present-day scholars.\textsuperscript{42}

The present attitude in music scholarship in general seems to favor the third view. Observation of developments in the musical art is encouraged, but the evaluation of these developments is restricted to the internal academic study of musicology. Developments may be evaluated as "good" or "bad" within the context of the historical, theoretical, or even aesthetic framework of music, but the overall "moral" evaluations inferred in the first two views are treated with suspicion. To ask if developments are comparatively "good" or "bad" or "better" or "worse" for the art in general at any given point in time is considered to be too speculative.

The study of ethnomusicology has particularly influenced modern musicological attitudes in this area. It has attached a definite nervousness to the formation of value judgments and to the use of such words as "primitive" and "refined" or "civilized" or "good" and "bad" or "better" and "worse" in any broad comparative context. As a result it seems that comparative evaluations of events, periods, and trends in music history have become preoccupied with more "neutral" criteria. For example, focusing attention on the interaction of classical and romantic elements through music history\textsuperscript{43} effectively avoids the undesirable connotations of value judgments.

In this atmosphere the view of evolutionary progress, so prevalent in the nineteenth-century histories of music, has been somewhat demoted, and this is not surprising. Thurston Dart has pointed

\textsuperscript{42}See, for example, Allen, op. cit., pp. 341-342; and Westrap Jack, An Introduction to Musical History, p. 18.
out that the evolutionary view makes us in the twentieth century appear "impossibly conceited and arrogant." As research into previous periods of music history has increased, high levels of understanding and development of proficiency and expertise have been attested to in all periods. This has made musicologists uneasy with the premise that development from the so-called simple to the complex necessarily implies a progression to higher quality.

What is surprising, however, is that at the same time as the view of evolutionary progress has declined in favor, the view of degeneration (as shown in figure 2b) has received added attention. Even in the nineteenth century, when evolutionary thinking reached a peak of popularity, critics such as Fétis and Hanslick saw decadence in the "new" music of Wagner and his musical offspring.

Certainly this idea was not new, but the revived interest and support it has received, particularly in the twentieth century, seems to be significant. Support for this view of degeneration strengthened with the development of the twelve-tone technique by Schönberg in the early 1920s. Since then it has received regular attention. Constant Lambert (1934), Henry Pleasants (1955), and, to a lesser extent, Deryck Cooke (1973) are three of the better known proponents of this

---

44 This was suggested by Lorenz in 1928, cited in Allen, W. D., op. cit., pp. 249-251. For a contemporary work that gives credence to this philosophy see Machlis, Joseph, Introduction to Contemporary Music, 2nd ed., pp. 6-7.


46 Lambert, Constant, Music Hol, 288 pp.


Two recent publications that incorporate music as part of the view that Western culture is in demise are works by H. R. Rookmaaker (1973) and Francis A. Schaeffer (1976). The subtitle of Schaeffer's book clearly enunciates its philosophical position: "The Rise and Decline of Western Civilization." It is interesting to note that most, if not all of these twentieth-century views of degeneration or decline follow figure 2b and not figure 2a.

At this point several questions need to be asked of both the present scholarly position (depicted best in figure 3) and the alternative view of a rise followed by a decline (depicted in figure 2b) which has achieved a certain measure of serious attention in the twentieth century. First, let us consider the present scholarly position. Why should there be such apparent reluctance to make value judgments of historical events, periods or trends in the development of the musical art? One can appreciate and understand caution and concern in this area because certain "errors" of judgment have been made in the past. For example, it is evident that many of the conclusions and categorizations made by music historians in the late nineteenth century were influenced and indeed controlled by the philosophy of evolutionary progress. The value judgment at the foundation of this view was being pushed too far or was possibly even wrongly formulated and not upheld by all the evidence.

50 See for example, Parry, C. H., Evolution of the Art of Music, p. 483.
It would now appear that there has been a reaction against making any type of value judgment with regard to music history. In fact, the making of value judgments is treated with suspicion and often with disdain, and is considered to be unscholarly. Could this, at least in part, be a result of the fact that the value judgments offered by the evolutionary view proved to be unacceptable? Furthermore, could it even be an admission that a suitable alternative set of criteria by which to make a better evaluation is not available? Could it be that, dissatisfied with the options, we are refraining from making any "moral" evaluations of the developments in music history at all?

It would appear that Allen is summarizing contemporary scholarly concern when at the conclusion of his book he suggests that we should all learn to "enjoy intelligently the largest variety of differences" and that, although necessary and important, standards as to what constitutes good music "will take care of themselves."51 Thus all music has some value and should be allowed to continue and develop in whatever direction it is going. The emphasis in the work of the scholar seems to be simply to monitor what is happening and to attempt to understand and report it accurately and objectively.

But surely this attitude also has its shortcomings. Is there not always a need to make certain comparative value judgments, not only aesthetically but morally? Surely there is always a need to define and affirm some standards--to say this is good, but that is better, or that is worse. Choices are a fact of life. Everyday we |

51Allen, op., cit., pp. 341, 342.
make decisions and we are particularly careful about how we make them if a wrong choice could affect us adversely. The very capacity for making choices indicates that we are so constituted as to be able to discern the reasons for one choice being better than another. All decisions and choices are based on a system of values—what is good, better, and best. The scholar and layman alike make value judgments when comparing, for example, the medical treatments and technology of the twentieth century with that of the Middle Ages. We talk of improvement or regression in the standard of living and the quality of life and this would certainly include the creative arts. Methods and procedures in most areas of life are constantly modified by value judgments.

Musicology itself would claim, or at least hope, that its procedures of research, its accuracy, and its overall understanding of the art of music is better now than in previous times. It seems that such vantage positions in understanding would make us better equipped to make even more informed value judgments about developments in the art. However, in all of the creative arts there seems to be an increasing reluctance to evaluate the quality of developments in the art itself.

When assessments and value judgments are made in musicology they are restricted to relatively narrow contexts within a particular branch of the academic discipline. To illustrate, in the study of music theory a particular harmonic progression may be considered "right" or "wrong," "good" or "bad" on the basis of the particular style under study. In the study of music history one might study the gradual
"perfection" of a particular form of writing as the style of a particular composer matures. A group of composers from a particular period (for example, Bach, Telemann, and Handel) may be discussed and their relative strengths and weaknesses compared. There may even be some discussion as to why the work of one has endured longer and more substantially than that of another. Such discussions are usually based on aesthetic criterion.

These evaluations and others like them are important and deservedly have their place in music scholarship, but should evaluation stop here? Is it not also important to ask if particular developments are good or bad, better or worse for the development of the art as a whole and for society? Surely the directions of trends in the development of music also need evaluation? This is an area for the music scholar to give direction with his/her superior knowledge. If value judgments were made, not only in small contextual studies but also in studies of broader historical trends, performers, scholars, students, and, particularly, composers could benefit and find guidance for the future.

In a paper presented at the 22nd National Conference on Higher Education, Barbara Tuchman commented that scholars were failing to exercise moral, social, and cultural leadership.

What they [the university professors] are not doing, notably is standing still and saying, "This is what I believe. This I will do and that I will not do. This is my code of behavior and that is outside it." . . . Standards of taste as well as morality need continued reaffirmation to stay alive. . . . To recognize and to proclaim the difference between what is good and the shoddy, the true and the fake, as well as between right and wrong . . . is the obligation of persons who presume to lead.52

Moral evaluation is imperative for the continued well-being of the musical art. This is pertinent in view of the fact that some artistic cultures have died out despite their sophisticated and deeply involved academic pursuits. In the development of music, its effect on life is as important as its context in life. The scholar must read and evaluate the influence of both of these aspects aright. Possibly the real problem boils down to a lack of any valid criteria by which to make such evaluations.

Second, let us consider the position which says that the musical art is degenerating. The main questions to be asked of this view are: On what basis has degeneration been ascertained? What criteria have been used to establish a process of degeneration? Where is the point from which degeneration is supposed to have commenced—and why that particular point? It is here that one encounters the old problem of arbitrary decisions again. If this view is to be considered more than just the swinging of the pendulum from the concept of evolutionary progress to the opposite end of the spectrum, there must be substantial evidence for adopting it as a viable view of music history. Is everyone going to agree to accept "cultural vitality" measured by popularity as an index to the worth of music and therefore see a decline after Stravinsky? Or would some draw the line with Wagner and Schönberg—or even with Beethoven's last string quartets? Someone else may point back to a philosophical change in the early nineteenth century which influenced subsequent thought. All of these opinions may be founded on facts of history, but their arbitrariness is somewhat conspicuous. The question is, Would someone else put the
origin of the decline at some other point for some other reason? Interpretation of history plays a major role here, and there could conceivably be as many interpretations as there are individuals. The lack of consistency regarding the point of decline weakens this view. It is precisely this type of subjectivity that makes the contemporary scholar skeptical and rightly so.

To summarize, on the one hand those who hold the present scholarly position seem unwilling to make moral evaluations. Furthermore, they apparently fail to see any necessity to make them, thereby neglecting an important function of the scholar's role for the development of the musical art. On the other hand, proponents of the view of degeneration find themselves with the problem of having inadequate criteria to make compelling and viable evaluations to support their philosophy.

Are we, then, just left to accept either of the views as they stand despite their weaknesses? Should the student desiring an education in the musical arts simply learn to broaden his/her taste in music to include as much as possible, accepting anything as long as its use with regard to time and place of performance can be justified? Should the historian or teacher refrain from trying "to impose standards as to what constitutes 'good' music?" Should we leave standards—whether aesthetic or moral—to find their own level in a relative framework as Allen suggests?

Undoubtedly, the problem for Allen, and for most of us, centers in the arbitrary imposition of standards. However, we must also

---

53Allen, op. cit., p. 341.
recognize that the noble desire to avoid imposing standards can lead to a denial, or simply a neglect to affirm that there are standards that can and should be used in music evaluation. If an equitable standard with sound criteria for judgment can be found, intellectual honesty must not cower before what that standard may suggest constitutes "good" music. Indeed, if a more consistently objective standard were found as the basis for judgment and interpretation, the problems with both the scholarly position and the view of degeneration could perhaps be allayed. It may even demand that the first two views of music history be more closely scrutinized and studied again as viable options for a philosophy of music history.

Obviously the element of human interpretation can never be completely eradicated from research. Thus we need to accord to it its proper place. Every person approaches facts of knowledge with a particular set of \textit{a priori} attitudes and the present writer is not excepted. However, the emphasis needs to be put on honesty in evaluation of the evidence. Recognizing human limitations and realizing that in the long run beliefs will always have the deciding vote when it comes to interpretation, it is nevertheless essential that the evidence rule the view rather than the view rule the evidence.

Finally, the topic chosen for this thesis is indeed unusually large in scope, but it is intentionally so. Only as one views large periods of time can one see trends in certain directions. The same principle operates in predicting election results and standardizing IQ tests. The larger the sample of voters or subjects, the more accurate are the results. Nevertheless, the writer realizes that to try to
see an overall picture as a single investigator is dangerous and fraught with difficulties and pitfalls. This is especially so when one is not an expert in every field of musicology to be utilized in the study. On the other hand, the dangers and pitfalls of narrowing a field of investigation to some minute point must also be recognized. Both types of research are necessary, although present scholarship prefers to limit the field of investigation to minimize the pitfalls of interpretation.

Nevertheless, it has become evident in the twentieth century that the perspective of an overview is imperative. The eternal quest of man is to determine his origin, his destiny, and his present relationship to the past and the future. To understand the present and plan for the future one must study the past, learning to reason from cause to effect while discerning the impact of trends on destiny. The present crises and problems of mankind surely teach this, if nothing else. Yet, overview of history are not popular in the twentieth century. Suggestions regarding directions of trends are considered too speculative and, therefore, are not treated seriously. Historical musicology does not differ in this respect from any other branch of learning. It, too, is suspicious of overviews of history. It seems that the fear of making some mistake that will be too readily discerned by the expert, the fear of generalization and misinterpretation, the fear of an inadequate knowledge of all the facts in this age of specialization has caused thinkers and writers to avoid this form of

---

54 There are very few philosophies of history that have been written in the twentieth century. Perhaps the two best known works are The Decline of the West by Oswald Spengler and A Study of History by Arnold J. Toynbee.
knowledge and research, unless it is the project of retired maturity. But will there ever be a scholar who will be in command of all the facts? Will there ever be a scholar who will not make some misinterpretation? No one is equal to this task, and yet it must be attempted.

Even if mistakes are present, and this is no excuse for them to be present, the overview perspective must never be lost. There may even be isolated specific examples that are contrary to the thrust of the overview. They must be evaluated for their worth and significance. If they call for modification of the overview this must be carried out. However, an overview is based on many points of evidence. It is therefore unlikely that a single objection or exception would disprove an overview in its entirety. An overview based on many points of evidence is more likely to reflect truth than any specific objection. Once having discovered the trends and directions that are evident in an overview, one needs to have an explanation for them. Thus, ultimately a philosophy of history becomes imperative.

No discipline can afford to concentrate only on specialized details and minutia, however fascinating or significant, to the neglect of the wider context that has to do with trends and destiny. This is especially so in the creative arts, for they mirror the spiritual vitality of a culture.55

Jesus Christ made a comment that is as appropriate to the culture of the 1980s as it was to the time when it was first spoken:

When it is evening you say "It will be fair weather; for the sky is red." And in the morning "It will be stormy today,

for the sky is red and threatening." You know how to interpret the appearance of the sky but you cannot interpret the signs of the times.56

It is the aim of this thesis to identify and interpret some of the "signs of the times" in the development of music in Western culture.

CHAPTER II

THE PSYCHO-PHYSIOLOGICAL EFFECTS OF PITCH, VOLUME, HARMONY, AND RHYTHM ON THE HUMAN ORGANISM

"The organized sounds of music elicit a variety of responses—sensual, emotional, and intellectual; thus, music may be viewed as a form of communication."¹ So begins chapter six in Paul Harder's Harmonic Materials in Tonal Music, a music theory textbook commonly used in undergraduate college music classes throughout the United States. Harder explains that an "elemental facet of communication is the use of tension and relaxation to arouse varying degrees of emotional response. Tension derives from harmony, rhythm, timbre, dynamics, texture and melodic contour."² For millenia man has recognized that music affects the human organism. Today this is still affirmed and taught as part of the understanding of music theory.

Historically, music has been intimately associated with healing rituals and medical practice for thousands of years. Records have been found regarding the therapeutic use of music in ancient Egypt. In biblical times David played his harp to relieve King Saul's depression. Asclepiades, Hippocrates, Pythagorus, Plato, and Aristotle recommended the use of music for medicinal purposes in ancient Greece.

²Ibid., p. 134.
The Arabs, in the thirteenth century, equipped their hospitals with music rooms. Philip V of Spain and George III of England were treated with music for melancholia. In France in the nineteenth century, psychiatrists Pinel and de Pescay used music in their treatments. Among English medical personnel Dr. Willis in the seventeenth century, Pargeter in the eighteenth century, and Florence Nightingale in the nineteenth century used music medicinally. Whether to encourage female fertility, to reduce fevers, or to cure such ailments as sciatica, the healing powers of music were believed and affirmed by most, if not all, cultures.

One case study will serve as an example of the medicinal use of music in a specific culture. As early as 1735 Jesuit priests observed tribal music ceremonies used by American Indian medicine men as part of their treatments. A recent analysis of some 1,500 therapeutic songs and chants on record with the United States Indian Bureau found that 70 percent were "slow and steady in rhythm so as to quiet the patient, reduce anxiety, and promote a feeling of well being." It was also observed that these songs and chants gradually reduced muscular tension and induced "an almost hypnotic state."

---


5 Ibid., p. 23.  

6 Ibid.

7 Ibid.
The major characteristics of Indian healing music were their tonal monotony, irregularity of accent, slow tempo, rhythmic patterns. The coincidence of voice and accompaniment almost always has a tranquilizing effect on listeners, even those who have never heard Indian music before.8

However, a concept and belief that music affects the human organism is not only to be traced in medical practice.9 This belief is also the basis for Negro work songs, old sea chanties, and marching songs. It is also evident in the use of music in religious rites and ceremonies. Both the human voice and musical instruments have been continually employed and exploited to enhance the effect of music on all such human activities. Commenting on this, Sears points out that "people seldom continue such things which are voluntary on their part, if they do not derive a worthwhile return."10

The Greek doctrine of ethos as well as the Affektenlehre and the Empfindsamkeit of the Baroque and Rococo times embodied the same belief that music has a direct and profound influence on the character and the affections. Certain instruments, tonalities, and melodic and rhythmic configurations were ascribed with particular effects. Although interest in the effects of music in these particular periods of music history is considered to be for the most part philosophical, the basic concept and belief that music does affect the human organism is still evident.

8Ibid.
9See, for example, Winold, C. A., The Effects of Change in Harmonic Tension upon Listener Responses, pp. 3-10, 89-129.
10Sears, W. W., A Study of Some Effects of Music upon Muscle Tension as Evidenced by Electromyographic Recordings, p. 36.
In the twentieth century, research into the effect of music on the human organism has become increasingly specialized. It has moved from general statements about what music does or does not do to the investigation of the effect of specific musical elements. Investigations are now concerned with what actually happens in the human organism when it encounters music and why certain reactions occur.

The more recent empirically-based study of this subject has again partly resulted from an interest in the medicinal use of music. After the first and second world wars, music therapy emerged as a recognized ancillary therapy in the treatment of mental illness. This led to the foundation of the National Association for Music Therapy in 1950 which has since directed and encouraged investigation and research in this field. This, together with research into the mood-provoking power of music and the investigation of the effects of modern rock music, is continuing to provide a wealth of information.

Meanwhile, this information is also being openly exploited. For example, the mood-provoking powers of music are being used by business enterprises in everyday life. The recent development of commercially used background music began with such companies as Muzak and 3M Music Systems. Their work is of interest to this study because of their deliberate attempt to use the effects of music on the human organism to bring about specific behavioral responses. In the early 1950s background music was introduced to mask kitchen clatter in restaurants, to dull factory noises, and to keep assembly lines moving. It was also used to warm the institutional chill of banks and to
encourage impulse buying in stores.\textsuperscript{11}

From these superficial beginnings, added research and refined techniques have produced confident programs and statements such as this one taken from a Muzak Corporation advertising brochure distributed in Australia in 1977.

We have produced programs to specification for cardiac studies—to help mortality rates. Special programs have been developed to improve the alertness and safety of automobile operators, to improve the learning ability of students, the receptivity of television viewers, the vigilance and reactions of people in complex monitoring operations.\textsuperscript{12} (Emphasis supplied.)

Further, in a section on "How Muzak Can Induce Physiological and Psychological Effects," it is explained that:

By producing our own music, we achieved the control which is essential for planning the application of musical factors which influence people. . . .

We can increase orchestra size from a small combination to a larger more stimulating group. And, with sure knowledge of its effect, we can vary instrumentation from string emphasis to brighter woodwinds to more stimulating bass. The possible combination of such music factors is almost without limit--giving us great flexibility for creating desirable moods and effects.\textsuperscript{13}

Speaking just as confidently about the use of music for creating moods on sound tracks for motion pictures, another writer notes that even standard works from the music repertoire can be used to good effect.\textsuperscript{14} This indicates that all music has the qualities needed to affect the human organism.

\textsuperscript{11} Cox, Harry, Music Soothes the Surgeon, p. 2. (Reprinted from People, issue of August 11, 1965.)


\textsuperscript{13} Ibid., p. 3.

From statements like these it is obvious that the research into those elements of music that affect the human organism has become quite specific and complex. Interest in the investigation of music's effect on mankind is as intense today as it has ever been, if not more so.

However, on the whole this type of research is still a relatively new area of study in which medically and psychologically trained personnel have been called to cooperate. The results of the investigations are not yet specific in all their implications. However, enough material of value is available to make the present study possible. Several statements will serve to justify the direction taken in this chapter.

Factors which have been experimentally isolated as contributing to differential mood effects are prevailing high and low pitch, wide and narrow total loudness and softness and orchestral color.\(^\text{15}\)

Changes in the gross harmonic tension (i.e. the level of harmonic tension prevalent for most of the vertical structures occurring in a musical example) of complete musical passages can produce significant changes in affective response.\(^\text{16}\)

An examination of the pieces employed to test the emotional effect of music would indicate that rhythm is a primary factor in determining the kind of effect produced.\(^\text{17}\)

While it may be questioned whether the isolation of these factors and their effects on the human organism really provides a true picture of music's effect, it would certainly not be denied that these

---

\(^{15}\)Mursell, J. L., *The Psychology of Music*, p. 35.


factors contribute to the overall effect of music. Thus, to facilitate easy and efficient handling of the data, the different categories of pitch, volume, harmony, and rhythm will be used in this study.

An explanation needs to be made as to why this study will discuss the psycho-physiological effects of music on the human organism. Since the mid 1960s there has been a move toward a more objective analysis of the effect of music. The dissatisfaction with former methods of research in this field has been expressed by Lundin in his discussion of the prevailing use of verbal responses of listeners relating how they felt a piece of music had affected them. "These verbal responses have been associated with the internal reactions, and, although they often are inadequate expressions, we have to depend on them until more adequate measurements are available."\(^{18}\)

Several independent researchers have addressed themselves to the challenges of this statement and have tried to find more objective means of measurement. For example Wagner studied the effects of music on Alpha brainwave rhythms, and in his report he quotes Lundin's statement as the impetus and justification for his studies.\(^{19}\) In 1962 George Zimny commented: "We decided that in all our studies we would measure the emotional or mood effects of the music by objective techniques rather than the more subjective techniques commonly used. We


selected physiological responses for this purpose."20 In 1963 McCurry justified his study of the effect of music on the electrical potential generated by the human brain with a similar apology.21 This method of objective research has now become an established and accepted means of assessing the effect of music on the human organism.22

There is some discussion among psychologists as to whether physiological indicators are really valid as complete indicators of emotional states.23 However, the subjectivity of introspective verbal responses is acknowledged24 and the mood-affecting power of music is commonly conceded.25 Whether physiological changes in the human organism completely reflect and accurately portray emotional states is not really the ultimate issue. The fact that mood changes occur simultaneously with physiological changes in the organism shows that both reactions are responses to the same stimuli. The possibility undeniably exists that the reactions are also related. The extent and means of the relationship may not be completely evident. However, the physiological indicators allow at least some measurement of the law of

---


22 See, for example, the unpublished doctoral dissertations of C. A. Winold and W. W. Sears. (For details see Bibliography.)


cause and effect that must be operating as sound reaches and interacts with the living organism. In an article discussing the physiological effects of audible sound, Welch confidently affirms that "sound, either continuous or intermittent, modifies the pacing by the brain of cardiovascular, endocrine, metabolic, reproductive, and neurological function. In fact, the "function of every system in the body is affected to some degree."

This is not meant to disparage purely psychological studies based on introspective reports of subjects. The extent to which music will affect an individual may well be determined by how willing and capable the person is of allowing the music to control the organism, and this will certainly be reflected in verbal responses. Hence this study will take into account psychological studies using verbal responses. However, the main interest of this study focuses on the psycho-physiological reactions to music that can be measured by more objective techniques.

Before entering into the discussion of the psycho-physiological effect of the musical elements of volume, pitch, harmony, and rhythm it should again be emphasized that this is not intended to be an "atomistic approach." Music obviously affects the human organism as

---

27 ibid., p. 533.
a total stimulus. However, to facilitate easy and efficient organization and comprehension of the data the elements of music will be examined individually. Following this discussion, some aspects of the effect of music as a total stimulus will also be mentioned. The final section of this chapter will comprise a discussion of several general factors and conditions that contribute to an understanding of the psycho-physiological effect of music on the human organism.

**Volume**

For the purpose of this paper, "volume" will be defined as dealing with the intensity of sound, its loudness or softness. The intensity of sound is measured in decibels. One decibel (dB) is the smallest difference in sound intensity detectable by the human ear.

As early as 1929 Vincent and Thompson conducted a series of experiments to determine the effect of volume on the human organism. They observed that loudness was followed by a fall in the subjects' blood pressure. Soft tones did not necessarily produce a corresponding rise although the soft tones allowed the blood pressure to return to normal.²⁹ The strength of muscle contractions while working or exercising was shown to increase as sound intensity increased.³⁰ Some of the earlier interpretations and conclusions drawn by men like Podolsky are possibly exaggerated in the extent of their implications. The actual experimentation, however, has generally been verified by later studies and experiments in which conditions and techniques were improved.

³⁰Ibid., p. 65.
Davis, Buchwald, and Frankman (1955) conducted a series of experiments to measure the effect of changes in intensity of pure tones. The stimuli used were tones of a set frequency, 100 Hz, delivered at 120, 90, and 70 dB through earphones. Responses for all of the nine different physiological measurements taken, except possibly one, varied significantly for the three stimuli levels. "Increased stimulus intensity over the range tested increased the response in all variables about in proportion to the sound pressure." Most of the response variables used in the measurements here are also used as emotion-change indicators.

In the 1960s the problem of noise pollution became a matter of concern to industrial and technological researchers and planners. In America and West Germany several in-depth studies were carried out to determine the effects of volume levels on the human organism. Gerd Jansen, who was working with the Max Planck Institute in Dortmund, Germany, studied the effect of sound on the autonomic nervous system. Jansen discovered that the body's autonomic nervous system--- begins to react at 70 decibels, equivalent to the sound of traffic on a relatively quiet city street. At that level, vasoconstrictive effects were noted—narrowing of the arteries, which raises the diastolic blood pressure, and also lessens the supply of blood to the heart. As the intensity of sound increased, the effects grew stronger: dilation of the pupils, drying of the mouth and tongue, loss of skin color, contraction of leg, abdomen and chest muscles, sudden excess production of

31 Denotes Herz, a term used in place of cycles per second.

32 Winold, op. cit., p. 104. "The nine response variables were: Skin resistance from the pressure pulse, finger volume, volume pulse, chin volume, chest breathing, and the ballisto cardiogram." Ibid., pp. 103-104.

33 See, for example, Zimny, op. cit., p. 183.
adrenalin, stoppage of the flow of gastric juices, and excitation of the heart. These effects were automatic, unaffected by the subject's health, his annoyance, or whether he was accustomed to noise in his job.34

In a more specific study by Demling, Tzscheppe, and Classen the effect of musical sounds on the secretory function of the stomach was investigated. The results obtained support the earlier conclusions of Jansen and add the possibility of a connection between loud music and gastric duodenal ulceration.35

In another series of experiments conducted by Atherley, Gibbons, and Powell (1970), it was shown that continued exposure (defined as three minutes or more) to moderate noise levels (defined as below 95 dB) may lead to a characteristic syndrome associated with:

1. Subjective complaints of tiredness and irritability
2. Decrease in secretion of urinary 17 ketosteroid relative to the control levels
3. Changes in cellular composition of the blood relative to the control levels.36

To elucidate the relevance of the experimentation cited above, the following tables are included. Table 1 outlines a broad range of decibel ratings for different sound sources. For comparison, table 2 outlines assigned decibel ratings for musical dynamic markings as

34Stewart-Gordon, James, "We're Poisoning Ourselves with Noise," Readers Digest p. 188, February, 1970.


### TABLE 1

**APPROXIMATE DECIBEL RATINGS OF DIFFERENT SOUND SOURCES**

<table>
<thead>
<tr>
<th>Sound Source</th>
<th>Approximate Decibel Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>A jet plane on takeoff</td>
<td>150+</td>
</tr>
<tr>
<td>Rock and roll band</td>
<td>144+</td>
</tr>
<tr>
<td>Loud outboard motor</td>
<td>102</td>
</tr>
<tr>
<td>Symphony orchestra</td>
<td>100+</td>
</tr>
<tr>
<td>Subway train</td>
<td>95</td>
</tr>
<tr>
<td>Heavy truck</td>
<td>90</td>
</tr>
<tr>
<td>Inside a bus</td>
<td>82</td>
</tr>
<tr>
<td>Vacuum cleaner</td>
<td>80</td>
</tr>
<tr>
<td>Department store of noisy office</td>
<td>64</td>
</tr>
<tr>
<td>Background music</td>
<td>60</td>
</tr>
<tr>
<td>Quiet residential street</td>
<td>55</td>
</tr>
<tr>
<td>Inside average residence</td>
<td>40</td>
</tr>
<tr>
<td>Room in a quiet London dwelling at midnight</td>
<td>32**</td>
</tr>
<tr>
<td>Very soft music</td>
<td>32</td>
</tr>
</tbody>
</table>


**Measured on the "A" scale, a modified form of decibel, weighted to emphasize the upper frequencies. All other figures are in the flat scale or "C" scale.

experienced by the listener, and table 3 outlines decibel ratings for musical dynamic markings as experienced by orchestral musicians. It should be noted that the volume of musical sound sources is quite comparable with the volume of other sound sources. The decibel ratings assigned to musical dynamic markings as shown on tables 2 and 3 illustrate this further.
### TABLE 2

**APPROXIMATE DECIBEL RATINGS OF MUSICAL DYNAMIC MARKINGS AS EXPERIENCED BY THE LISTENER***

<table>
<thead>
<tr>
<th>Musical Dynamic Markings</th>
<th>Approximate Decibel Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>f</strong></td>
<td>100+</td>
</tr>
<tr>
<td>*</td>
<td>80</td>
</tr>
<tr>
<td><strong>mf</strong></td>
<td>70</td>
</tr>
<tr>
<td><strong>p</strong></td>
<td>60</td>
</tr>
<tr>
<td><strong>ppp</strong></td>
<td>40</td>
</tr>
</tbody>
</table>

*Backus, John, *The Acoustical Foundations of Music*, p. 83. The decibel ratings shown above are moderate estimates.

### TABLE 3

**APPROXIMATE DECIBEL RATINGS OF MUSICAL DYNAMIC MARKINGS AS EXPERIENCED BY ORCHESTRAL MUSICIANS**

<table>
<thead>
<tr>
<th>Musical Dynamic Markings</th>
<th>Approximate Decibel Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ppp</strong></td>
<td>Up to 60 phons*</td>
</tr>
<tr>
<td><strong>p</strong></td>
<td>Up to 70 phons</td>
</tr>
<tr>
<td><strong>mf</strong></td>
<td>Up to 100 phons</td>
</tr>
<tr>
<td><strong>f</strong></td>
<td>Up to 110 phons</td>
</tr>
<tr>
<td><strong>fff</strong></td>
<td>Up to 118 phons</td>
</tr>
</tbody>
</table>

*A phon is the acoustical equivalent of a decibel.*

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
It is evident that anything from mezzo forte (70 dB) upward in volume is relevant to the experimentation cited above. In 1965 an article by Gerhard Weise reported some research done at the Max Planck Institut für Arbeitsphysiologie in Munich by Hugo Schmale.\(^{37}\) Schmale investigated the working conditions of orchestral musicians concentrating particularly on the tension and stress they experience as part of their work. The ratings he listed for musical dynamic markings, as experienced by orchestral musicians, are shown on table 3.

Schmale reported that an orchestral musician spends most of his working hours in conditions of around 100 phon or more. This factor definitely contributes to the stress experienced by orchestral musicians. From this report it would appear that the musician, even more than the listener, experiences sound intensity levels relevant to the experimentation cited above. For the rock musician, the experimentation has been shown to be even more applicable.\(^{38}\) The musician is affected even more than the listener because of his proximity to the sound being produced. However, the listener to Western art music is generally quiet and attentive and voluntarily under the control of the performer when the sound stimulus is present. This allows for optimum affect on him also.

The effect of surges in volume intensity, or bursts of sound, such as in a sudden sforzando or even a crescendo and diminuendo, must


Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
also be examined. Research, using electrocardiographs and electro-encephalographs, has been conducted to assess the effect of bursts of sound on the sleeping human organism.

Bursts of sound—even when mild enough at 55 decibels not to wake the sleeper—are recorded by the brain. And the autonomic nervous system responds just as it does during the waking hours. The effect is to turn a long restorative slumber into a less beneficial series of catnaps.  

Thus, bursts of sound intensity less than the level of a mere mezzo forte have been shown to have significant effects. The effect of music and noise on sleep has been further investigated by Ando and Hattori (1977). They compared the effect of music with the effect of noise from an international airport on sleeping babies. These investigations showed that music of 70 dBA and 80 dBA produced psychophysiological reactions and disturbed deep sleep even in those babies that were accustomed to high levels of noise.  

The most profound physiological effects seem to occur when individuals who are accustomed to low levels of sound volume are unexpectedly subjected to higher levels. The resultant effect persists for a considerable period of time because the body mechanisms disturbed by the physiological response return to their previous level very gradually. This is underlined further by an experiment in which only "soothing music" comprised of lullabies was used. The report stated that it took approximately fifteen minutes after the

---

39 Stewart-Gordon, op. cit., p. 190.
41 Welch, op. cit., p. 533.
closing chord until the biological data of the participants returned to its previous level. Grădina and others (1968) reported that effects continued for up to thirty minutes after experimental conditions had returned to normal.

**Pitch**

For the purpose of this study "pitch" will be defined as dealing with the frequency of tonal vibrations. High pitch is produced by fast vibrations and low pitch is produced by slow vibrations.

In 1929 Vincent and Thompson detected changes in blood pressure with the change in the pitch of melodies. It was also observed that the strength of muscle contraction increased with higher pitches. Tests conducted with a deaf man by the name of Sutermeister revealed that musical vibrations produced a direct effect upon the central nervous system of his body. He could sense the difference between music in high and low registers. The report states that "he was able to identify the kind of music that was being played and to respond selectively to its mood."

Research has consistently shown that higher pitches create tension, while lower mid-range pitches induce relaxation. Laird and

---


46 Mursell, *op. cit.*, p. 76.
Coye (1930) observed that between the ranges of 256-512 Hz, which correspond to the normal human voice range, there was significantly less annoyance to the human organism than when frequencies were above or below this range. Misbach (1932) confirmed the work of Laird and Coye using galvanic skin response as a means of measurement. His conclusions were as follows:

Galvanic skin responses to tones of frequency higher than about 521 v.d. [antiquated term denoting Hz] occur more often and increase in average magnitude as frequency becomes higher. Galvanic responses to tones of frequency lower than about 256 v.d. occur often and increase in average magnitude as frequency becomes lower. Tones ranging in frequency from about 256-512 v.d. elicit fewer and smaller galvanic responses.

In this context it is interesting to note that the structure of the human auditory apparatus at birth is most responsive to the frequencies within the range of fundamentals of the voice. The human voice at normal intensities is non-aversive and prepotent to a newborn baby. Anything beyond the limits of basic voice frequencies tends to evoke the defensive reflexes.

Misbach also demonstrated that changes of one octave above or below the range of the human voice produced average changes in the

---


48 Galvanic skin response (G.S.R.) is a measurement of electrical conductivity of the skin and is used as an emotional indicator.


51 Ibid., p. 890.
magnitude of G.S.R. greater than changes of 10 dB in volume of any frequency. This gives at least some kind of comparative evaluation of the effect of volume and pitch on the human organism.

Kate Hevner, studying listener response to music, measured the affective value of the elements of music by means of verbal responses on her famed "Adjective Circle." Her investigations revealed that "pitch and tempo show themselves to be of the greatest importance in carrying the expressiveness in music."

Studies connected with the effects of rock music on the human organism report that unexpected high notes, like those produced by a wild guitar riff, may cause the body to react with a high degree of tension. On the other hand, low bass tones affect the pulsation of cerebrospinal fluid in the autonomic nervous system by slowing it down and this in turn affects the pituitary gland. Rock music has exploited both extreme high and low frequencies as well as high volume levels to heighten the emotional effect.

Another factor involved in musical performance which should be discussed at this point is the use of vibrato. Vibrato is a form of pitch variation best described as a slight oscillation about a fixed pitch. It is used in both vocal and instrumental music mainly on

---

52 Misbach, op. cit., p. 183.
53 See Appendix A for a copy of the "Hevner Adjective Circle" (Revised Version).
sustained tones to "increase the emotional quality." This device is capable of creating different moods and feelings in the listener. Doubtless the quick variations in pitch also affect the autonomic nervous system. In describing vibrato and its use, Meyer has made the following comment:

With regard to musical performances, experience has shown that the imagination of the hearer is in general so much at the disposal of the master, that by the help of variation, movements, intervals and modulation, he may stamp what impression on the mind he pleases.

The combination of volume and pitch extremes, often found in Western art music, has the effect of intensifying the stimulus. It has been observed that fast tempi, loud dynamics and high tessitura are often found together, while slow tempi, soft dynamics, and low ranges are usually associated together. Pitches above 500 Hz, at lower volumes, elicit responses equal to lower pitches of much greater volume. That is, when higher volume is combined with higher pitch, the effect on the human organism is compounded. The effect of very low pitches added to high volume also compounds the effect as has been demonstrated by the use of electrically amplified bass for deliberate effect in a rock music band. Grădină and others (1968) studied the combined effect of pitch and volume on the human organism. The hearing sensibility, blood pressure, pulse rate, blood cell

---

58 Ibid., p. 139. 59 Laird and Coye, op. cit., p. 162.
60 Larson, op. cit., p. 121.
count, urine composition, electrocardiogram, and electroencephalograph were monitored and showed definite relative changes after exposure to different pitch and volume stimuli.\textsuperscript{61}

The human ear is sensitive to minute variations in volume and pitch. "In the area of 10-130 dB, 120 [different] loudness levels of noise can be distinguished. Approximately this number is employed in symphonic music."\textsuperscript{62} Approximately 850 different pitches can be distinguished by the human ear. In the pitch range c-c\textsuperscript{2} at a sufficient volume (e.g., 80 dB) fluctuations of 1.5 percent are noticeable.\textsuperscript{63} Above c\textsuperscript{2} the differentiation is slightly less. Basically the ear can distinguish fluctuations of a quarter tone at G and gradually up to one twentieth of a tone from c\textsuperscript{2} on upwards. At higher volume levels the sensitivity to pitch fluctuation is doubled.\textsuperscript{64}

In a musical composition pitch is probably most closely related to the melody. Hence the effect of different aspects of melody should also be noted in this context. The results of studies into the ways in which melody affects the human organism are summarized below:

1. Diatonic movement appears to have the least affect on the human organism.

2. The greater distance between successive tones the greater

\textsuperscript{61}Grădina and others, \textit{op. cit.}, pp. 453-460. Two pitch levels were used, 500 Hz and 100 Hz, delivered at two loudness levels, 80+-2 dB and 90+-2 dB.

\textsuperscript{62}Winkel, Fritz, \textit{Music, Sound, and Sensation}, translated by Thomas Binkley, p. 120.

\textsuperscript{63}See Appendix B for explanation of pitches.

\textsuperscript{64}Winkel, \textit{op. cit.}, p. 120.
the tension aroused in the listener.

3. Very small intervals, such as those in chromatic movement also provoke tension.

4. Generally ascending intervals are more tension laden than descending intervals.

5. High-pitched tones are more tension arousing than low-pitched tones.\textsuperscript{65}

It is important to note that in a melody made up of a succession of pitches the relationship between different pitches as well as the pitches themselves have their effect on the listener. However, given that melodies in general tend to use higher rather than lower pitches (i.e., usually above 100 Hz), the above summary supports and affirms the experimentation in the area of pitch cited previously.

\textbf{Harmony}

Unlike pitch and volume, the effects of harmony and rhythm cannot be quantified. Volume is related to intensity which can be measured in dB, and pitch is related to frequency which can be measured in Hz. However, harmony and rhythm have no such equivalent relationships and hence they defy such relatively simple isolation and empirical measurement. Consequently the means used to assess the effect of harmony and rhythm on the human organism will differ from that employed for pitch and volume. The difficulties encountered in isolating and researching the effect of harmony probably explains the comparatively small amount of literature that is presently

\textsuperscript{65} Kreitler, Hans and Kreitler, Shulamith, \textit{Psychology of the Arts}, pp. 134-140.
available in this area of music.

For the purpose of this paper, "harmony" will be defined as the simultaneous sounding of three or more tones of distinct pitch, or, more simply, "the science and study of chords." The psychophysiological effects of harmony are a result of the combination of tones in a single chord as well as the relationship between consecutive chords in a piece of music. As harmony cannot exist without the other elements of music, it is difficult to sequester those effects on the human organism that are specifically attributable to harmony. Henkin (1955) recognized this problem. "One notices that although a harmony factor was predicted, none was evident in the interpretation of the factors. . . . There appears to be no adequate music pieces which are written in a purely harmonic idiom." Henkin is not denying the potency of harmony as a factor in the total effect of music. Rather, he is lamenting the lack of music literature that isolates harmony to facilitate its study. Because the effect of harmony is also the result of the relationship between consecutive chords in a piece of music, harmony cannot be separated from rhythm. However, as has been recognized for centuries and is taught as a part of the understanding of music theory, harmony is an important component in the total musical stimulus.

---

Experimentation that has been done in this area began with the analysis of introspective verbal reports. This research investigated the traditional view that the major mode is linked with happy, joyful emotions. In 1928 Heinlein used isolated pairs of major and minor chords to test subjects' discrimination and effective responses. The responses he received differed widely because of several extrinsic variables. He concluded that "the assumptions long entertained by theorists in regard to the supposed intrinsic characters of the modes must be dismissed. It has been shown that reaction to harmonic configuration is variable for both trained and untrained subjects." He dismissed any relationship between mode and emotions as purely intellectual discrimination.

Hevner (1935) examined Heinlein's work and concluded that his results were unsatisfactory. She proposed the use of actual music rather than isolated chords to investigate the cumulative effect of harmony. She used what has become known as the most objective of subject initiated and interpreted responses, the "Hevner Adjective Circle." The subject responds introspectively as to how he feels the music affects him, but the response is restricted to the adjectives listed on the circle.

In explaining the affective response to music as measured by this circle, Hevner wrote:

A complete circuit of the circle carries one quite smoothly over the range of the most common affective experiences. In

---

70 Winold, op. cit., p. 118.

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
studying the arrangement in the circle, we may note several
details which are consistent with our usual concepts of affec-
tive states. Muscular tension is probably most strongly asso-
ciated with the vigorous-robust, exciting-impetuous groups, and
least with the groups directly opposite, the sentimental-
yearning and quiet-serene groups. Likewise, activity is asso-
ciated with the four groups beginning with vigorous-robust
through exhilarated-restless, merry-bright and humorous-
graceful, but quiescence is associated with the other four
groups, from lyrical-soothing to spiritual-serious.71

Thus it can be seen that in a sense, physiological changes are mirrored
though not measured by this technique.

Using the "Adjective Circle," Hevner investigated the histori-
cally affirmed characteristics of the major and minor modes. A total
of 205 subjects were asked to respond to major and minor versions of
ten different works in a variety of styles. The traditional charac-
teristics were confirmed. Hevner concluded that neither intelligence
nor talent, training or background in music affected the ability of
subjects to discriminate the mood effects of the two modes.

Further research using this technique showed that complex dis-
sonant harmonies are consistently interpreted as exciting, agitated,
vigorous, and inclined towards sadness. Simple consonant harmonies
are happy, graceful, serene, and lyrical.72 They are on opposite
ends of the emotional reaction spectrum as recorded on the "Hevner
Adjective Circle." Hevner also noted that "the augmented dissonance,
e.g., the nervous, modern discords in the modern 'movie' style, make
the music more exciting and impetuous, and that diminished and minor
seventh dissonance makes the music more depressed and yearning."73

---

71 Hevner, Kate, "Experimental Studies of the Elements of Ex-
72 Ibid., p. 268. 73 Ibid., p. 267.
However, she did not use any of the sonorites classified as strongly dissonant by Hindemith, Krenek, and other twentieth-century theorists and composers.

Hevner's investigations have been confirmed by subsequent studies. Rigg and Watson verified Hevner's research and agreed that "dissonance or complex harmony produces sad, tragic, or very exciting effects."\(^7^4\) Dreher conducted a series of experiments measuring galvanic skin response together with responses on the "Adjective Circle" simultaneously. He established that physiological changes in the measure of G.S.R. correspond to affective responses as marked on the "Adjective Circle."\(^7^5\)

In response to the dearth of research into the psycho-physiological effect of harmony on the human organism, Winold (1963) conducted a series of experiments to assess the effect of consonant, mildly dissonant, and strongly dissonant chords.\(^7^6\) His research also


\(^7^6\) Winold, op. cit., p. 134 describes consonant, mildly dissonant, and strongly dissonant chords as follows:

<table>
<thead>
<tr>
<th>Consonant</th>
<th>Mildly Dissonant</th>
<th>Strongly Dissonant</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Consonant" /></td>
<td><img src="image2.png" alt="Mildly Dissonant" /></td>
<td><img src="image3.png" alt="Strongly Dissonant" /></td>
</tr>
</tbody>
</table>
utilized the "Hevner Adjective Circle" and the physiological measurement of galvanic skin response to investigate the effect of changes in harmonic tension. Pitch and intensity were maintained at a constant level so that the effect of the harmony could be measured. Winold found that G.S.R. was greatest for strong dissonance and least for mild dissonance. The G.S.R. response to consonance was intermediate. Winold concluded that "it is obvious, however, that response to changes in harmonic tension cannot adequately be described in terms of any single measurement. It is a complex response to a complex and subtle stimulus." The "unexpected" response to mild dissonance will be discussed later in this chapter as an evidence of a definite change in perception in the human organism.

In 1974 two psychiatrists, Marie-Luise Fuhrmeister and Eckart Wiesenhuetter, working in Frankfurt, studied 208 professional musicians belonging to three orchestras, playing different kinds of music. They observed that the "harsh atonal sounds of modern classics not only can disagree with the audiences, they can actually make members of the orchestra sick." Groups that played modern art music frequently or exclusively reported that 82 percent of their members were nervous, 81 percent were irritable, 62 percent quarrelsome, 34 percent suffered from lack of sleep, and 22 percent suffered from headaches, earaches, and other chronic complaints. Members reported definite

77 Ibid., p. 206.
78 See p. 76 of this thesis for discussion of this point.
79 "Song is Ended but Malady Lingers On," Variety, 274:2, March 6, 1974.
improvement in their health when older classical works were played.\textsuperscript{80} While the element of harmony was not specifically isolated in this study, the findings point in the same direction as previous findings--strong dissonance causes a strong reaction in the human organism.

Some research conducted by the USSR Ministry of Public Health concurs with the evidence cited above. Leonid Melnikov researched the effect of harmonious and disharmonious (dodecaphonic) music. "It turned out that Bruckner's \textit{Ninth Symphony} had a negative physiological influence upon the cardiovascular system, the same as noise, while Bach's \textit{Third Brandenburg Concerto} produced a positive influence."\textsuperscript{81} While this report is scanty in its detail and method of investigation, it confirms the general trend in the results of previous research. The effect of complex harmonies on the human organism is different from and possibly more extensive than the effect of simply harmonies.

Two further aspects of the effect of harmony on the human organism need to be mentioned--the use of chromaticism and modulation. It is generally accepted that an increased use of chromaticism provokes a tension response in the human organism.\textsuperscript{82} Modulation is also generally accepted as a means of provoking tension.\textsuperscript{83} Both the frequency in the change of key(s) and the distance relationship of the new

\begin{footnotes}
\item[\textsuperscript{80}] \textit{Ibid.}, p. 2.
\item[\textsuperscript{82}] Cooke, Deryck, \textit{The Language of Music}, p. 54.
\item[\textsuperscript{83}] Kreitler and Kreitler, \textit{op. cit.}, pp. 132-134.
\end{footnotes}
key(s) have a bearing on response. The more frequent the modulation and the more distant the new key, the higher the response. The medieval church modes used until the end of the Renaissance lacked the strong tensions of the major/minor tonality system. As the major/minor tonality system became accepted, the introduction of modulation, a gradual increase of chromaticism, and the eventual dissolution of tonality have each in turn caused greater tension in the listener.84

Rhythm

E. Thayer Gaston calls rhythm "the most potent, the most dynamic element in music."85 Rhythm has always been an important factor in the work and ceremonies of most, if not all, cultures. The human organism itself relies heavily on the rhythm of its different functions for its smooth and continued operation. However, like harmony, rhythm is a complex element and it is difficult to accurately define and isolate. For the purpose of this paper, "rhythm" will be defined as that element of music concerned with periodical accent and the duration of notes--"the principle of alternating tension and relaxation in the duration of tones."86

Unlike harmony, the effect of rhythm on the human organism has been consistently and thoroughly investigated. Much of the research done into the effect of rhythm on the human organism has been carried out with the use of actual music and percussion instruments.

84 Cooke, op. cit., p. 54.
86 Lee, op. cit., p. 54.
Consequently, rhythm has certainly not been studied in isolation, although certain phenomena have become evident that seem unique and directly traceable to the rhythmic element in music.

Rhythm in music stimulates muscular action and induces bodily movement. It enhances and builds up physical energy.\(^{87}\) It is often associated with percussiveness which precipitates the "startle response" in the human organism.\(^{88}\) The constant repetition of a quiet, simple rhythm will produce a sedative and sometimes a hypnotic effect.\(^{89}\) A good example of this is a lullaby. A strong rhythmic pattern can be very threatening to epileptics. Seizures are precipitated by specifically irritating music, although they may not immediately follow the onset of music.

Because the body functions are characterized by various rhythms, it has been suggested that rhythm be viewed as the language of physiology. For example, the heart beat, brainwaves, peristaltic rhythms, diurnal rhythms, and the nervous system which communicates at a preconscious level "by means of a system of neural impulses interpreted according to their rhythm"\(^{90}\) are all controlled by rhythm. There is evidence to suggest that all physiological rhythms are analogous in structure to the rhythms of music. Hence,


"music can communicate at the more primitive, physiological level of rhythm and develop a rapport that may not be attainable with conventional language."\(^{91}\)

The effect of musical rhythms on the rhythms of the human organism is the basis for music therapy and rhythm group therapy for geriatric patients\(^{92}\) and the mentally retarded.\(^{93}\) The effects of rhythm therapy have been extensively explored. Davis showed that Beta Rhythm brainwaves can be established or destroyed by musical rhythms;\(^{94}\) circulation can be stimulated;\(^{95}\) working ability improved; and the internal secretion of glands can be noticeably affected.\(^{96}\) There is also evidence that all the separate rhythms of the body are related and interconnected and to interfere with one is to affect all.\(^{97}\)

Charles Hughes found that rhythm is a primary factor in determining the kind of mood effect that is produced by music. Dotted

---

\(^{91}\)Ibid., pp. 138-139.


figures or uneven rhythms were found to affect mood to the greatest extent. Heinlein, Hevner, and Gundlach confirmed this independently. Hanson found that: (1) all things being equal, as tempo is accelerated from the pulse rate toward the upper limit of practical tempo emotional tension increases; (2) while the subdivisions of the metric units are regular and the accents conform strictly with the basic pattern, the effect may be exhilarating, but it will not be disturbing; (3) rhythm tension is heightened by the extent to which the dynamic accent is misplaced in terms of the metric accent; and, (4) an increase in dynamic power heightens the emotional effect of "off balance" accent.

Hughes points out that a listener or spectator, though he neither participates nor creates, responds to music in terms of muscular tension and emotional reactions. "Data derived from tests of audience reaction to music . . . suggests the importance of rhythm in determining audience response."

The prominent rhythms of rock music have also been researched. "Listening to beat and jazz drives the blood pressure up, increases the pulse and the rate of breathing. It is also apt to make people take unwise chances while driving." A New York physician, John

---

98 Hughes, op. cit., p. 169.
101 Hughes, op. cit., p. 187.
Diamond, speaking as the president-elect of the International Academy of Preventive Medicine, states that while all rock music is not damaging "music employing an anapestic beat--where the last beat is the loudest--has detrimental effects." Using the Rolling Stone's song "Satisfaction" as an example, Diamond states that "this type of musical beat can heighten stress and anger, reduce output, increase hyperactivity, weaken muscle strength, and could play a role in juvenile delinquency." The beat evident in some rock music may also cause a breakdown in the normal synchronization of the two sides of the brain. Under the influence of certain rock music beats, every muscle in the body can become weakened. Larson states that the rhythms of rock music can cause decreases in blood calcium which interfere with the smooth action of the whole nervous system. The frenzied gyrations accompanying rock rhythms may even induce sexual orgasm.

A study by Andrew Neher focuses on the use of drum rhythms in ceremonies of non-Western cultures. Because Neher's research is of special interest and significance to this study, the results and observations it contains will be closely examined.

Neher found that the rhythmic stimulation of a drum is important for several reasons. First, a single beat of a drum contains many frequencies. Different sound frequencies are transmitted along

---

104 Ibid., p. 77. 105 Ibid.
106 Larson, op. cit., p. 122.
107 Ibid., p. 123.
different nerve pathways in the brain. Therefore, the sound of a
drum would stimulate a larger area in the brain than a sound of a
single frequency. Second, a drum beat contains mainly low frequen­
cies. The low frequency receptors of the ear are more resistant to
damage than the delicate high frequency receptors and can withstand
higher amplitudes of sound before pain is felt. Therefore, it should
be possible to transmit more energy to the brain with a drum than
with a stimulus of higher frequency.\textsuperscript{108} Neher reports that responses
to drumming included a change in electrical activity of the brain,
unusual perceptions and muscle twitching in some subjects. Stimula­
tion near the frequency of the normal basic Alpha Rhythm of the brain
has two electrical effects. First, the amplitude of the brainwave is
built up. Second, if the frequency of the rhythmic stimulation
changes, the brain rhythm changes to the new frequency.\textsuperscript{109}

One of the means used to try to isolate and quantify the
effects of rhythm on the human organism a little more accurately is
photic driving, or rhythmic light stimulation. The comparison of
rhythmic light stimulation with rhythmic sound stimulation, or audi­
tory driving, has enriched understanding of photic and auditory driv­ing
the following list of effects is presented in ascending order of
severity:

1. Visual sensations with characters not present in the
   stimulus, that is (a) color, (b) pattern, (c) movement.
2. Simple sensations in other than the visual mode:
   (a) kinesthetic (swaying, spinning, jumping, vertigo);

\textsuperscript{108} Neher, \textit{op. cit.}, pp. 152-153.
\textsuperscript{109} \textit{Ibid.}, p. 153.
(b) cutaneous (tingling, pricking); (c) auditory (rare); (d) gustatory and olfactory (doubtful); (e) visceral (probably connected with a);

3. General emotional and abstract experience:
(a) fatigue; (b) confusion; (c) fear; (d) disgust; (e) anger; (f) pleasure; (g) disturbance of time sense.

4. Organized hallucinations of various types.

5. Clinical psychopathic states and epileptic seizures.

Although these behavioral effects are most pertinent to the study of drum ceremonies, their reciprocity to the effects of some contemporary rock music is obvious. It is possible that Western art music elicits responses that are relevant to the first three points listed above.

Research has shown that the most effective frequency range for gaining optimum effect on the human organism with rhythmic stimuli lies a little lower than eight to thirteen cycles per second. This is due to the presence of low frequencies (Theta Rhythms) in the auditory region of the cortex. This explains why the really low-pitched tones of some pipe organs and electrically amplified bass tones can interfere with the pulsation of the cerebrospinal fluid. In general, however, the rhythm of Western art music is almost always in a slower tempo than the most effective frequency range for gaining this type of optimum response to rhythmic stimulation.

Neher notes several precipitators that are known to aid simple rhythmic stimulation and thus help produce unusual emotional responses.

1. Rhythms that accompany the main rhythm, and particularly those that reinforce the main rhythm in that they are multiples of it, heighten the response.

2. Rhythmic stimulation

in more than one sensory mode aids the response...

3. Stress in general increases susceptibility.

The relevance of these precipitators can again be readily seen with regard to contemporary rock music. Rhythmic stimulation in more than one sensory mode is evident in the use of the stroboscope which flashes different colors at the listener at a particular frequency simultaneously with the aural rhythmic frequency. Listeners to rock music are usually involved in rhythmic gyrations which result in stress and fatigue. This over-exertion also increases susceptibility to the effects of rhythm.

Could it be that in Western art music complex harmonies also act as precipitators that create tension and stress and thus help to increase the force of the rhythmic stimulation in the music of Stravinsky and Bartok and other such twentieth century composers?

Some General Considerations

It has been shown that the elements of music affect almost every part of the human organism in some way. This merely supports the more general studies on the physiological effect of audible sound on the human body referred to earlier in the article by Welch. It would appear that the circulation, respiration, metabolism, electrical conductivity, the nervous system, the digestive system, the endocrine system, and the excretory system all seem to respond to musical stimuli. Comprehensive summaries of the general psycho-psychological

111 Ibid., pp. 155-156.

112 Welch, op. cit., p. 533.
effects of music as a total stimulus can be found in articles by Paul and Staudt (1950)\(^\text{113}\) and Leno (1976).\(^\text{114}\)

However, an observation made by Welch concerning the effects of familiarity with and habituation of sound stimuli deserves attention at this point. Welch notes that with repeated exposure to sound the organism may learn both behaviorally and physiologically to partly ignore and thus reduce the intensity of its response to sound. "However this does not mean that it does not respond, or that the response that it does make is unimportant."\(^\text{115}\) Thus the effects of music may be dampened but not eradicated by learning or choosing to ignore it.

Music and the Conscious Decision-Making Process

Music is perceived through that portion of the brain receiving the stimuli of emotion, sensations, and feelings without being first subjected to the brain centers involving reason and intelligence.\(^\text{116}\)

Music, which does not depend upon the master brain to gain its entry into the organism, can still arouse by way of the thalmus—the relay station of all emotions, sensations, and feelings. Once a stimulus has been able to reach the thalmus, the master brain is automatically invaded, and if the stimulus is continued for some time, closer contact between the master brain and the world of reality can thus be established.\(^\text{117}\)

\(^\text{113}\)Paul and Staudt, \textit{op. cit.}, pp. 168-171.


\(^\text{115}\)Welch, \textit{op. cit.}, p. 533.


\(^\text{117}\)Altshuler, \textit{op. cit.}, p. 271.
Several other researchers have confirmed this view.\footnote{Masserman, J. H., "Music and the Child in Society," American Journal of Psychotherapy 8:63-67, January 1954; and Leno, "Physiological and Psychological Effects of Music," Review and Herald 156:165, February 12, 1976.} An individual is thus powerless to keep the effect of music being played within his hearing from registering in his body.\footnote{Hamel, Paul, The Christian and His Music, pp. 25-26.} It makes no difference whether or not the individual is partial to the music or is prejudiced against it. In fact, it is on this premise that music is incorporated in film sound tracks and installed as background music in offices, surgeries, stores, and factories.

Research into the effect of music and sound on human fetuses and neonates supports this further. Forbes (1968) found that the human fetus can respond with movements to the sound of a concert.\footnote{Fridman, Ruth, "The First Cry of the Newborn: Basis for the Child's Future Musical Development," Journal of Research in Music Education 21:265, Spring, 1973.} Condon and Sander (1973) found that at birth "the human neonate moves in precise and sustained segments of movement that are synchronus with the articulated structure of adult speech."\footnote{Condon, W. S. and Sander, L. W., "Neonate Movement is Synchronized with Adult Speech: Interactional Participation and Language Acquisition," Science 183:99, January 11, 1974.} The movements of sixteen infants, in response to adult speech, were filmed and analyzed. Two different languages were used—Chinese and American English—spoken both live and from a tape recorder. Unaffected by education or cultural conditioning, the infants responded with distinctly similar movements to the organized sound patterns of human
speech. The reaction of the infants appears to confirm that sounds which would obviously include musical sounds can by-pass the conscious decision-making process.

The Effect of Music on Professional Musicians

Research into the effect of music on professional musicians is a more recent field of investigation. It seems that whatever reactions are evident in listeners are amplified in the musicians. Schmale reports rapid changes in the pulse rate of orchestral musicians throughout a performance as well as an overall higher average count. At difficult sections in a piece of music the pulse rates of cellists and brass players can rise to 160 beats per minute.\(^{122}\) Finger-tip temperature is another indicator of blood circulation. During nervously taxing tasks, the blood vessels in the finger tips constrict limiting circulation which results in a drop in temperature. Despite rising room temperature, the finger-tip temperature of orchestral musicians dropped by two degrees centigrade during a performance.\(^{123}\) Schmale also investigated the effect of music and the musicians' working conditions on the vegetative functions of the human organism. He found that an average month's activities of an orchestra included about 20 opera or concert engagements and about 14 rehearsals with about four days free. At the beginning of the month about 27 percent of the musicians examined showed signs of badly strained vegetative functions. At the end of the month, 70 percent

\(^{122}\) Weise, \textit{op. cit.}, p. 459.

\(^{123}\) \textit{Ibid.}, p. 459.
showed signs of badly strained vegetative functions. 124

Music and the Relative Importance of Melody, Harmony, and Rhythm

From a review of the literature concerning the effect of music on the human organism, it appears that the effect of rhythm is the greatest. The effect of melody is comparatively small, while the effect of harmony is comparatively moderate. Gaston, Leno, and others have stressed the importance of the effect of rhythm on the human organism. Leno states that "rhythm is the most physically stimulating of the musical elements." 125 Supporting this Hevner goes on to comment on the "unimportance of the purely melodic factor." 126

The Relative Effect of Instrumental and Vocal Music

Gaston reported on the comparative effect of instrumental and vocal music on the human organism. He found that instrumental music has a greater effect on the human organism than vocal music. "Music of the stimulative type is more often instrumental. The voice and choral music are physically less stimulative." 127

124 Ibid., p. 460.


Music and Cultural Differences

Music's basic communication is through the natural characteristics of sound. It has been demonstrated that the physiological effects of sound stimuli transcend culture, race, and environment. In 1962 and 1963 a series of tests were conducted with the aid of some Mabaan tribesmen. Living in an atmosphere as nearly noise-free as any on earth, these Africans showed no evidence of the typical Western symptoms of hypertension or heart disease and their hearing remained acute in old age. Yet, when they were exposed to loud, impulsive noises recorded in a steel mill, "they exhibited the same autonomic responses, at the same noise levels as the steelworkers."\(^{128}\)

Although this study involved responses to noise, it has been demonstrated that responses to musical dynamic levels are by no means incomparable to responses to noise.\(^{129}\)

Neher's study of rhythmic drum ceremonies reports that studies using light stimulation show no difference in susceptibility to rhythm between South African blacks and white Westerners.\(^{130}\) Human beings, regardless of race, color, or cultural background, still have the same basic organism. Therefore, the basic elements of music--pitch, volume, harmony, and rhythm--apparently affect the physical and mental processes of all people in a similar way.\(^{131}\) Grunewald, having

\(^{128}\)Stewart-Gordon, op. cit., p. 188.

\(^{129}\)Weise, op. cit., p. 460.

\(^{130}\)Neher, op. cit., p. 159.

established that the effect of music is universal, comments that "if there is such a thing as a 'physiological basis' of experiencing music, everybody ought to be sensitive to music; a physiological principle should be generally valid by definition."\(^{132}\) She goes on to explain that even non-musical people "must be subject to the purely sensory acoustic stimuli emanating from music in the same way as those who enjoy music."\(^{133}\) Davies (1978) confirms this view from another perspective by comparing the similarities in music output of different musical cultures.

Differences between musical cultures are likely to concern particular conventions or differences in the emphasis placed on different aspects. Such differences should not lead us to overlook the fact that there are often similarities in terms of certain very basic musical events.\(^{134}\)

However, it cannot be denied that music also has a culturally and socially derived communication. The finer nuances of a musical style do seem to have cultural origins. Hence, the music of a given culture has particular and special meaning to that culture. Certainly the matter of taste, whether an individual likes or dislikes a certain piece of music or whether an individual can relate to it, is to a large extent determined by cultural conditioning.\(^{135}\) This would also be true for the factor of association whereby an individual might associate a particular piece or type of music with a particular

\(^{132}\)Grunewald, \textit{op. cit.}, p. 66.

\(^{133}\)\textit{Ibid.}, p. 66.

\(^{134}\)Davies, \textit{op. cit.}, p. 176.

experience. Even how an individual interprets the effect of music on his or her body is determined largely by cultural and social conditioning. Despite these cultural characteristics of perception, however, it appears that music communicates even general psychological moods to people from all cultures.

Gundlach (1932), in an analysis of American Indian music, questioned the popularly held view that the mood effects of music are culturally idiosyncratic. As a result of his experimentation, he reported that "at least the dynamic characteristics of moods can be communicated by song even when the performers or audience have no means of conceptual communication." Gundlach found that the communication of moods by music was basically universal and not dependent upon local musical traditions. Commenting on a particular characteristic of American Indian healing music, Tromanhauser (1970) noted that "the coincidence of voice and accompaniment almost always has a tranquilizing effect on listeners, even those who have never heard Indian music before."

Masserman observed that despite the wide range of cultural systems in the world, music contains the nucleus of a universal language understood by all mankind. The study of ethno-musicology has especially contributed to the study of music's universal

137 Ibid., p. 135.
138 Tromanhauser, op. cit., p. 23.
139 Masserman, op. cit., p. 63.
communication. Keil and Keil studied the perception of Indian, Western, and Afro-American musical moods by American students. Commenting particularly on the perception of moods of Indian Ragas, they concluded that "we know that the somber moods of Indian music are readily and specifically communicated to uninitiated Westerners, while lighter moods particularly 'religious joy' are more difficult to decipher." The fact that specific moods are difficult for an individual from another culture to relate to and understand seems quite natural. For example, the religious joy of Eastern religions belongs to a radically different philosophical system from Western religious thought. Hence, its precise communication may not be appreciated by a Westerner. A discussion of the effect of music on the individual may illuminate this further.

Music and Its Effect on the Individual

Although music seemingly has the same physiological effect on all people, and although it communicates the same basic moods to all men, it is obvious that some people are affected more by music than others. Payne explains this seeming contradiction by suggesting that people become more personally involved the more they know and appreciate the music. 

The difference between the response to familiar and unfamiliar music may prove to be a very vital one as far as the impact of personality upon appreciation is concerned. . . . Strong


hints were given that with familiar music, appreciation tends to be a more personally involved experience.\textsuperscript{142}

The more familiar a person is with a particular style of music the more he "gives" himself emotionally and psychologically to it. His enjoyment of and familiarity with the music allows him to participate emotionally and psychologically in the music. As a person becomes psychologically and emotionally involved in the music, even the physiological response may become intensified.

However, some people may not respond to music on a psychological level. Non-Western listeners, for example, find it difficult to fully appreciate Western music, and the Westerner finds it difficult to fully appreciate non-Western music. Similarly a non-musical or musically uneducated Westerner listening to Western art music is limited in his or her appreciation of this music. Such a listener does not respond emotionally and psychologically because he or she is deaf to the emotional language of the particular style of music. The listener's response is thus limited purely to basic physiological responses.

Perception Changes in Music

Another factor which must be considered at this point is that there have been definite changes in the perception of music throughout the history of Western culture. The perception of music involves not only how it is conceived and received but also what an individual comes to expect from a musical stimulus. In Western culture music

perception has changed from a monodic to a polyphonic concept, then from the horizontal to the vertical, and then from the vertical to the pointillistic-horizontal—although this last change has not been fully realized. Zofia Lissa makes the following comment about these perceptual changes:

Monodic music sounds differently today from what it must have sounded in the ear of the listener who saw the nascence of monody and subsequently was familiar with the various phases in its development. Listening to monodic music today, we are unable to extricate ourselves from what to us sounds like its harmonic content; we infuse melodic structures with a harmonic content which emerges from our own musical thinking. Since harmony rests at the very root of our musical imagination, we are unable to modify our contemporary way of hearing music.  

This explains why it is often difficult for individuals today to appreciate music of the distant past. It may be worth considering whether these perceptual changes have involved and perhaps even been the result of simultaneous psycho-physiological changes in the way music affects the human organism. Mitchell and Zanker (1949) played music representative of the various periods of music from the sixteenth to the twentieth centuries during group psychotherapy sessions in order to observe reactions to certain musical styles and periods. They found that Modal music, Classical and Eastern styles elicited indifferent and bored reactions. Romantic and realistic music, on the other hand, produced very definite emotional responses, some positive and some negative. This demonstrates that the musical styles that are closer to the individual in both time and familiarity,

143 Lissa, op. cit., p. 274.
produce greater responses than music of earlier periods.

Winold's study (1963) of harmonic tension revealed that the mildly dissonant sonorities used in Kate Hevner's studies in the 1930s, which were then effective "in causing mood responses of the sad-frustrated category," were no longer capable of eliciting the same response. This seems to be a recent example of change in perception, where the previously stimulating, mildly dissonant sonorities produced the indifferent reaction necessitating a stronger, more exciting, contemporary stimulus to evoke the original response. Could it be that this example holds a key to understanding how musical perception has changed through the centuries? Is it possible that there is a type of psycho-physiological habituation to musical sound stimuli that has occurred throughout the history of Western art music?

One thing is evident, changes in perception have occurred over relatively short periods in more recent times. This has not always been the case. "In earlier times kindred transformations proceeded at a much slower pace."146

The very increase in the rate of change of perception, which simultaneously involves an individual in increasing efforts to adapt to change and novelties in the musical stimulus itself, also initiates psycho-physiological responses.147 When this is seen in the wider context of an overall accelerating rate of change in many different

---

145 Winold, op. cit., p. 20.
146 Lissa, op. cit., p. 279.
147 Ibid., p. 311.
aspects of life in twentieth century Western society, changes in the musical stimuli could well be part of the total picture described in the following statement: "By stepping up the pace of scientific, technological and social change, we are tampering with the chemistry and biological stability of the human race."\textsuperscript{148} However, as Toffler goes on to point out, change itself is not necessarily bad. Change is part of life and so are the reactions we have to change. What he does point out, however, is that there are limits on adaptability.

There are finite boundaries; we are not infinitely resilient. Each orientation response, each adaptive reaction exacts a price, wearing down the body's machinery bit by minute bit until imperceptible tissue damage results.\textsuperscript{149}

The research of Winold, Mitchell, and Zanker certainly suggests that changes in perception and simultaneous changes in the music stimulus itself have had a psycho-physiological effect on the human organism throughout Western art music history. If these changes are forming part of the accelerating rate of change in twentieth-century Western society, then perhaps the time has come to stop and survey and assess the situation. Maybe developments in Western art music are contributing to the wearing down of Western society?

All this seems to highlight the immense influence and responsibility of the composer. Zofia Lissa notes that the creative artist is the one who shapes and determines the musical perception of future generations.

It is the mission of the creative artist to determine the path of development of musical perceptiveness. The

\textsuperscript{148}Toffler, Alvin, \textit{Future Shock}, p. 311.

\textsuperscript{149}\textit{Ibid.}, p. 311.
transformations unfolding in creativity determine the change ... in the principles governing the listener's musical perception.150

The composer controls not only the musical perception of future generations and the rate of perception change, but also the psycho-physiological effect of music on those generations. Perhaps it is worth turning at this point to look at what has actually happened in the history of Western art music up to the present time in the context of the research cited in this chapter.

Summary

Despite the neatly categorized research presented in this chapter it is recognized that the human reaction to the total musical stimuli is a very complex one. There is much more that could and should be explained and elaborated upon, and there needs to be even more research. This chapter has shown that the musical elements of volume, pitch, harmony, and rhythm do have a psycho-physiological effect on the human organism. Several other factors involving music as a total stimulus have also been discussed.

Basically the significance of music's effect on the human organism lies in its ultimate effect on the mind—the moods, thought processes, and decisions of the individual. This is forcefully underlined by the use of music by background music corporations and the film industry, as well as in the work of music therapy. Music has a profound influence on the individual and society in general. We need to understand its influence better.

150 Lissa, op. cit., p. 284.
The key points considered in this chapter can be summarized as follows:

**Volume**

1. Volume affects the human organism.
2. The effect intensifies as volume increases.
3. The autonomic nervous system begins to react appreciably to volume increase at 70 decibels, although bursts of sound of 55 decibels are recorded by the brain and elicit a response.
4. The effect intensifies greatly with sudden changes, especially from low volume to high volume.
5. Psycho-physiological responses may last from 15 to 30 minutes after the actual stimulus has ceased.
6. Music volume levels from \textit{mf} upwards are particularly relevant to the experimentation cited.

**Pitch**

1. Pitch affects the human organism.
2. The effect is least between 256-512 Hz, the normal range of the human voice.
3. Physiological changes occur more noticeably with pitches either above or below this range and increase in average magnitude as frequency becomes higher or lower.
4. The effects intensify with sudden high or very low pitches.
5. It appears that consistent, rapid, up-and-down fluctuations in pitch, as in vibrato, affects the human organism and evokes an emotional response.
6. The human organism detects even minute variations in pitch, especially in higher pitches, and the detection of pitch differences is doubled if the volume level is high.

7. There is often a correlation between volume and pitch extremes compounding the effects of each element, for example, the simultaneous use of high volume and high pitch.

8. Melody is related to pitch and affects the human organism in the following ways:
   
   (a) Diatonic movement appears to have the least effect on the human organism.
   
   (b) The greater the distance between successive tones the greater the tension aroused in the listener.
   
   (c) Very small intervals such as those in chromatic movement also provoke tension.
   
   (d) Generally, ascending intervals are more tension laden than descending intervals.
   
   (e) High-pitched tones are more tension arousing than low-pitched tones.

Harmony

1. Harmony affects the human organism; however, it is a complex musical element and it is difficult to isolate and measure.

2. The characteristics traditionally associated with major and minor modes have been experimentally confirmed.

3. Complex dissonant harmonies are associated with muscular tension, excitement, agitation, or tragedy.

4. Simple consonant harmonies are associated with muscular relaxation, peace, happiness, and gracefulness.

5. The human organism reacts most strongly to complex, dissonant harmonies.
6. Increased use of chromaticism and an increase in the rate and "distance" of modulation heighten tension response.

7. Neither intelligence, musical talent, training, nor background affects the ability to discriminate between the mood effect of the major and minor mode.

**Rhythm**

1. Rhythm does affect the human organism; however it is a complex element and it is difficult to isolate and measure.

2. Music rhythms are analogous to the physiological rhythms of the human organism and can either change their rate or increase their amplitude.

3. The use of a drum or similar percussion instrument of indefinite pitch as the rhythmic stimulus source affects a larger area of the human brain and transmits more energy to it than the use of an instrument of definite pitch.

4. Dotted figures, uneven rhythms, and the anaplectic beat affect mood to the greatest extent.

5. All things being equal, as tempo is accelerated from the pulse rate toward the upper limit of practical tempo, emotional tension increases.

6. Whenever the subdivisions of the metric units are regular and the accents conform strictly with the basic pattern, the effect may be exhilarating but it will not be disturbing.

7. Rhythmic tension is heightened by the extent to which the dynamic accent is misplaced in terms of the metric accent.
8. An increase in dynamic power heightens the emotional effect of "off balance" accent.

9. There are several "precipitators" that are known to increase response to rhythmic stimulation--accompanying rhythms that are multiples of the main rhythm, rhythmic stimulation in more than one sensory mode, stress, fatigue, low blood glucose, and adrenalin production.

Some General Considerations

1. Music as a total stimulus influences almost every part of the human organism in some way.

2. The effects of music cannot be eradicated by learning or choosing to ignore it.

3. Music by-passes the conscious decision-making process to enter the human organism. Thus, an individual is powerless to keep the effect of music, played within his hearing, from registering in his body.

4. The effect of music on the performing musician is stronger than the effect of music on the listener.

5. Rhythm is the musical element generally considered to affect the human organism most; the effect of harmony is comparatively moderate, and the effect of melody is least.

6. Instrumental music is more physically stimulative than vocal music.

7. Musical communication, based on the natural characteristics of sound, transcends all cultural and environmental influences. The communication of culturally and socially idiosyncratic stylistic
characteristics of music requires education and familiarity for complete appreciation.

8. Musical taste is predominantly socially and culturally derived, but this does not affect the basic psycho-physiological responses.

9. Some people are affected by music more than others because of their voluntary involvement. Familiarity with and appreciation for a particular music style, as a result of education or cultural conditioning, increases emotional and possibly even psycho-physiological involvement in the music and thus the effect is heightened.

10. Changes in musical perception have occurred throughout Western art music history and these changes are occurring faster now than they did previously.

11. The rate of change is musical perception and in the musical stimulus itself also has its own psycho-physiological effect. This is especially evident when seen as a part of the accelerating changes taking place in twentieth century Western society as a whole.
CHAPTER III

STYLISTIC CHANGE AND DEVELOPMENT IN WESTERN ART MUSIC AS RELATED TO PSYCHO-PHYSIOLOGICAL IMPACT

The development of melody, harmony, rhythm, and dynamics in Western art music can be traced continuously through musical sources from the ninth century to the present. Inevitably, as one goes back in time, musical characteristics gradually become less tangible and less easy to identify. However, written records of the evolution of Western art musical style are easily accessible and quite reliable, especially from c. 1600 to the present. These records seem to indicate that a trend to gradually increase psycho-physiological impact on the human organism has occurred.

In verifying this trend, this chapter is concerned more with the broad sweep of change than with all the specific changes that have taken place. Enough detail is included to give evidence for each of the broad changes referred to. The direction of developments is the major concern.

When tracing developmental change in musical styles and practices, it is easier and more significant to trace innovation than expiration. Because a new development starts at a particular time does not mean that older traditional styles cease to be used from that point on. Old styles usually continue to co-exist with the new for some time. Possibly the old and the new even continue
to develop independently until the old gradually "fades out." For example, "monophonic music—songs and dances—continued to be performed in Europe until well into the sixteenth century; but with the exception of Guillaume de Machaut, few professional composers of first rank are known to have written in this style after the thirteenth century."¹

When innovations are first introduced, departures from the traditional practices are highlighted and are easy to trace. By considering a series of such innovations, it is easier to discern if, indeed, a trend is apparent and what the direction of that trend may be. Often there are also some significant clues available as to why the innovations were adopted at a particular time. This helps to illuminate and clarify the reasons and motivations for the developments that have occurred and to explain the direction of any trend that may be evident. Hence in tracing the developments in Western art music, emphasis is placed on innovation rather than expiration of particular styles.

**Melody**

Melody can be defined as an organized succession of three or more single musical tones. Melody naturally includes both a pitch quality and a time quality. The pitch quality is the main concern of this study. The historical development of total pitch range as well as the intervallic size between successive tones in a melody are of particular interest, because they seem to coincide with those

factors of pitch that elicit a psycho-physiological response in the human organism.

It has been said that "early music was entirely, or almost entirely, melodic."\(^2\) This is true it seems of both ancient Greek music and early Christian chant. Although Western art music really had its birth in the early Christian era, Greek music has often been the point of departure in histories of Western art music. It is interesting that Greek music, like early Christian chant up to the ninth century, was monophonic, unaccompanied, and, for all intents and purposes, limited to the human voice. Admittedly, the extant sources of Greek music are rather meagre--twenty treatises, most of which are fragmentary, and six melodies which again consist mainly of fragments.\(^3\) However, from what is available, it is evident that at least in pitch range, intervallic size between tones and tessitura, ancient Greek music was similar to early Christian music.

Up to the ninth century, Christian chant was not only monophonic, unaccompanied, and limited to the human voice, but it also had a very narrow total range that often did not extend beyond the interval of a fifth.\(^4\) The total range rarely exceeded an octave, or, at most, a tenth within the tessitura of about c-g\(^1\). The melody moved in conjunct, diatonic progression with few skips. The


\(^3\)Grout, op. cit., p. 34.

\(^4\)Wold, Milo, and Cykler, Edmund, An Outline History of Music, p. 15.
Alleluia: Angelus Domini illustrates these confined characteristics very well:

It seems significant that the overall pitch range and tessitura of the music of this period lies in and around the range that elicits the least psycho-physiological response from the human organism. The fact that the music was monophonic, had mainly conjunct, diatonic movement, and was limited in performance to the human voice simply underlines and adds credence to this observation, because each of these characteristics is associated with a minimal psycho-physiological response.

Up to the eleventh century, melodies used in secular monophony often used a slightly wider pitch range than was used in Christian chant and sometimes utilized instruments. This was particularly true of dance music, even though secular music at the time was also mainly vocal. It would appear that through music history secular music, including folk music and other more popular styles, was less conservative and not as strictly formal in its usage of the different musical elements as was sacred music and other more

\[5\] Ibid., pp. 15, 18.
serious art music styles. Nevertheless in any given period there is usually some similarity between serious and popular music styles since both reflect the broad ideals and characteristics of their time.

From the ninth to the sixteenth centuries, despite the development of polyphony, individual melody lines retained their conjunct movement and limited pitch range of between an octave and a twelfth. The almost universal vocal conception of music during this period of Western art music history limited the development of melody to vocal range, tessitura, and technique. Melodic writing, whether for voices or instruments, was governed by stylistic features which the voice could easily master. In fact, until the beginning of the seventeenth century, the whole concept of music was horizontal rather than vertical and was based on vocal melodic lines.

With the development of polyphony, each of the simultaneously sounding lines continued to be treated as a separate melody, and until the sixteenth century they were even written out as separate and individual melodies. However, as polyphony became more and more firmly established, there was a distinct trend in the fourteenth century to center the melodic and rhythmic interest in the top voice; at the same time, the lowest part often moved with slightly larger intervals than the upper parts. This practice eventually led to the definition of tonality and the "functional

---

bass." An example of this can be found in the ballata, Amor c'al tuo suggetto by Francesco Landini:

This increased interest in the outer parts meant that attention was gradually focused on the more extreme pitch ranges. Thus the higher and lower tessituras received more emphasis, and some of the first steps to increase the psycho-physiological effect of melody were taken.

During the fourteenth century the overall range of voices was also slowly extended upward.\(^7\) The mid-range tessitura of c-g\(^1\), so prevalent in early Western art music, was gradually superceded in importance by these extensions. After 1600 the mid-range tessitura was left for the supporting parts in multiple-part compositions. Generally, between 1400 and 1600 the different voice parts were considered basically of equal importance "in that all shared equally in presenting the musical motives in a texture of imitative counterpoint; however, the two outer voices had special functions in defining tonal centers, and the makeup of some church

\(^7\)Grout, op. cit., p. 144.
choirs suggests that the soprano line was given some prominence in performance.8

During the latter part of the fifteenth century, the bass part, which before 1450 rarely extended below c, was extended downward to G or F, or even lower in special combinations of low voices.9

The normal ranges of voice parts during this period are outlined below:

![Voice Range Diagram]

The disjunct movement of the lowest part also became more prominent at this time.

It seems, however, that safeguards were always built into the developmental process of Western art music to avoid too many radical changes taking place too quickly. These safeguards were probably never intended to be such, but, in effect, they helped to keep the brakes on the rate of change. One such safeguard concerned a practice whereby if a large interval was used in a melodic line, the following notes would always lie within the range of the large interval. Thus the compact nature of the overall pitch range for any particular voice was maintained. This is noted in the voice leadings in the motet by Obrecht, O beate Basili:

8 Ibid., p. 177. 9 Ibid., p. 182.
This practice can be traced continuously to the polyphonic music of Palestrina, di Lasso, and other composers of the late Renaissance.

An important development concerned with the concept and process of composition occurred during the early part of the sixteenth century. Instead of writing the different parts of a musical composition separately and successively in a manuscript, all parts were written simultaneously and directly underneath one another. Undoubtedly this facilitated the perception of vertical relationships and hence, possibly, contributed also to the development and extension of the outer parts. It certainly seems to have expedited rather than hindered the changes occurring in Western art music at this time.

The Renaissance period of music history climaxed in the sixteenth century, and the vocal polyphonic style was brought to its "ultimate degree of perfection." As many as eight parts were notated, although five parts became the more frequently used configuration. Fine examples of this style can be found in Palestrina's masses as well as in motets by Willaert, Morales, and di Lasso. Many secular works such as the chanson, Faule d'argent by Josquin

---

de Près, madrigals by Monteverdi, di Lasso, Gesualdo, de Rore, as well as those of English composers such as Byrd, Wilbye, Gibbons, and Dowland furnish good examples of the polyphonic style of this time. The increase in the number of parts particularly helped to extend the upper pitch range. For example, the range of the top voice was extended to include $g^2$ as illustrated in the opening measures of the first Agnus Dei from Palestrina's Mass of Pope Marcellus and Gesualdo's madrigal Moro Lasso al mio duolo.

The madrigal by Gesualdo also demonstrates the composer's rather daring experimentation with chromaticism in voice leadings—a rather unusual and radical example for this period. Nevertheless it foreshadowed the increased interest and attention chromaticism would receive in later periods. Even in Gesualdo's madrigal, chromaticism seems to have been introduced specifically to heighten tension and thus facilitate a more vivid portrayal of the rather morbid subject of the song. The tension produced by these unusual voice leadings and the constantly changing tonal centers must have had quite a remarkable effect on listeners at the time it was written.

Until the Baroque period, the basic changes that have been traced in melodic development are the gradual multiplication of parts and the extension of total pitch range from $c-g^1$ to $F-g^2$. In general, individual voices still maintained a limited range of about one and one-half octaves. An increasing interest in the outer voices and a small amount of experimental interest in chromaticism have also been observed.
However, during the Baroque period, melodic development really began to gather momentum, and those features of melody that elicit psycho-physiological responses in the human organism became more prominent. With the new interest in music for accompanied soloists and the rise to prominence of instrumental music with its idiomatic instrumental writing, the pitch range, tessitura, and the angularity of individual melodic lines changed quite dramatically. Apart from the changes in melody, the increased use of instruments produced greater psycho-physiological effect than purely vocal music had done.

Around the turn of the seventeenth century as the works of Peri, Caccini, Cavalieri, and others became known, the accompanied solo song became the basis of a new style in Western art music. Caccini's document *Le Nuove Musiche* set down the basic characteristics of the new style, elaborating especially on the new vocal techniques used in the ornamentation of the melody line. Despite the original desire to make the music subservient to the text of a song, the freedom of singing a solo part above a smooth instrumental accompaniment soon manifested itself in radical changes in the singer's melodic line. Many of the ornaments had an improvisatory nature and contained unexpected quick passages, different rhythmic configurations, trills, and other such figures as illustrated in this example from *Le Nuove Musiche*:
These ornaments were designed to convey the text more vividly to the listener. The stimulus of the constantly changing melodic line must have been a change from the traditional, more predictable nature of melodic lines in polyphonic compositions. This style of singing became the basis for the recitative and aria which, in turn, became key elements in the opera, oratorio, and cantata which were developed at this time. The work of Monteverdi is of particular significance here in that, although devoted to the new
style, he also incorporated in his operas elements from the older style, thus welding together the old and the new. This became the basis for the future operatic concept.\textsuperscript{11} The dramatic form of art music cast in opera was often the experimental ground for important developments in art music, particularly in the nineteenth and twentieth centuries. By nature, it is a form of music in which the expressive potential of music is exploited.

However, the changes initiated by the accompanied solo song were not limited to ornamentation. The freedom of solo singing soon evidenced itself in fewer restrictions being imposed on voice leadings in the melody. For example, greater freedom in the use of intervals became evident. One should notice the intervals used at the beginning and end of the\textit{Concerto Ecclesiastico: Exaudi me, Domine} by Viadana:

\begin{center}
\footnotesize
\texttt{Exaudí me Domine, exaudí me Domine.}
\end{center}

Also worth notice are the intervals used in the following example taken from\textit{Euridice} by Peri:

\begin{center}
\footnotesize
\texttt{me verior est audí me}
\end{center}

\textsuperscript{11}See, for example, Orfeo which makes use of recitatives, solo airs, duets, madrigal-like ensembles and dances, as well as having more expressive harmonies which make the representations of emotions stronger and more varied than other contemporary works.
This greater angularity, or increased use of larger intervals, was explored more consistently as the instrumental idiom became reflected in melody writing. As homophony became established, intervals in the melody often followed basic triadic patterns. Instruments were not as limited in tone production as the human voice and could, therefore, cope quite easily with larger, more complex intervals and extended pitch ranges. Thus arpeggios and related figures became very common in instrumental melodies:

\[\text{Correlli, Prerudio, from Sonata No. 8}\]

\[\text{Violin I}\]

\[\text{Violin II}\]

\[\text{etc.}\]

\[\text{Handel, Adagio, from Sonata in F major for Violin and Continuo, Op. 1, No. 12}\]

\[\text{Violin}\]

\[\text{etc.}\]
The bass part, even though it was now developed as a figured bass, was often still melodically conceived. However, during the eighteenth century the bass part was increasingly seen in a supporting role as the foundation for a homophonic superstructure. Melodic interest was gradually centered in the top part/s, where increasingly higher pitches were being explored.

As instrumental music began to flourish, vocal compositions were influenced by the instrumental idiom. Leaps of fourths, fifths, and sixths as well as diminished intervals became quite common in vocal parts. For example, Monteverdi's recitative Ma che temi from Orfeo contains leaps of a fourth, sixth, and diminished fifth as well as an arpeggio-type figure. Dido's Lament from Dido and Aeneas by Purcell frequently employs leaps of a fourth, a fifth, and a sixth:

\[\text{etc.}\]  

\[\text{earth, may my wrongs cre - ate no trou - ble, no trou - ble in - thy}\]

\[\text{etc.}\]

---

12 See, for example, the cantatas of J. S. Bach. The continuo part, particularly in trio arrangements for voice, solo instrument, and continuo, provides excellent examples of this.
The very effective chromatic ground in the aria from Dido's Lament is another example of the interest and fascination with chromaticism that budded slowly and blossomed in the next two hundred years.

By the mid-eighteenth century, which was the climax of Baroque melody-writing as exhibited in the works of Bach, Handel, and Telemann, the overall pitch range, tessitura, and intervallic size of a melody had been considerably extended. One should note, for example, the solo air The People that Walked in Darkness from The Messiah by Handel. The pitch range of the melody is from F♯-e, all of which is to be sung by the one voice. A wide range of intervals is also used:

![Musical notation]

The deliberate use of an ascending melody to achieve maximum effect on the word "light" is also worth noting. This is just one of the word painting devices used by Handel to portray the text more vividly. It is significant that this device is also based on a psycho-physiologically stimulating progression. Limited word painting had been used by Renaissance composers such as Palestrina, Gesualdo, and others. However, in the Baroque period composers developed it more
keenly because of their interest and belief in the Affektenlehre. The music of Bach abounds in similar examples, especially his cantatas and the *St. Matthew Passion*.

The pitch range in the following oboe melody taken from an aria by J. S. Bach spans nearly two octaves in a relatively high tessitura. The vocal melody begins by following the instrumental melody very closely. This is an example of the direct effect of instrumental idiom on vocal melody writings:
It would appear that one of the factors among many others which stimulated composers to experiment with more daring musical innovations was the love of display. During the eighteenth century the bel canto style of singing, particularly nurtured in the Italian school, emphasized "beauty of vocal sound and brilliant florid technique."

Sometimes composers deliberately wrote spectacular melodies to demonstrate the prowess of the performing vocalist. The resultant music included an extensive and breath-taking use of the entire pitch range, often exploiting the extremes of pitch range at climax points. It seems only natural that music which was designed to dazzle the audience should exploit those characteristics that would increase psycho-physiological response in the listener.

A similar trend occurred in instrumental compositions. Various preludes, fantasies, toccatas, and theme and variations were written to parade the abilities of the performer. Like virtuoso vocal music, this music contained similar devices to stimulate the listener. All these devices helped to highlight the exciting new characteristics of melody that had developed during the Baroque period.

In general the range of any individual melody--whether vocal or instrumental--had increased to encompass approximately two octaves. The intervals used included most major, minor, diminished, and augmented leaps, as well as diatonic and chromatic steps. In studying the music of the late Baroque period, it would appear that

---

the approximate pitch range for voices was F-a\(^2\), which does not really differ substantially from what it was before the Baroque period. However, much more consistent use was made of the entire range. The total pitch range for instruments seems to have been approximately C-g\(^3\).

Composers such as Karl Phillip Emanuel Bach, Johann Christian Bach, Stamitz, and the two giants, Haydn and Mozart, were responsible for the developments in Western art music that occurred during the latter half of the eighteenth century. The radical changes brought about during the Baroque period became established and consolidated during that time. The thicker polyphonic textures that had become evident in the large choral fugues of Bach and Handel were eliminated. Emphasis was placed on a more transparent lyricism with smooth melodic contours. An example can be found in the simple melody at the beginning of the first movement of Mozart's Sonata in C, K545:

The bass part no longer served in a melodic function but was used primarily as the basis for the harmonic structure.

The melody was still the focal point of interest in the Classical era. It was almost always found in the top part except, possibly, in a theme-and-variation movement of a string quartet
such as the third movement of Haydn's *The Emperor Quartet, Op. 76, No. 3*. Nevertheless, the melody in this example furnishes another good example of a transparent, symmetrical, well-defined, and easily recognizable Classical melody.

During the Classical period, pitch range was again extended and exploited a little further beyond the practices set up by the late Baroque composers. For example, the first theme in the last movement of *Symphony No. 40* by Mozart covers the ascending pitch range d¹–e³—a little over two octaves—within the space of six measures. Admittedly, this is achieved by means of a tonal sequence, but even so it illustrates a greater freedom of facile movement within a fairly wide pitch range than was allowable in Baroque times. This rapid ascent to high tessitura would have served to produce more excitement and thus produced greater psycho-physiological effect. The increased angularity of vocal melody writing at this time further demonstrates the influence of instrumental idiom. This is illustrated in the rapid leaping back and forth over the intervals of a fourth, a fifth, and a third in the *Introduction* from *Don Giovanni* by Mozart:
Changes in melodic structure accelerated even further during the nineteenth century. Many melodies that in later times were to become famous were composed at this time. However, the more stimulating instrumental idiom increasingly dominated melodic development. Vocal melody kept pace with these developments as best it could.

There was a definite tendency for Romantic melodies to grow out of harmonic progressions and to be less independent than was previously the case. In the first movement of Beethoven's Piano Sonata No. 1 in F minor, one finds that the melodies tend to be quite angular and contain more disjunct than conjunct motion. The melody, in fact, seems to have lost its position of absolute prime

---

14Examples of such melodies include the first movement of Schubert's unfinished Symphony No. 8, the nocturnes, ballades, impromptus, and mazurkas of Chopin and the ballet suites, symphonies, and Capricio Italien by Tchaikovsky.
importance and has become subservient to the harmonic element. Chopin's Nocturne in $e^b$, Op. 27, No. 2 is an example of a composition in which a fairly prominent melody is based very strongly on the predominant harmonic progressions:

This example also contains evidence of the increased use of chromaticism. At times the melody incorporates some rather large leaps; for example, measures seven and eight contain a leap of an octave, and measure sixty contains a leap of three octaves—$e^b_1- e^b_4$ and back. The use of a high $e^b$ at the climax of the piece not only extends the total pitch range of the melody to approximately three octaves, but it also heightens the psycho-physiological effect at that point.

Mention should also be made of the many concertos written during the Romantic period for solo instrumentalists and orchestral accompaniment, in which the full pitch range of an instrument was
often exploited. Mendelssohn's violin concerto, for example, demands a pitch range of g-e\textsuperscript{4}. The melodies in this type of composition called for a high degree of technical virtuosity and were consistently made more exacting and exciting as the Romantic era unfolded. Any device that paraded the prowess of the performer and which made the music more scintillating was included.

It seems that the use of large leaps in the melody line helped to bring the overall effect of melody to its ultimate intensity, beyond which other factors had to be introduced to maintain the potency of musical communication. It is significant that during this period of Western art music history, the harmonic element became fully developed and took precedence over the melody, to become for a time the most prominent factor in the musical stimulus.

The break-up of the melodic element was expedited by means of extended intervals and large pitch range. The Scherzo from the String Quartet No. 16 in F major by Beethoven illustrates the beginning of this break-up.
The extremely high pitches in the first violin part in the above example are quite unusual. The rather large leap in the melody line is also uncommon, even though it is to a type of pedal note—similar to that found in other violin music. All this appears to be even more unusual when it is realized that in a string quartet there are other parts to carry the pedal note if it is required. It seems that for some reason Beethoven deliberately wanted to break up the smooth flow of the melody. It would appear that irregularities such as these were often derived from an intense desire for expression of personal feeling. Thus those characteristics of music which are associated with psycho-physiological response in the human organism were often employed to intensify the effect of the musical communication. The motive, it seems, was not specifically to increase psycho-physiological involvement of performers and listeners, but rather to intensify the musical message—to communicate the message of the composition more clearly and forcefully. However, it seems that could not be done without the psycho-physiological effect being increased. The intensity of the musical message and its effect on the human organism appear to be inseparably linked and may even be related.

Because of its capacity to increase the intensity of musical communication, chromaticism gained more and more attention and interest in the nineteenth century. A full discussion of chromaticism is carried out later in this chapter under the heading of

---

15See, for example, Chaconne from Partita No. 2 in D minor BWV 1004 by J. S. Bach.
"Harmony." However, Wagner's "endless melody" is significant at this point in the discussion of melodic development. Melodic chromaticism, with its implication of constantly shifting tonality, together with the consistent use of deceptive cadences which avoided any feeling of finality were the earmarks of "endless melody."

The Prelude and Liebestod from the opera Tristan and Isolde by Wagner probably exemplify the ultimate form of this type of melody:

![Musical notation]

Chromaticism was specifically created and designed to be a vehicle for strong tensions and to enshroud the listener in a totally absorbing experience of sight and sound as he/she watched and listened to the opera. In order to portray the intensity of the feelings of the two lovers in Tristan and Isolde, Wagner sought a more penetrating musical language than had ever been used before.

Even though these melodies were written to be sung, they were much harder to sing than those of preceding eras. Because of the unusual intervals employed, a very keen and accurate sense of pitch was demanded of the singer. Physical stamina and power were also required in order for the singer to be heard above the full Romantic orchestral accompaniment. Thus, by a combination of factors, a truly intense form of musical communication came into being. It is not hard to imagine that this particular combination of factors

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
also increased psycho-physiological involvement in both performer
and listener.

Particularly in the second half of the nineteenth century, it became more and more evident that the whole concept of melody was moving further and further away from a vocal idiom to an instrumental idiom. Vocal technique was stretched to its limits in the operas of Wagner, Verdi, Puccini, and Richard Strauss. Apart from several well-known composers such as Schumann, Brahms, and Hugo Wolf, who wrote songs for vocal performance, the emphasis in art music composition during the nineteenth century was on instrumental music. It would appear that composers felt vocal music had come to the zenith of its potential communicative power, and that the voice did not have the resources for development which instruments had; therefore instruments received more attention. Again this supports the trend being traced—that there has been a move to develop those factors that intensify psycho-physiological effect.

Melodies became more angular as they were developed to reflect instrumental idiom. The two themes in the first movements of Symphony No. 1 and Symphony No. 5 by Shostakovich provide good examples of this.\textsuperscript{16} The predominant tessitura of these melodies is also worth noting:

\begin{quote}
\textsuperscript{16}See also the melodies in the Concerto for Violin and Orchestra by Roger Sessions, Piano Variations and Statements by Copland, and works by Mahler and Hindemith.
\end{quote}
In the early twentieth century, composers such as Debussy, Ravel, and Delius, of the Impressionistic school, made use of modality and a variety of new scales such as the whole tone and pentatonic scales. This use of modality and different scales, together with melodic angularity and rapidly shifting tonalities, gradually helped to free each tone from any traditional relationship to other tones. Eventually these developments culminated in the pointillistic melody of the twelve-tone school. *Pierrot Lunaire* by Schönberg (1912) not only demonstrates extreme angularity but also the use of a wide pitch range in the accompanying instrumental melody—D\(^2\)-g\(^#3\). This piece also illustrates a departure from distinct tonal pitch designation and the vocal technique known as *sprechstimme*. This innovation highlights the new interest in non-tonal sound that was being explored in art music at this time. One should note the following examples from sections six and seven of *Pierrot Lunaire*:

1. The flute melody from *Der Kranke Mond*:
2. Sprechstimme from Madonna:

Also to be noted is the theme from the Gavotte from the Suite for Piano Op. 25 by Schönberg (1924):

In these examples, frequent wide leaps--sometimes over several octaves--and uncommon intervals which are not directly related to one another other than by the overall serial technique combine with unusual and often extreme pitch ranges to crown the developments in melody traced so far. Large pitch range and extreme angularity are among the very characteristics of melody shown to have maximum psycho-physiological effect on the human organism.

The tension-producing chromatic progressions of nineteenth-century melody were superceded by the use of micro-tonality in the twentieth century. Composers such as Haba, Carrillo, and even Charles Ives experimented with the use of melodic intervals of less than a semitone. With the development of musique concrète and electronic music, non-tonal sounds and complex sound sonorities
became the main point of interest, virtually displacing melody altogether. Electronic sound sources also lifted any natural restriction on pitch range so as to permit the inclusion of any frequency within the audible spectrum. This only makes the experimentation regarding human response to extremes in pitch and non-tonal sounds, including noise, all the more relevant to this study and underlines the trend to evoke increased psycho-physiological response in the human organism.

It seems significant that during the twentieth century, melody has gradually lost its former identity as a powerful musical element. It appears that it has reached its ultimate capacity to affect the human organism and, therefore, it has disintegrated to make way for more potent musical elements to carry the main load of communication. Thus melody has become less and less important as a vehicle for musical expression.

In broad terms, melody has developed from having a narrow range, diatonic, conjunct movement to having an extremely wide pitch range, extreme disjunct movement, as well as extremely small micro-intervals, with no tonal relationship at all between intervals. From a form of melody which affected the psycho-physiological responses of the human organism least, it has been shown that there has been a trend to develop a form of melody which has directly increased psycho-physiological involvement to maximum potential.

Harmony

In so far as melody constitutes the horizontal structure of single musical tones, harmony constitutes the vertical structure of
simultaneously sounding musical tones. As defined in Chapter II, harmony is "the science and study of chords."\textsuperscript{17} The facet of harmony which is of greatest interest to this study is the development of dissonance throughout Western art music history. The psychophysiological effect on the human organism has consistently been shown to be greatest when harmonies are the most dissonant and complex. Because of their ability to elicit a response from the human organism, developments in chromaticism and modulation are also noted in the relevant periods of history.

Arnold Schönberg observed that the history of the development of harmony is the history of the development of the concept of dissonance.\textsuperscript{18} While explaining the process of this development, Machlis makes the following comment:

The history of music reflects a steady broadening of the harmonic sense, an ever greater tolerance of the human ear. In the course of this evolution, tone combinations which at first were regarded as dissonant come to be accepted, with time and familiarity, as consonant. The leader in this development has consistently been the composer. Striving to avoid the commonplace, he added a tone that did not properly belong to the chord, or held over a note from the old chord to the new, thereby creating a piquant effect to which, as time went on people grew accustomed. This dissonance came to be treated with ever greater freedom and gradually became a fullfledged member of the chord in which it had once been a stranger. Ultimately it lost its flavorsome quality, its character of dissonance, whereupon composers cast about for new combinations that would add zest and pungency to their music. "Every tone relationship that has been used too often," wrote Arnold Schönberg, "must finally be regarded as exhausted. It ceases to have power to convey a thought worthy of it. Therefore every composer is obliged to invent anew."\textsuperscript{19}

\textsuperscript{17}Lee, W. F., editor, \textit{Music Theory Dictionary}, p. 29.
\textsuperscript{19}\textit{Ibid.}, pp. 19, 20.
It seems significant that this description should include phraseology such as "steady broadening of the harmonic sense," "ever greater tolerance of the human ear," "combinations that would add zest and pungency to their music," and so on. These statements, which are reinforced by Schönberg's comment that once a tone relationship has been used too often it "must finally be regarded as exhausted" and that it "ceases to have power to convey a thought," can only be made if a process of interaction with a living organism is involved. It would appear that these observations underscore the same type of process that has just been traced in the development of the melodic element, that in order to maintain the potency of communication, those factors which automatically increase psycho-physiological involvement have been consistently developed. If there has been a continual historical tendency to broaden the harmonic sense to tolerate increasingly complex and harsh dissonance, and if complex and harsh dissonance intensifies psycho-physiological response, then this furnishes still more evidence for the trend traced in this study.

An examination of Western art music history reveals that at first the development of harmony was slow. In fact, the concept of harmony as we know it today was really non-existent before 1450. The fully vertical concept of chord structure did not become firmly established until the middle of the Baroque period, when tonality and functional harmony became the basis for composition. It was not until the nineteenth century that harmonic developments began to accelerate rapidly.
However, even before 1450 differing relationships between simultaneously sounding tones were apparent. As polyphony developed, it was discovered that certain intervals sounded "better" simultaneously than did others. At first the intervals of fourths, fifths, and octaves were considered to be consonant and all others to be dissonant. Consequently the practice of organum—in which two melodic lines were sung simultaneously—consisted of the Vox principalis and Vox organalis singing at the interval of a fourth, fifth, or octave in parallel motion. The Scholia Enchiriadis (c. 850) provide examples of this:

1. Organum of the octave

\[ \text{etc.} \]

Nec qui vivimus benedicens Dominum or hoc nunc et usque in saeculum.

2. Organum of the fifth

\[ \text{etc.} \]

Vox principalis

Vox organalis

3. Organum of the fourth

\[ \text{etc.} \]

Vox principalis

Vox organalis

From the ninth to eleventh centuries, the gradual development of more free forms of organum allowed a piece to begin in unison, then for one of the parts to move freely through the intervals of a second and third to the fixed fourth or fixed fifth for most of the phrase, and then to merge back to the unison at the end. For example:
Gradually so-called "free organum" became a free-moving part above a fixed part, as can be seen in the compositions of the twelfth century schools of St. Martial, Compostela, and Notre Dame. Thus different vertical intervallic relationships gradually made their impression on the minds of the listeners. However, up to the eleventh and twelfth centuries, the unison, fourth, fifth, and octave remained established as the chief consonances of two-part writing. Any other intervals, including thirds and sixths, were still considered dissonant and were only occasionally used in inconspicuous positions.

With the addition of voices from two to three and four parts during the thirteenth and fourteenth centuries, the intervallic harmony gradually included more daring vertical relationships. The last line of a motet, Dominator-Ecce-Domino from the School of Notre Dame (c. 1225), illustrates this point:

![Musical notation](image)

---

First, one should notice the use of the consonant open triad 1-5-8 at the end of the piece. The full triad 1-3-5 is also used here, albeit in a weak position. It is used again just before the end as 1-5-10. Notice should also be given to the use of the dissonant interval of a seventh which is utilized several times in weak positions.

Gradually full triads came to be used more frequently and appeared at more prominent points. This is evident in Guillaume de Machaut's isorhythmic motet S'il estoit nulz (fourteenth century).

As triadic sonorities became more commonplace and were accepted as being consonant, dissonance was increasingly used only between these new consonant pillars. The intervals that had previously been regarded as consonant (unison, fourth, fifth, and octave) were gradually abandoned. Perhaps this is an early illustration of Schönberg's observation that "every tone relationship that has been used too often, must finally be regarded as exhausted."
It ceases to have power to convey a thought worthy of it. Therefore the composer is obliged to invent anew."\(^{21}\) It could also be true that the change in perception observed by Winold (1963) when repeating some of the work of Kate Hevner\(^{22}\) is but a reflection of the perception change that appears to have taken place between the thirteenth and fifteenth centuries.

Although harmony was still essentially intervallic rather than chordal, from 1450 onwards full triads and sixth chords were increasingly used in musical composition. However, the Renaissance set the stage for the emergence of the much stronger and more tension-laden relationships in the major/minor tonality system. Gradually sections of homophonic texture designated as "familiar style" were used to intersperse the still predominantly polyphonic texture. The motet *Tu pauperum refugium* for four voices, by Josquin Desprez, is an example of this.

\(^{21}\) Machlis, *op. cit.*., p. 20.

\(^{22}\) Winold's experimentation, conducted thirty years after that of Hevner, revealed that mild dissonance once able to evoke a strong response had taken on the reaction ascribed to consonant triads in Hevner's work. Maybe the triad previously considered as mild dissonance also usurped the position of the previous consonances during the period between the thirteenth and fifteenth centuries. This point is discussed on p. 76 of this thesis.
In this piece dissonance is conceived in intervallic relationships and is mainly restricted to passing tones, neighboring tones, suspensions, and changing-note groups.

During the late Renaissance all dissonance was used sparingly. The suspension was possibly the most conspicuous form of dissonance that was used, but even this was usually resolved immediately:

Palestrina, Agnus Dei I, from Missa Papae Marcelli

As can also be seen in this example, preference is given to the strong tonal cadence IV-I to finish the piece. Once points of established tonality were used to locate tonal centers throughout
the piece, it was possible to depart deliberately from these tonalities, and thus strong harmonic tensions could be produced. This meant that the whole concept of harmony was being projected into a more potent and powerful sphere. Even though intervallic dissonance had been able to produce a certain amount of tension and tonal color it would always be limited simply by its very nature. However, the system of chordal major/minor tonality was a much more forceful and highly powered dissonance. This naturally implied the possibility of increased psycho-physiological effect on the human organism.

It was during the Baroque period that the major/minor tonality system was established. It seems significant that it should be the Baroque period when such an important change in the development of harmony should take place, for it was also during this period that significant changes in melodic development took place. The development of functional harmony and the increased emphasis on tonic, subdominant, and dominant triads brought a distinct break from traditional modality. Dissonance, rather than being restricted to purely intervallic relationships, now extended into the vertical chordal dissonance dimension with seventh chords and altered chords such as the diminished seventh and Neapolitan sixth chords. Dissonance in the form of suspensions, changing notes, passing notes, and neighboring tones was still used freely; however, it was also resolved fairly readily. An example is the chorale prelude by

---

23 This view is supported by Deryck Cooke in his book The Language of Music, p. 54. "From the Renaissance onwards, the modes, with their lack of strong tensions, gave way more and more to the powerful tensions of the major and minor systems."
J. S. Bach Vor deinen Tron tret' ich hier mit BWV668.

Once equal temperament was established with its possibility of twenty-four different keys of major and minor tonality, modest modulations were also introduced. A good example of all these features is found in the forty-eight preludes and fugues by J. S. Bach, otherwise known as The Well-Tempered Clavier. Chromaticism, previously used only by the radical experimentalist composers such as Gesualdo in his Moro Lasso al mio duolo, was now more generally utilized and freely employed for expressive purposes. One should see, for example, the Crucifixus from the Mass in B minor BWV232 by J. S. Bach and the following duet Fiero acerbo by Francesco Durante:

In 1722 Rameau's treatise Traité de L'Harmonie formally enunciated the whole new system of functional harmony. In chapter twenty of the treatise he turns his attention to the properties of harmonies and how harmonies should best be used in a composition.
It is certain that harmony can arouse in us different passions, depending on the particular harmonies that are employed. There are harmonies that are sad, languishing, tender, agreeable, gay and striking; there are also certain successions of harmonies for the expression of these passions; and although it is quite foreign to my purpose I shall give of this as full an explanation as experience has given me.  

Rameau goes on to enumerate the various emotional effects of harmony in terms of consonance and dissonance. It is significant that in presenting a roughly gradated list, in which he correlates different emotional effects with varying types of dissonance and consonance, he reveals a belief that the stronger and more prominent the dissonance, the more severe the effect and the more intense the emotion being portrayed. "Despair and all passions having to do with anger or which have anything striking about them require unprepared dissonances of every kind; above all, the major dissonances should be situated in the soprano." Although Rameau is probably reflecting attitudes that were common in the Affektenlehre at that time, it seems more than coincidental that strong dissonance, which has been shown in Chapter II of this study to be linked with increased psychophysiological response in the human organism, was even at that time seen as having the strongest impact. Rameau's reference to having the "major dissonances" in the soprano part is interesting, in light of the fact that if the dissonance occurs in a higher pitch range its effect will be augmented.

---


25 Ibid., p. 213.
During the Classical period the harmonic vocabulary of the Baroque period was simplified and formally systematized. The tonic, subdominant, and dominant triads became very firmly established as the basic building blocks of harmonic organization and tonality. One should notice, for example, the beginning of the Minuet, the third movement of Quartet Op. 76, No. 3 by Haydn. C Major tonality is firmly established by I-IV-V6-I so that departures from this tonality are made more conspicuous:

It is also interesting to note the predominance of I and V chords at the beginning of the first movements of Mozart's Eine Kleine Nacht Musik and Symphony No. 40 in G minor. Of particular note are the repetition and emphasis at cadence points.

The dissonances developed during the Baroque era were still utilized during the Classical period. These included seventh chords
and ninth chords as well as chromatic alterations. However, the chromatically altered chords in Mozart's Symphony No. 40, introduced toward the end of the statement of the first theme in the first movement, reveal a growing boldness in the use of unprepared dissonance:

The effects of modulation were explored within the controlled bounds of a development section in the newly emerged sonata form. In fact, some of the experiments in modulation were quite daring, as are the chromatic modulations in the development section of the first movement of Mozart's Symphony No. 40. In addition, more distant modulations with and without pivot chords were gradually introduced to increase tension. For example, the quite rapid, often unprepared key changes used throughout the Fantasia in C minor K475 by Mozart are even unusual for the Classical period. Nevertheless, they foreshadowed some of the developments that would emerge in the nineteenth century in the compositions of Chopin and Wagner.

During the Romantic period, harmonic developments in Western art music gathered momentum and, to a large extent, overshadowed other developments in the period. The triadic system was fully exploited. The resultant developments in increased tension have been well-summarized by Hans and Shulamith Kreitler.
In the beginning a musical composition had to stay within the framework of a specific key. . . . When the possibilities of producing tension by these limited means had become too familiar to listeners, a new procedure had to be devised for the enhancement to tension. Tones outside the key began to be used, so that these formed a new dissonance. The resolution, however, followed immediately, by means of a return to the harmonic tones of a key. . . . In the course of time, new means of tension had again to be developed, and the practice of using several keys in the same composition set in. . . . Changes from one key to another were, of course, not performed capriciously. Initially, even the permitted shifts were strictly limited to near or related keys. . . . When the fascination of modulation wore out . . . instead of passing to nearby keys over elaborate and lengthy bridges—modulations took the form of ever shorter passages over the chords common to or almost common to the two keys, so that keys increasingly removed from each other were used consecutively with no bridge between them. 26

What Mozart had done with regard to bold modulation in his Fantasia in C minor became quite common, as can be seen in Beethoven's piano sonatas (for example No. 17 in D minor and No. 21 in C major), his String Quartet No. 16 in F major and even Schubert's song, Erlkönig. All show a greater freedom of approach in this area.

In trying to understand why composers moved in this direction, it seems significant that in the Erlkönig, for example, the rather bold modulation to more remote keys occurs as the emotional intensity of the words increases throughout the song. In other words, Schubert recognized that to portray the mounting tension of the words of the song he needed musical elements that also increased tension in the listener. He also recognized that to modulate to unrelated keys with little or no preparation would help to do this. The key changes from measure 76 to the end of the song are particularly noteworthy: G minor(V) - B minor - G major - C major - C# major -

D minor - E♭ major - D minor - G minor - A♭ major - G minor.

Even though the *Erlkönig* is a relatively simple song compared to the larger more complex compositions of the Romantic period, it still demonstrates very well many of the characteristics of the period. Chromaticism, another tension-producing device, is also quite apparent in sections of the song. It is skillfully used to assist in some of the key changes.

As chromaticism became more commonly exploited and modulations became more abrupt and less related to the key, the sense of the key center became progressively weaker. Tonality which itself had provided the foundation for the development of more powerful tensions was gradually being forced apart by the tension-producing factors it had spawned.

In the *Preludes* of Chopin one sees on a small scale the same developments that Wagner was to bring to fruition in his opera *Tristan and Isolde*. Chopin had already experimented with heavily chromatic sonorities such as unresolved consecutive diminished seventh chords in the middle section of his *Etude in E major Op. 10, No. 3* published in 1833. Interestingly enough this piece also contains what has become one of the well-known Romantic melodies.
It seems that the melody which is used at the beginning and end of the piece helps to offset the turbulence of the middle section:

However, it is in Chopin's Prelude in E minor Op. 28, No. 4 (1839) that the break up of tonality is quietly and unassumingly exploited:
In both of these examples any sense of key center is almost completely obscured. If it were not for the return to the original melody in the Etude, and the final cadence resolution in the Prelude, there would be no point of relaxation for the tension that is built up in these compositions.
The thrust and power of this type of tension production was deliberately and grandly exploited by Wagner. This was the most powerful means he knew to portray the strong feelings in the romance between Tristan and Isolde. A piano arrangement of the first 24 measures of the Prelude to the opera demonstrates this point:

Besides the very evident chromaticism and the free modulation to almost any key, the frequent use of deceptive cadences helps to maintain the tension created in the harmonic structure at a
continuously taut level. There is no chance for relaxation, and thus what has been called "unending melody" and unresolved tonality is created.

The ambiguous use of tonality and the avoidance of any strong formal cadences gradually became more common toward the end of the nineteenth century and the beginning of the twentieth century. Dissonance, which had previously been used to create strong tension only to be subsequently resolved into consonant $5\over 3$ chords, now became the mainstay of the harmonic structure. This was particularly true of all types of seventh chords. Primary triads in root position and their inversions became the exception rather than the rule. Tristan and Isolde shows a distinct move toward a more dissonant form of musical composition than anything composed previously. Consequently, the effects of this type of dissonance, which were once considered to be strong, became commonplace. The way was thus prepared for even more potent dissonance, which would demand even greater psycho-physiological involvement.

Developments in harmony had accelerated to unprecedented heights during Wagner's time; however, the break up of tonality was not complete. In order to make way for the harshly dissonant sonorities of Expressionism of the twentieth century, more momentum was needed than the work of one or two radical composers could afford. Even the more conservative Romantic composers such as Brahms helped to weaken tonality by the fusion of the major and minor systems. Ambiguity resulted from using chords typical of one mode in another mode. The beginning of the first movement of
Symphony No. 3 by Brahms is a typical example of this—one is not quite sure whether the fundamental tonality is F major or F minor. This tonal ambiguity also resulted in a certain amount of tension in the listener. Ambiguity was exploited further in the Impressionist School, where "washes of color" became more important than distinct melodies and key centers. To achieve this, the Impressionist composers such as Debussy, Honegger, Milhaud, and Ravel introduced the use of parallel chords, neomodality, and new scale systems such as the pentatonic and whole-tone scales, which also helped to further break down the three-century-old tonal harmonic system. Pieces such as Prelude Après midi d'un faune, La Cathédrale engloutie, and Reflets dans L'eau by Debussy illustrate most of these characteristics.

The increasing use of ninth, eleventh, and thirteenth chords, evident in the music of Bruckner, Scriabin, Stravinsky and others working around the time of the turn of the twentieth century, also increased tonal ambiguity and dissonance. The climax in the first movement of Bruckner's Symphony No. 7 is a good example of a piece in which a ninth chord is extended to an eleventh chord and then to a thirteenth chord:

![Musical notation image]
This not only produced a rather large dissonant sonority but also provided opportunity to increase the volume of sound, both of which increase psycho-physiological response in the human organism.

Another source of dissonant harmony that was often exploited at the same time was the use of polyharmony. Polyharmony consisted of two streams of harmony being played against one another as, indeed, two melodies had been played against one another in an earlier period. This is demonstrated in Stravinsky's *Petrushka*:

\[ \text{etc.} \]

Instead of basing chords on superimposed thirds, composers began to use superimposed fourths and fifths as shown in an example from Scriabin's *Prelude No. 1, Op. 74*:

\[ \text{measure 6} \quad \text{measure 10} \]
One should also notice this chord of piled-up fifths from Stravinsky's *Rite of Spring*:

Experimenting with a more compact type of sonority, Bartok explored the dissonance of tone clusters, particularly in his compositions for piano. These cluster-chords were often struck in a loud percussive manner, which naturally intensified the effect on the listener. Charles Ives' composition *General William Booth Enters into Heaven* (1914) illustrates the use of tone clusters (1) as well as polychords and mixtures of the two (2):
Thus as increasingly harsh, dissonant sonorities were invented and experimented with, tonality was gradually broken up and eventually abandoned. In the 1920s, with the development of dodecaphonic music, atonality, or the negation of tonality, was complete. In the twelve-tone technique, which was developed and practised by Schönberg, Berg, Webern, Krenek, and others, the distinction between dissonance and consonance ceases to be relevant. All relationships between tones are possible and usable, and there is no hierarchy of dissonance and consonance. 27

What was previously harsh dissonance has, in the twentieth century, become increasingly commonplace, indeed, the foundation——

the norm—for any musical composition. Machlis comments: "Our era is interested in the dissonance rather than in the resolution. The greater amount of dissonance in contemporary music reflects the heightened tension and drive of contemporary life." It is significant in this context that the twelve-tone school was specifically developed by Schönberg to try to depict the frustrations and deep-seated turmoil of the emotional forces within the real inner-self, the real personality of an individual which exists beneath the external veneer revealed to the world. This music was to describe the dark, hidden recesses of the subconscious mind which was being investigated in the psycho-analysis of Freudian psychology. Alban Berg's opera Wozzeck is an example of this type of music.

Because dissonance had become such a powerful element in musical communication, it was now merely intensified in order to create a music "that functions always at maximum tension." Consonance was deliberately avoided "because of its association with the external world of conventional beauty." Dika Newlin, Schönberg's biographer, has described the use of dissonance in twelve-tone music as producing "its well-nigh hysterical emotionality."

Dodecaphonic music represents a deliberate attempt to try to create a type of music that has maximal effect on the listener. It

---

28 Machlis, op. cit., p. 22. 29 Ibid., p. 141.
31 Machlis, op. cit., p. 141.
is significant that again a deliberate move toward more harsh dissonance is evident. The evidence seems to indicate that this is an unchanging course which has been pursued with uncanny consistency and persistence throughout Western art music history. The historians merely confirm this trend when they write that "twentieth century harmony is recognized as being much more dissonant than that of previous eras."  

From the late 1940s, electronically contrived music began to appear on the music scene. It appeared first as musique concrète and then as purely electronically produced sounds. Sounds were no longer put together on the basis of their function in a tonal system, but rather in terms of sonorities or tone colors. During the 1960s Penderecki made some use of voices and traditional instruments. However, they were utilized in a very untraditional manner. Sounds not usually associated with the instruments in a musical context were called for to add more color to the palette of sound sonorities available. Examples of this type of music can be heard in Threnody for Victims of Hiroshima and Passion According to St. Luke, both of which are by Penderecki.

Thus Western art music has developed to include not only sharp and harsh tonal dissonance but even so-called "noise" or unorganized sound as a sonority. Perhaps Gerd Jensen's studies on the effects of noise pollution in a steel factory in West Germany are more relevant to the study of the psycho-physiological effects of Western art music than is first evident. This is particularly so in the light of compositions such as Steel Foundry, from

\[32\] Wold and Cykler, op. cit., p. 235.
Symphony of Machines (1928) by Alexander Mossolov, which tries to imitate sounds in a steel foundry and Dnieprostrot, by Meytuss, which tries to imitate the sounds of sinking pylons into a river. All this should dismiss any uncertainty as to how much correlation there is between the effects of the experiments studying nontonal sound and the study of the effects of tonal sound on the human organism.

Besides the effect of volume, which is discussed later in this chapter, the fact that this type of sound sonority involves the simultaneous sounding of a whole range of nontonal pitch frequencies makes it comparable to the dissonant tone cluster used by Stravinsky, Bartok, and Ives, only on a much more complex level. It has already been shown in a study by Neher\(^{33}\) that percussion instruments of indefinite pitch are able to affect a larger area of the human brain, because many more frequencies are involved than with an instrument of definite pitch. Considering then that any move to harsher dissonance and greater complexity in a sound sonority evokes increased reaction in the human organism's response, it would appear that inclusion of "noise" in Western art music merely confirms that historically there has been a trend to increase psycho-physiological involvement.

### Rhythm

Rhythm is the principle of organization that "regulates the flow of music in time."\(^ {34}\) It is that element of music concerned with

---


\(^{34}\)Machlis, *op. cit.*, p. 29.
periodic accent and the duration of tones. Rhythm has always been present in music. However, as an organizational principle in Western art music, it has not always functioned historically in the same way.

It would appear that the rhythmic element in music has always been associated with some degree of psycho-physiological response in the human organism. However, a study of the development of rhythm provides evidence that there has been a tendency to increase the potency of its communication, along with similar developments already discussed with regard to the development of melody and harmony.

It has been shown in Chapter II that once a metrical concept of rhythm is established, the more complexity and irregularity in both duration of tone and accent are introduced, the greater will be the effect on the human organism. However, from a study of experiments done on the effects of rhythm, it seems that a firm sense of regular underlying meter must be present for the departures and irregularities to be most effective. The historical development of rhythm shows that the path to increase the psycho-physiological effect of rhythm has led first to the establishment of metered music, and second to the introduction of rhythmic irregularities and complexities.

Up to 1200 Western art music was "measure free" music. Before 1200 the rhythm of the music was determined by the poetic flow of the prose. This was usually governed by the long and short syllabic structure of Latin. Rhythmic patterns with periodically regular

---

36 Wold and Cykler, op. cit., p. 16.
accents were absent in sacred monophony. Thus at the beginning of Western art music history the rhythmic element was at a stage where it had least effect on the human organism. Secular music—for example, dance music—often had a more metrical basis in order to provide a suitable background for rhythmic movement. However, these rhythms were generally very simple triple or duple meters.

With the development of polyphony, it became evident that a degree of rhythmic organization was needed so that there was some agreement of accent between simultaneously sounding voices. Thus a system of six different rhythmic modes was invented to provide some means of cohesion. Each of these modes was used as a repeated rhythmic pattern:

\[
\begin{align*}
\text{I:} & \quad \cdot \quad \cdot \quad \cdot \\
\text{II:} & \quad \cdot \quad \cdot \\
\text{III:} & \quad \cdot \quad \cdot \\
\text{IV:} & \quad \cdot \quad \cdot \\
\text{V:} & \quad \cdot \\
\text{VI:} & \quad \cdot \quad \cdot 
\end{align*}
\]

It seems significant that even these early moves away from poetic rhythm to some more regularly patterned system of rhythmic
organization was associated with composers "who were concerned with extending the expressiveness of music." Could it be that the poetic rhythm with which Western art music had begun had lost some of its expressive potential, and so a horizontally metered rhythm was introduced to provide the rhythmic element in the music with more vitality and expressive power? There seems to be a parallel here with the process of harmonic development. It appears that here one can trace one of the first small steps to develop the rhythmic element into a more potent, psycho-physiologically stimulating force in Western art music. As Western art music had begun without a periodically measured rhythm, a framework had to be erected from which the complexities and irregularities which produce the greatest psycho-physiological effect could emerge. It is interesting that even this gradual building of the framework was considered to be a move in the direction of greater expressive potential in the total musical communication.

Leonin, a twelfth-century composer of the Notre Dame school, initiated this modal rhythmic organization by measuring the top voice in his two voice organa. Here, for example, is the first line of a Hec dies in Leoninus style (c. 1175):

\[\text{music notation}\]

\[\text{etc.}\]

\[37\text{Ibid., p. 33.}\]
The predominant use of rhythmic mode No. III in the first section should be noticed here. A little further on in the clausulae of the same composition, both voices have been measured simultaneously as can be seen in the following example:

Perotinus (c. 1200) was the first composer of Western art music to establish the three-part composition with all three voices treated methodically in rhythm and meter. Toward the end of the thirteenth century, the rhythmic concept established by the modes was broadened by the introduction of smaller note values in the place of one breve. This opened the way for the future development of more complex rhythms. At this time the triple meter was the predominant pattern used in Western art music, particularly in sacred music. Secular forms used either triple or duple meter.

The next step in building the framework of rhythmic structure came shortly after 1300. Duple and triple meter began to be recognized as of equal standing in art music. As a result of the equivalent use of all note values from maxima to the semiminima in both meters, Philippe de Vitry (c. 1320) established the system of meters 2/4, 3/4, 6/8, and 9/8 as the basis for mensural notation. This broadened the scope for exploration and it also brought with
it rapid advances in the use of rhythmic subtleties such as dotted rhythms, triplets, hemiola formations, syncopation, and polyrhythms. The isorhythmic principle, in which the talea was the rhythmic pattern and the color the melodic pattern, was also developed at this time.

The period around the fourteenth century is loosely referred to as the Ars Nova or the "new art." The developments in rhythmic complexity were indeed a prominent part of the newness in art music at that time. Notice should be taken here of the range of note values, including a dotted eighth, in this isorhythmic motet from the Roman de Fauvel: Detractor est:

Guillaume de Machaut was an important—if not the most important—composer of this period. A line of one of his motets, De bon espoir—Puisqu' al douce rouse—SPERAVI, composed around the mid-fourteenth century, illustrates here the complex use of hemiola:
To illustrate the rhythmic complexity that was indulged towards the end of the fourteenth century, two examples are included. The first is from a ballade, *En attendant*, by Jacopin Selesses and the second is *Amans ames*, a rondeau by Baude Cordier:
It is very evident that the rhythmic structure of this music is highly complex and irregular, and that it must have had an increased effect on the listener. As has already been observed, this music was the direct result of a desire to make rhythm a more powerfully expressive element. However, there are several factors that need to be mentioned which help to define the relative position of Ars Nova music in the context of historical rhythmic development. First until the seventeenth century rhythm was horizontally rather than vertically conceived, as, indeed, was the whole concept and perception of music at that time. This meant that although individual voice parts became rhythmically complex and irregular, the overall effect on the listener was often ameliorated or even negated because of the polyphonic texture of the music. Thus the listener would not have necessarily discerned all the rhythmic complexities as the total stimulus of sounds reached him or her. Perhaps the educated listener who could follow one part more accurately would have noticed more and hence would have been
affected more. However, as Grout observes, "the sophisticated music of the southern French courts was designed for auditors of exceptional cultivation and performers of professional skill."\textsuperscript{38} This is not to deny that in some sections, such as measures three, six, and fifteen in the \textit{ballade} by Selesse, irregular rhythms would have been prominent, despite the polyphonic texture. However, if these pockets of metric disruption are compared to the vertical complexities of rhythm which pervade the whole fabric of the music of the twentieth century, it is evident that the overall effects of rhythm are far more pronounced in the twentieth century than they would have been in the fourteenth century.

One must also consider that there has been an increase in the number of parts, and hence an increase in the volume and power of the total rhythmic pulse of twentieth-century music. In the late fourteenth century, music generally contained only three parts, and if each individual part had different rhythms the overall effect of the irregularities were drastically diminished in power and intensity.

It would appear that around the end of the fourteenth century and the early fifteenth century composers sensed that a limit in the effectiveness of rhythmic complexity had been reached. The expressive power of rhythm had been exploited as far as was feasible--given the polyphonic structure of music at that time. During the fifteenth century these complexities generally disappeared and "measure free" polyphony ruled compositional technique until the

\textsuperscript{38}Grout, \textit{op. cit.}, p. 137.
Baroque period. It was as if the developments in rhythm which had mushroomed during the fourteenth century had been frustrated by an impasse, which at that time could not be surmounted. So the prominence given to the development of rhythm waned. For the next two to three hundred years attention seemed to be focused mainly on melodic and harmonic developments. Thus the foundation was laid for a dramatic surge of rhythmic development in the twentieth century. Rhythmic development took a small step backwards in order to take a giant leap forward. This is not meant to imply that no rhythmic development occurred between the fifteenth and twentieth centuries, but rather that this musical element was not in the spotlight as it had generally been in the fourteenth century.

The lack of any strong metered rhythm is very evident during the fifteenth and sixteenth centuries. The works of Palestrina, di Lasso, and other composers of the sixteenth century abound in examples in which the underlying meter has been obscured by what have been called "multimetric formations" in the different voice parts. An example of this is an extract taken from Adoramus Te by Palestrina:

---

This could be rewritten thus to show more clearly these multimetric formations:

However, almost imperceptibly smaller developments were occurring which influenced the development of rhythm. For example, during the fifteenth and sixteenth centuries, in the absence of strict metrical rhythm, the concept of "harmonic rhythm" developed. Accents became associated with the intervallic harmony of voice...
leadings, particularly as devices such as suspensions, appoggiaturas, and new voice entries were explored. This is illustrated in the middle section of the Kyrie from the Missa L'Homme arme by Johannes Ockeghem:

Palestrina's Adoramus Te contains some good examples of accents associated with new voice entries. However, in that the different parts of this polyphonic music overlap and the accents of voice entries occur at different times, it removes any sense of regular metered rhythm pattern. Rhythmic regularity is further confused by the accents produced by the harmonic progressions. An example of this can be found in the last measure of Palestrina's Adoramus Te.

Once isometric rhythm had been introduced into Western art music this type of harmonic rhythm added complexity to the purely metrical structure. The Liebestod from the opera Tristan and Isolde by Wagner provides an example of this. By using harmony as one already psycho-physiologically stimulating musical element and
adding to it irregularity of accent, the effects on the human organism were compounded.

However, in the fifteenth and sixteenth centuries composers were exploiting harmonic rhythm on its own, and as such the effect of this type of rhythm on the human organism was probably more a result of the harmonies than of the rhythm. It is, however, still an important step in preparation for future developments.

It seems that the Baroque period produced significant developments in most of the psycho-physiologically stimulating aspects of music, rhythm being no exception. It was during the seventeenth century that the barline entered Western art music, and rhythm took on a vertical, isometric concept. This was an important development—one of those isolated spotlight occurrences between the fourteenth and twentieth centuries. It probably occurred as a result of the simultaneous change to a vertical conception of harmony. However, it was the first time in art music history that all parts on one score were consistently measured and metered in the same way, with regular accents pervading and regulating the entire fabric. Previously dance music and popular vocal music had employed this type of rhythmic organization, but now it became general practice. The very fact that this type of isometric rhythm had been consistently used in dance music implies that such music has a greater capacity for psycho-physiological effect. This was the very foundation that was needed for the development of a more potent rhythmic element in Western art music. Just as harmony had been projected into a new sphere of power with the introduction of a vertical concept and
perception, so the introduction of a vertical concept of rhythm radically increased the potential for rhythmic stimulation.

At first composers seemed content to explore the strong regular accents inherent in generally simple isometric rhythms. One must remember that the developments in melody, harmony, rhythm, and dynamics were all surging forward at this time, and that the composers' attention was demanded on many different fronts at once. History shows that melody and harmony were probably given more attention at this time. It was not really until the nineteenth century that the dissatisfaction with the more simple isometric rhythms became widespread, and momentum gathered for the adoption of greater rhythmic intricacy and irregularity.

Although basically simple isometric rhythms were used in the seventeenth and early eighteenth centuries there are several other smaller developments which point toward a tendency to increase psycho-physiological effect. First, a regularly recurring rhythmic pattern, together with the emerging concept of tonality, led to the formation of larger pieces of music. Compared with the complex organization of polyphony, the more readily comprehensible rhythmic organization of Baroque music facilitated the attention span of the listener. This development is significant in that it provided the composer with greater opportunity to create a more total experience. A progression of feelings could now be expressed and explored, and thus musical communication could be intensified.

Second, harmonic rhythm often moved quite rapidly as a result of harmony changes being controlled by a melodic basso
continuo. Although metric rhythms may have been simple, the driving harmonic rhythm contributed to the force of the total rhythmic motion. One should notice the changes on almost every quarter note in these lines taken from an aria with ritornellos by Adam Krieger (1634-1666):

The moving basso continuo provided a sense of driving, almost motoric rhythm which would have added interest and vitality. The opening measures of the aria Erfreue dich Seele by J. S. Bach illustrate this:
Around 1700 Vivaldi introduced another small development which served to increase the total psycho-physiological impact of rhythm on the human organism by the means of increasing rhythmic complexity. This innovation was concerned with the use of notes of small value in the context of a simple meter to produce a precise and energetic rhythm. These notes were simultaneously sounded by all parts, as demonstrated in the last movement of *Concerto No. 2 in G minor Op. 336* from The Four Seasons. The resultant driving rhythmic vitality was something which late Baroque composers used and exploited. For example, in the first movement of J. S. Bach's *Brandenburg Concerto No. 2 in F major* the consistent eighth note rhythm dominates the fabric of the music:

Baroque composers also explored the use of dotted notes—the prolonging of the time value of one note and the shortening of the
time value of the succeeding note—as a rhythmic device. With the new vertically conceived isometric rhythm, dotted figures became much more apparent in the musical texture. Thus they were consistently exploited for their dramatic and jagged effect and were particularly useful for portraying certain emotions and feelings. In his oratorio, The Messiah, Handel uses dotted figures to good effect in the middle section of the alto aria, He was Despised, to portray the horror and cruelty of Christ's suffering. The smiting, the plucking, the spitting are represented by a simultaneously sounding background of jagged, irregular rhythm:

\[
\text{Un poco piano,}
\]

The same rhythm is carried on into the chorus, Surely He Hath Borne our Griefs. It is deliberately and very forcefully contrasted in the middle section of this chorus by a short, smooth-flowing section. Even though this use of rhythm, along with certain uses of harmonic dissonance, can probably be ascribed to the concepts of the Affektenlehre prevalent at that time, it is still significant that this type of rhythmic irregularity was used to portray powerful and striking sentiments. The fact that such rhythmic configurations
are associated with increased psycho-physiological response in the human organism suggests that perhaps some of the Affektenlehre practices are based on something more than speculation and tradition.

Inverted dotting or "scotch snap" also made its first significant appearance in art music during the Baroque era. It appeared first in the late sixteenth century to indicate correct pronunciation in French songs. However, during the seventeenth century it became extremely common in Italian and English music and was again significantly associated with exaggerated expressiveness in musical communication. Examples of its use can be seen in Caccini's Le Nuove Musiche.

The exploration of rhythmic irregularity to achieve more pronounced rhythmic effect also evidenced itself in the practice of double dotting notes. This practice was mainly associated with instrumental music and it was particularly developed in France. The slow sections of Lully's French Overtures abound in examples of this development. Handel used this style in the first part of the overture to The Messiah:

\[ \text{etc.} \]

\[ \text{etc.} \]

\[ \text{etc.} \]

---

\[40\text{Ibid., p. 243.}\]
In this example the maximum effect of the rhythmic figure is achieved by the vertical synchronization of all instruments in block chord structures.

However these rhythmic variations did not interfere with the generally simple, recurring, metric accent of the music of this period. It seems that the time values of notes were stretched about as far as they could be without upsetting the overall set meter. This allowed for added vitality and variation for expressive purposes within the set framework. Nevertheless a more potent rhythmic language was gradually being built up.

The latter half of the eighteenth century saw the consolidation of rhythmic developments rather than the introduction of any major, new rhythmic innovations. The broken-chord figure known as the Alberti bass was used extensively as a repeated rhythmic pattern in the piano sonatas of Haydn and Mozart. An example of this is found in the left-hand part of the beginning of Mozart's Sonata in C major K545. However, it was a very regular pattern, which merely provided a secure foundation, from which irregularities in the rhythm of the melody could originate.

Throughout the seventeenth and eighteenth centuries the use of accents was basically very predictable—they were always placed on the first beat of the measure. Towards the end of the eighteenth century, Haydn experimented with shifting accents to those beats of the measure that were generally considered to be "weak." His Symphony No. 104 (The London) written in 1795 provides examples of this. In the third movement a dynamic accent is placed on the
third beat of each measure giving the effect of an off-balance rhythm:

![Musical notation]

The effect of this unusual accentuation is heightened by the concept of a vertical synchronization of sound so that no other sounds can interfere with or subtract from the strength of this displaced accent. As Hanson comments, this was "a mild disturbance it is true, but a forerunner of later developments." 

In the first movement of Beethoven's *Eroica Symphony* the dynamic accent is not only used on the second beat in a triple meter, but it is also used to introduce a duple meter within a triple meter:

![Musical notation]

---

41 Hanson, *op. cit.*, p. 367.
In another place in the same movement the duple meter is introduced again, only this time by means of note values:

Beethoven's middle-to-late piano sonatas show an increasing tendency to place emphasis on weak beats, thus upsetting the regular metrical accent in the piece.

Around the turn of the nineteenth century it is evident that there was a gradual gathering of momentum toward greater rhythmic irregularity and complexity. Beethoven's *Eroica Symphony* (1804) was one of the heralds of the Romantic period. Many of the characteristics and developments which were to be exploited during the nineteenth century were initiated by Beethoven. It has been said that he was "the first to use 'complete syncopation', i.e., the displacement of accents in the entire texture." This is particularly to be found in later works such as the Piano Sonata Op. 101:

---

Syncopation, or the deliberate disturbance of the normal pulse, was used in earlier music, but normally it occurred only in one part while other parts continued to maintain and emphasize the normal pulse of the meter. However, the synchronization of syncopation in all parts was a very forceful means of creating a complete imbalance in the listeners' feeling of rhythmic security.\textsuperscript{43} This type of departure from regular dynamic accent and meter carried with it an increased capacity for boosting the psycho-physiological effect on the human organism.

At the beginning of the nineteenth century, syncopation, which really includes all the various means of displacing dynamic accents, was somewhat limited in its use. Generally it was employed to heighten climax points, as was the case in the examples from the \textit{Eroica Symphony}. As the Romantic era progressed, however, more and more scintillating, irregular rhythmic effects were used more and more freely. Many of Schumann's works contain examples of the consistent employment of irregular rhythms. The third movement of his \textit{Piano Concerto in A minor} includes the following example of a duple meter in a section which is fundamentally in a triple meter:

\textsuperscript{43}\textit{Ibid.}, p. 828.
This duple rhythm continues for over forty measures. It is then followed by an ambiguous section in which triple and duple meters alternate. Finally triple meter becomes prominent again. However, the ambiguity between the two meters continues, including some quite prominent sections of displaced rhythmic accent in the left hand of the piano section:

The Fantasiestücke, particularly Des Abends and Grillen, provide additional illustrations of experimentatic: with different rhythmic complexities by this composer.

This serves to illustrate that by the mid-nineteenth century composers were beginning to deliberately and more generally exploit rhythmic irregularity. The foundation of vertical isometric rhythm
had been firmly laid down so these departures could be deliberately employed for their effect.

However, this move toward rhythmic irregularity was not limited to one composer. The increased use of cross-rhythms and syncopations became evident in the works of composers such as Chopin and Brahms. The Preludes of Chopin reveal not only his experiments with the use of dissonance and harmonic ambiguity but also rhythmic complexity and irregularity. One should notice this example from Prelude No. 1 in C major Op. 28:

In this example, triplets, quintuplets, and a dotted eighth note followed by a sixteenth all combine in what is fundamentally a duple meter. The effect of dotted notes being used in conjunction with triplets is explored in Prelude No. 9 in E major:
Consistent second and fifth beat dynamic accents provide the syncopated rhythms in *Prelude No. 22 in G minor*:

![Musical notation](image)

The *Nocturne Op. 15 No. 2 in F♯ major* provides an example of a syncopated left-hand rhythm as well as right-hand complex cross-rhythms:

![Musical notation](image)

These are not isolated examples. Entire compositions exploit these rhythmic intricacies. *Symphony No. 2* by Brahms is an example of work in which cross-rhythms are consistently used.

The use of superimposed rhythmic patterns became quite common, particularly the grouping of two against three or three against four. For example, the beginning of the *Valse in Aᵇ Op. 42* by Chopin provides an example of the rhythmic pattern of the grouping of two against three, and *Fantasie Impromptu in C♯ minor Op. 66* by Chopin provides an example of the rhythmic pattern of the grouping of six against eight.
The use of rubato, which affects the tempo of the general rhythmic pulse of a piece of music, came into prominence during the nineteenth century. Chopin's use of rubato in the performance of his own compositions allowed for a deliberate unsteadiness in general rhythmic tempo. The slight surging and waning in tempo was exploited to intensify the communication of expressive feeling, particularly around climax points. Rubato was often used simultaneously with other factors such as high pitch and volume, which have already been shown to be associated with increased effect on the human organism. The whole concept of tempo variation was explored more and more during the Romantic period to increase the emotional impact. The changes in rhythm and tempo in the last movement of Grieg's Piano Concerto in A minor should be noticed. The end of Tschaikovsky's Piano Concerto No. 1 in B minor provides another such example. Even the use of ritardando and accelerando was exploited during this period more than at any time previously. One of the first, if not the first, accelerando to be used in Western art music was used by Haydn in the latter half of the eighteenth century in his Symphony No. 60 in C major. By the late nineteenth century the ebb and flow in tempo was one of the highlights of interpretation. One notices, for example, the composer's intentions in the final pages of Rachmaninov's Piano Concerto No. 2 and Piano Concerto No. 3. In the last 180 measures of Piano Concerto No. 2 there are at least seventeen marked changes in tempo without including the use of rubato.

It has been suggested that throughout the history of Western
art music there has been a move to greater variation in the overall
tempo of compositions. When art music was first notated, it seems
that the notation itself expressed an absolute note value, variable
only within small limits. These limits were most probably linked
to various natural tempos such as walking or the pulse rate of the
human organism. However, there has historically been a trend to
extend these limits. With the entry of tempo markings from around
1600, the tendency has been to make fast sections faster and slow
sections slower than they were originally. The virtose performers
of the nineteenth century often exploited fast tempo for deliberate
and stunning emotional effect. This is significant in the light of
Hanson's comment that the "further the tempo is accelerated from
the pulse rate toward the upper limit of practical tempo" the
greater increase in emotional tension in the human organism.

It is quite clear that in the nineteenth century, despite avid
interest in harmonic development, the rhythmic element was given more
than casual attention. The nationalist schools which emerged around
the mid-nineteenth century added much to the rhythmic palette,
drawing their rhythms from national folk dances and songs. The
Russians played a leading role in this development together with
Polish, Hungarian, Bohemian, Norwegian, and Spanish composers. For
example, the opera Boris Gudunov by Mussorgsky displays some of the
jagged, erratic rhythms of Russian folk music. Borodin's Prince
Igor with its Polovtsian Dances provides yet another example.

45 Hanson, op. cit., p. 365.
Chopin's Mazurkas, Grieg's Lyric pieces, Smetna's The Bartered Bride, Sibelius' Tone Poems, and Dvorak's Slavonic Dances and Rhapsodies all provide evidence of the influence of national folk music on art music composition in the mid-nineteenth century. The unique dance rhythms of Spanish music were exploited by composers such as Albeniz, Granados, and Manuel de Falla, whose ballet The Three Cornered Hat provides a good example. National folk music almost always includes some piquant rhythmic complexities and irregularities which composers hastened to incorporate into art music.

It seems significant that this emphasis on nationalistic music came at a time when rhythm was gradually gaining more and more attention from art music composers. Consequently, folk-music rhythms had a direct effect on the development of rhythm in Western art music. The influence of folk music continued on into the twentieth century, when composers such as Stravinsky, Bartok, Kodaly, Janacek, Enesco, Villa Lobos, Chavez, Gershwin, Ives, and others on the Western side of the Atlantic fully exploited the rhythmic element in its vertical isometric form.

Generally there seems to be no doubt that the development of rhythmic complexity and irregularity gathered momentum and became more common and widespread throughout the nineteenth century. This provides ample support for the case that there has been a trend to increase the psycho-physiological impact of rhythm on the human organism.

In commenting on the development of rhythm from the sixteenth to the twentieth century, Hanson makes the following summary observation:
The increase in the use of disruptive dissonance and rhythmic irregularity from the sixteenth to at least the middle of the nineteenth century was slow and gradual. With the advent of the twentieth century, however, caution was generally abandoned and music proceeded rapidly on the path to greater harmonic dissonance and greater rhythmic irregularity.46

Music historians are in general agreement that in the twentieth century rhythm has played a much more prominent role in music than in most other periods of history. Rhythm in the twentieth century has greater vitality, complexity, variety, and flexibility.47

The rhythmic developments in the twentieth century can be summarized as follows:48

1. New metric schemes such as 5/8 and 7/8 were introduced, as can be seen in the opening scene from Stravinsky's ballet *Petrushka* and Mars from Holst's orchestral suite *The Planets*. Other musical meters such as 4½/4 and 3½/4 can be found in General William Booth *Enters into Heaven* by Ives. In this composition Ives introduced an unusual, new, and irregular type of accent into the metered rhythmic system.

2. Multimetric music in which rapid meter changes occur were also exploited to enhance rhythmic vitality. This is illustrated in an example from Stravinsky's *Rite of Spring*:

---

46 Ibid., p. 367.
Bartok in his *Mikrokosmos Book V, No. 126* experiments with time changes in each measure, thus consistently and constantly producing irregular accents in the vertical rhythmic structure. The consequent unexpectedness of the accent means that each accent has maximum effect on the human organism, thus increasing the potency of the rhythmic communication.

3. Another practice with similar results to those outlined in the previous two points was initiated by using asymmetrical beat groupings. An 8/8 meter was split into at least three different groupings, for example 3-3-2 (rumba), 3-2-3, or 2-3-3. As seen in the Scherzo movement of Bartok's *Fifth String Quartet*, a time signature may be indicated as $\frac{4+2+3}{8}$ (9/8 meter). The trio section of this same movement is divided $\frac{3+2+2+3}{8}$ (10/8 meter). Regular meters such as 3/4 and 4/4 were also given different beat groupings besides the already irregular displacing of dynamic accents. Below is an example from David Ward-Skinman's *Three Lyric Preludes* for keyboard, *Prelude No. 3*:

---

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
In this piece the 3/4 meter has been divided into groups of 1\(\frac{1}{2}\)-1\(\frac{1}{2}\), and the 4/4 into 1-1\(\frac{1}{2}\)-1\(\frac{1}{2}\). Dynamic accents have been added to help underline the irregularity.

4. Polymetric music, in which two or more meters are used simultaneously, has also been exploited for its effect. In Stravinsky's Petroushka, for example, passages of 5/8 meter appear against 2/4 meter, and 7/8 meter against 3/4 meter. The effect of these polymetric schemes was increased beyond anything of a similar nature in the fourteenth century. This is achieved first by the increased volume of sound, and second by the use of vertical blocks of parts providing the different rhythmic pulses. For example, at one point the piccolos I and II, three oboes, and the trombones play this common rhythmic figure: 7/8 \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) \(\frac{7}{8}\) which is set against a predominantly regular 3/4 meter played by the rest of the orchestra and percussion. Another example can be seen in Ravel's Piano Trio in which 3/4 meter appears set against 4/2 meter.

5. Another device which became widely used as a means of introducing rhythmic irregularity into a metered piece of music is displacement of the bar line. Conventional time signatures have been disrupted by unusual accenting of beats, as illustrated in the opening scene of Stravinsky's Petrushka. In a predominantly 3/4 meter pattern the cellos, basses, and bassoons play the following pattern:

\[
\begin{array}{cccccccc}
\end{array}
\] etc.
This effectively produces a 2/4 rhythm in a 3/4 scheme resulting in odd accents which permeate the rhythmic fabric. The bass rhythm in the *Marche du Soldat* by Stravinsky provides another example of barline displacement. In the example shown below, a 2/4 dynamic rhythm is maintained throughout the piece, despite the many different meter changes:

\[
\begin{array}{cccccccc}
\frac{2}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} & \frac{1}{4} \\
\end{array}
\]

However, this example also illustrates the grouping of beats across a barline. This is exemplified further in the *Symphony of Psalms* by the same composer. In a quite regular 3/2 rhythm the bassoons and clarinets are given this grouping:

\[
\begin{array}{cccccccc}
\frac{3}{2} & \frac{3}{2} & \frac{3}{2} & \frac{3}{2} & \frac{3}{2} & \frac{3}{2} & \frac{3}{2} & \frac{3}{2} \\
\end{array}
\]

Tying notes across the barline in prolonged syncopations is another means used to achieve barline displacement. While this device and, indeed, some other devices were used in earlier music, in the context of twentieth-century developments they simply added to an already complex range of rhythmic irregularities. Britten's *Passacaglia* from *Peter Grimes* and the "Till" theme from *Till Eulenspiegel* by Richard Strauss illustrate another method whereby
the theme itself produces rhythmic irregularity by virtue of its own length. The former has a repeated 11-beat rhythmic-melodic pattern in 4/4 meter and the latter a 7-beat pattern in 6/8 meter.

All of these developments have added to the complexity of the rhythmic element in Western art music. Many of these devices have been used simultaneously to intensify the overall effect. The harmonic rhythms resulting from the development of increasingly sharp dissonance toward the end of the nineteenth and during the early twentieth century have compounded even more the effect of unusual accents.

With the emergence of tape and electronic music, non-metric music, with its completely irregular rhythmic pattern, was introduced into Western art music. While it is true that music was non-metric in the eighth and ninth centuries, it was controlled by the fairly predictable prose rhythm of the Latin language. In the twentieth century, non-metric music is controlled completely by the unpredictable whim and fancy of the composer. The totally unexpected nature of rhythmic events heightens their effect on the human organism. This is particularly the case when it is remembered that Western society has been conditioned for the last three hundred years to expect a certain amount of rhythmic regularity to pervade the musical fabric.

It seems significant that the developments in rhythm that have occurred during the twentieth century were given impetus at the beginning of this century by the primitivism expressed in the music of Stravinsky and Bartok. The rhythms incorporated in
Stravinsky's *Rite of Spring*, for example, came from sensually oriented rites and ceremonies. It is only logical that when these same rhythms were incorporated into Western art music, they would bring with them their primitive sense-oriented impact.

The jazz idiom with its characteristic syncopated rhythms also had an influence on art music, especially around the 1920s. Satie, Honegger, Milhaud, Stravinsky, Hindemith, and Krenek all experimented with jazz as a new form of rhythmic communication. Jazz was associated with a dynamic and sensually orientated style of dance music. Its roots are found in the African drum rhythms which were brought to America during the slave trade. Machlis describes its inclusion into art music as symbolizing "the restlessness and hunger for excitement of a war-weary world."\(^{49}\) Again it seems apparent that composers were looking for and were willing to employ any device that would increase the excitement and stimulation of the musical communication, and thus make it more powerful in its impact on the listener.

The increased study in the twentieth century of non-Western cultures has also had an important influence on the development of rhythm in Western art music. This is evidenced by the boom in percussion ensembles towards the middle of the twentieth century. Rhythms from the Far East, Africa, and Latin America have been utilized. In his composition entitled *Ionisation*, Edgard Varèse (1931) explored the use of oriental rhythms and textures, using the Javanese gambon to add to the oriental flavor. The Mexican composer,

\(^{49}\)Machlis, *op. cit.*, p. 158.
Carlos Chavez, exploits the use of *ostinato* rhythms in his *Toccata* for *Percussion Instruments*. Villa Lobos incorporated rhythms from his native Brazil in many of his compositions.

The inclusion of exotic rhythms to add excitement to Western art music furnishes more evidence that sense stimulation was increasingly becoming the primary concern of the composer. No longer can it be said that studies such as those conducted by Andrew Neher on the effects of drum ceremonies on the human organism are completely irrelevant to the study of Western art music.

In 1941, following this same trend, John Cage composed his *Double Music for Percussion* exploiting various rhythms and the timbres of sounds produced by metallic instruments. Elliot Carter's *Canaries from Eight Pieces for Four Timpani* also illustrates this interest in complex rhythms and percussion instruments. It seems significant that in these compositions the rhythmic element, which is the most potent of the musical elements, has virtually been given sole emphasis, almost to the complete neglect of melody and harmony. Added to this is the stress that was placed on percussion instruments which have no distinct pitch. Such instruments produce a sound sonority composed of many simultaneously sounding frequencies, thus ensuring maximum effect on the listener. Whether or not the act is deliberate, the human organism is being bombarded by the most powerful stimulus known to composers.

Exploration of synthetic rhythms produced by electronic music began with Henry Jacob's experiments in 1953. The *Sonata for Loudspeaker in Three Parts* by Jacobs is an example in which
the sounds of different percussion instruments were electronically compiled. With the introduction into Western art music of the electronic medium, rhythmic patterns involving intricacies and complexities that defy human performance could be achieved. This opened the door to even greater potential impact on the human organism and provided further evidence of the continuing trend to increase psycho-physiological impact.

**The Use of Dynamics in Western Art Music**

Dynamics have probably always been employed to some extent in the performance of Western art music. However, it is only in comparatively recent times that dynamic markings have become part of a composer's intention in creating a musical composition.

There are no expression marks of any kind found in music written before 1500. Even until the late eighteenth century, details of expression often appear as a "somewhat extraneous addition" rather than something that was woven into the fabric of the composition. Nevertheless, as early as the fourteenth century, there was a definite distinction made between high (haut) and low (bas) instruments. This distinction referred to loudness, not pitch. It referred to the context--time and place--in which certain instruments were to be used, rather than to their expressive use within a composition.

In general it appears that before the sixteenth century

---

there was little variation in the dynamics used during the performance of a musical composition. Dynamic levels were fixed more according to the venue and the occasion rather than the communication of anything particular in a musical composition. Thus once a particular dynamic level was introduced, the effect of this factor on the listener would have remained fairly constant. If anything, there might have been a slight drop in the effect as the listener became accustomed to the continuously steady stimulus. In comparison with developments after 1600, the overall effect of dynamic levels on the human organism until then would have been relatively minimal.

After 1600 the range of dynamics used in Western art music gradually broadened enabling higher and lower intensity levels to be used within a given composition. This opened the way for sudden loud passages to be used after softer passages and also for the introduction of gradual increases in intensity, as well as for the use of sustained loud passages. With each of these developments there was a corresponding increase in the psycho-physiological effect on the human organism.

The earliest dynamic indication, *tocco pian piano* (touch very softly), is found in the *Capirola lute book* of c. 1517. The first tempo indications appeared around 1535 in *El Maestro* by Luis Milan. All of these early references to expression marks were in music written for solo instrumental performance. Some of the earliest dynamic indications for concerted music appear in the *Sonata pian' e forte* composed by Giovanni Gabrielli toward the end of the sixteenth century.
With the introduction of the monodic style in the seventeenth century, nuances of dynamic shading became more important. Again it seems noteworthy that significant developments in dynamic expression were made during the Baroque period, for it was during this period that many other developments which have been shown to increase the psycho-physiological impact of Western art music on the human organism also took place. Gradually the use of dynamic indications became more and more popular. Around the turn of the eighteenth century composers such as Corelli and Vivaldi explored the effects of sudden changes between loud and soft passages. This usually took the form of a statement followed by its echo, as seen, for example, in the fast movements of Concerto No. 1 and Concerto No. 3 of The Four Seasons by Vivaldi. Alternating large and small groups of instruments was usually used to make the distinctions between the loud and soft passages more apparent, because the facilities for marked changes in dynamics on individual instruments were fairly limited at this time. Crescendos and diminuendos had been introduced in the seventeenth century, but it was not until 1739 that the signs used today to denote these dynamic variations came into being. Geminiani's Prime Sonata (1739) was possibly the first composition to incorporate these signs.

Around 1750 members of the Mannheim school in Germany began to incorporate dynamic effects in music that are comparable to modern usage. The Symphony for Orchestra Op. 5 No. 2 by Johann Stamitz is an example from this period in which dynamic markings are regularly included:
Both \textit{pp} and \textit{ff} are called for in the course of this movement. This reveals that a steadily broadening dynamic range and capacity was being explored and looked for, even within the confines of a single composition.

Towards the end of the eighteenth century dynamics came to be part of the battery of techniques used to increase the power of musical communication. Some of the later works of Haydn and Mozart, and particularly the works of Beethoven and the nineteenth century Romantic composers, used specific dynamic markings to indicate the element of sudden surprise. Haydn's \textit{Symphony No. 94} was nicknamed the "Surprise Symphony" because of the loud, unexpected stroke of the drum in the slow second movement. The finale of Beethoven's \textit{Symphony No. 2} is another example in which sudden, loud bursts of sound not only add to the excitement of the piece but also have an increased psycho-physiological effect upon the listener.

In 1812 Gioacchino Rossini developed what has become known
as the "Rossini crescendo." This "trademark" was first used in the overture to the opera La Pietra del Paragone, and it consists of a long crescendo in which volume and instrumentation are gradually built up to achieve a momentous climax. This type of crescendo, which was often associated with a gradual rise in pitch and an accelerating tempo, became a favorite device in the Romantic period for achieving a powerful effect. A good example of this can be found at the end of the last movement of Tschaikovsky's Piano Concerto No. 1 in B♭ minor, where the last orchestral tutti builds up more and more intensity until the reentry of the piano. The build-up is produced by a gradual crescendo and a rise in pitch and increase in instrumentation. The solo piano then follows the same principles, until piano and orchestra join together in a stupendous climax. It has already been shown that the compounding of the effects of increased volume and ascending pitch intensifies the psycho-physiological response of the listener.\(^{52}\) In view of the historical trend being traced, it seems only natural that composers should take hold of this device and exploit it in order to increase the potency of the musical message of their compositions.

As the nineteenth century progressed, composers demanded more and more dynamic shade in their music. An example of this is found in the string section of the fifth movement of Berloiz' Symphonie Fantastique, in which a rapid alternating from pp to ff appears:

\(^{52}\)See p. 49 of this thesis for a discussion of this point.
Romantic composers were constantly striving to extend the outer limits of the volume range of their compositions in order to achieve greater flexibility and expressive potential. Berlioz's use of fifteen timpani and four brass groups together with a full orchestra in his *Requiem Op. 8* (1837) is just one example of this.
No longer satisfied with the peak loudness of fortissimo (ff), composers requested fff. The end of the first act of Puccini's opera La Bohème provides an example of this. Following a big crescendo, the soloists are required to sing in a fairly high pitch and in a high tessitura, while the full orchestra plays fff largamente sostenuto. Such dynamic markings are not merely notating a finer gradation in volume, but the orchestra and soloists are being requested to extend themselves to their extremity:

Wagner calls for a similar, but more sustained, orchestral buildup at the end of the duet in Act I of Die Walküre. The intention seems to be to overwhelm the listener by the sheer force of the volume.

On the other hand composers also desired to extend softness to its extreme. Tschaikovsky notated ppppp at the end of his Sixth Symphony. In Act III of Aida, Verdi notates pp, ppp, and eventually ppppp, together with the word morendo and further diminuendo marks:
The measures shown above occur soon after a section in which fff is quickly followed by ppp in order to achieve maximum contrast and effect:
By using dynamics in this way, composers were attempting to and were, in fact, succeeding in maximizing the effect of their music on the listeners. The extremely loud sections were made all the more pronounced and effective by alternating with extremely soft sections.

With the advent of electronic music in the twentieth century, the practical restrictions on the loudness levels of mechanical instruments were overturned, and even greater dynamic levels became possible and were, in fact, exploited. The record jacket of
Ginastera's *Cantata para America magica* (1960) calls for a loudness intensity that will "make the walls shake." Again the call is not merely for more gradation of dynamics within a set range of extreme levels but rather for an extension of the extremes themselves.

Particularly in the last four centuries, it has become evident that developments in the use of dynamics have coincided with developments in melody, harmony, and rhythm. All four elements have been consistently and constantly developed to increase their potential psycho-physiological impact on the human organism. Each of the individual developments that have been traced may seem to be small and rather insignificant by themselves. There may even be a temptation to regard some of them as being coincidental and inconsequential. However, when the total picture is amassed and collated, the overall trend of developments seems to point unerringly in one direction. Furthermore, it has become increasingly evident that since the Baroque period of Western art music history, the developments in that direction have escalated.

It seems significant to note that not only have the individual elements of music been exploited within themselves to increase their potential effect, but the overall consecutive development of these elements suggests the same trend. It is clear from the evidence cited so far that at the beginning of Western art music history the emphasis was almost totally on the melodic element which, on its own, affects the human organism least. Melody was gradually fully exploited and then became subservient to the emerging harmonic element which had greater potential impact on the human organism.
When harmony seemed to have been exploited to its limits, emphasis shifted to the development of rhythm--the most powerful element of all. Obviously the development of these elements overlapped, and the changes that occurred were gradual.

The general shift from a vocal to an instrumental emphasis mirrors this same trend. At the beginning of Western art music history, music was almost completely vocal in style and emphasis. Throughout its history the emphasis has changed until twentieth century Western art music is almost completely instrumental in style and emphasis. Similarly, the gradual shift from being a tone-centered art to a sonority-centered art supports this same trend of increasing potential psycho-physiological impact by means of compounded, rather than single, frequencies.

It seems that what has happened on the micro level has also happened on the macro level. The trend to develop those elements of Western art music that elicit greatest psycho-physiological response in the human organism appears to be thoroughly consistent.

This trend could be diagrammed in the following way:(see fig. 4). The compounding effect of developments in the total musical stimulus discussed so far suggests a progression which increases in geometrical proportions. A study of the development of musical instruments used in Western art music, which is the subject of discussion in Chapter IV of this study, supports this even further.

However, at this point several other more general but concurrent factors should also be briefly mentioned and discussed. These factors may cast some light on the underlying reasons for the trend that has been traced so far.
The Desire for Greater Emotional Expression

In the discussion so far, reference has been repeatedly made to the fact that many of the stylistic developments in art music history were initiated in order to achieve a greater capacity for emotional expression and exhilaration. Music historians have consistently noted this phenomenon and commented upon it.

In describing early Christian chant, Cannon, Johnson, and Waite observed that "individual expression, vain display or idle decoration are suppressed." It seems as if there is general consent that emotional exhilaration and expression were relatively minimal at the beginning of Western art music history. Grout refers to the fact that right up until the end of the thirteenth century there was a general "avoidance of chromaticism and other devices of merely sensuous appeal." However, he and others also

---

53Cannon, Johnson, and Waite, op. cit., p. 44.
54Grout, op. cit., p. 114.
note that the developments that were seen in Western art music up to this time were, nevertheless, associated with a desire for greater expressive potential. For example, the development of *melismas* and *tropes* and sequences reflects this tendency. The preoccupation with rhythmic developments in the fourteenth century were also viewed as part of this preference. The interest shown in text painting, which produced many of the developments in melody and harmony which occurred during the fifteenth, sixteenth, and seventeenth centuries, is inseparably linked with the urge for greater emotional expression. In fact, in his summary comments on the events of the fourteenth century, Grout consistently notes that there has been a general and growing search for greater emotional expression.

It is interesting that this quest for additional expressive power in musical communication was often associated with an appeal to the senses. Regarding the acceptance of the intervals of a third and sixth in the fifteenth century, Cannon, Johnson, and Waite write:

> No justification could be advanced for a harmony based on imperfect intervals other than a judgment made by the senses: it pleased the ear. It is no accident that this break-through from medieval concepts of harmony occurred at the moment in history when man no longer disdained the world of sense perceptions.

---

Grout supports this observation in his discussion of the changes in musical style that occurred between the thirteenth and fifteenth centuries. He states that there "was a gradual turning away from interest in abstract, nonsensuous principles of construction toward pleasure in sounds for their own sakes." It seems strange that the connection between the trend to greater emotional expressiveness and the trend to greater sense-orientation in Western art music has been recognized by historians and scholars but never exhaustively pursued as a separate study.

Most music historians who discuss the Baroque period of music history make mention of the desire to express feelings and emotions as being an integral part of the stylistic changes that occurred in art music during this period. The concern with the doctrine of the affections evidenced itself in melodic and rhythmic configurations and harmonic progressions. The desire for greater emotional expression was not only noticeable in the stylistic changes in the music itself but also in the development and revitalization of particular forms at this time--the opera, passion, oratorio, and cantata. Dramatic forms such as these provided ample opportunity for the development of emotional expression.

The inclusion of expression markings in the latter half of the eighteenth century was another move toward greater expressive

potential. As the nineteenth century unfolded, the "expression of emotion and the evocation of imagination became the primary goal of most Romantic music." Again and again composers initiated stylistic changes in order to achieve greater potency in their musical communication. The employment of every device, from chromaticism—which has consistently been seen as an expressive device—through the gamut of harmonic, rhythmic, and melodic development, was directed to this one overwhelming urge.

This intensification of the expressive properties of the musical stimulus has continued on into the twentieth century in the work of Impressionist and Expressionist composers. Schönberg and his followers developed and utilized the twelve-tone technique to express not only the superficial appearance of passions but also the blatant "shocks and traumata which are tangible manifestations of the unconscious."

The development of musique concrète and electronic music is only a step further in this desire for more expressive power. In this type of music the composer is not restricted by having to leave the performance and interpretation of his creation to someone else. Rather the composer is in complete control from start to finish, and he is able to express exactly what he wants to communicate. Machlis has summarized these twentieth-century developments

64 Wold and Cykler, op. cit., p. 172.
66 Ibid., p. 425.
thus: "Significantly the leaders of the modern movement wished only—as composers have done through the ages—to make their music express their own time." 67

It seems that developments in Western art music reflect "an ever greater tolerance of the human ear" 68 and the never-ending quest for the piquant and flavorsome. As habituation with traditional stylistic features in music have exhausted their potential for expressive communication, more powerful features have had to be created to maintain the zest and pungency of the music. Thus a trend toward greater expressiveness, greater sense-orientation, and the resultant greater psycho-physiological effect on the human organism has occurred.

The Attitude to Principles of Musical Composition

Another factor which is related to the desire for greater emotional expression in art music concerns the more relaxed attitude in the twentieth century to the principles and conventions of musical composition. In reference to the developments in harmony and rhythm, Hanson has commented that "with the advent of the twentieth century—caution was generally abandoned and music proceeded rapidly on the path to greater harmonic dissonance and greater rhythmic irregularity." 69 Hanson also noted that composers of earlier periods in art music history had been much more "restricted" in their creative process by the "numerous 'rules' to keep music on

67 Machlis, op. cit., p. 4. 68 Ibid., p. 19.
69 Hanson, op. cit., p. 367.
the straight and narrow path of rhythmic regularity as well as consonance. The gradual process of throwing off caution and restraint has thus been linked with the trend to increase the psycho-physiological impact of Western art music. While the cautions and restraints were there, the developments in the trend were slow. However, as the cautions and restraints were gradually thrown off, developments accelerated more and more rapidly in the direction of the trend. This seems to be a significant key that may help to explain the developments in Western art music discussed so far.

Commenting on Hanson's statement regarding the gradual removal of restraint in the use of harmonic dissonance and rhythmic irregularity, Rudolf Dreikurs explains:

> It is obvious that this greater freedom and independence is in line with the democratic evolution which overcame the strict rigidity of autocratic rule and gave the individual greater freedom of movement and of self-expression.!

(Emphasis supplied.)

It is certainly evident that the further one goes back in time to the beginning of Western art music history, the less individualism there is, and the more rigorously the rules and conventions of music composition are followed. Until the Renaissance the amount of variation and divergence from traditional practices was comparatively small. New innovations were adopted and accepted very slowly. For this period of Western art music history the musical styles of

---

70Ibid., p. 367.
schools of composition rather than those of individual composers were, and still are, discussed. Thus earlier composers are often spoken of as belonging to the Notre Dame School, the Burgundian School, the Venetian School, the Roman School, and so on. Individual composers have no doubt always had idiosyncrasies of style, but in earlier times they were much less individualistic than later composers such as Chopin, Wagner, Schönberg, Stravinsky, and Varèse.

However, as has already been observed, it was during the Baroque period that marked changes in stylistic development began to occur more consistently and rapidly than ever before. During this period there was a greater emphasis on a more individualistic approach to musical composition. Composers began to formulate their own rules and to make exceptions to the existing ones as they became dissatisfied with the traditional practices. The less restrictive forms of composition such as the prelude and toccata, theme and variations, rhapsodic forms and pictorial program music gained increased attention during the eighteenth and nineteenth centuries. Even those forms of art music, such as the symphony and the sonata, that were based on strict rules of composition were gradually modified. This became particularly evident in the later compositions of Beethoven and in the works of nineteenth-century composers such as Berlioz, Chopin, Liszt, Wagner, and Debussy.

The ultimate example of the relaxing of attitudes to structural rules and conventions of composition has been realized in the twentieth century and is exemplified in the aleatoric music, or
"chance music," of Cage and Stockhausen composed in the 1960s. In this music the principle of indeterminancy has been adopted to the extent that the composer rejects altogether the idea of art as a rational, structured activity. Cage's *Imaginary Landscape No. 4* (1954) is one example of this type of music. This composition consists of twelve radios being tuned to different stations and set going simultaneously. "The only predetermined element was the time span within which this assemblage of sounds and noises took place." However, the concept of chance music could only have been developed and considered seriously, as indeed Machlis seems to do, in an environment in which freedom from restrictions had become the accepted and even the desired goal. Chance music is merely the logical outgrowth of this underlying aim.

It could be argued that some aleatoric music is really an outgrowth of improvisatory techniques which have, throughout the centuries of art music history, always employed a certain element of chance. However, improvised music has never been very far removed from the ideals, structural principles, and conventions of regularly composed music of the time. For example, improvisations by musicians during the Baroque period would still have been recognized as Baroque music. Such improvisations would have reflected the conventions of regularly composed Baroque music, which, in turn, was still generally more structured than music of the nineteenth and twentieth centuries. In the same way, the improvised aleatoric music of the twentieth century reflects the increased

72 Machlis, *op. cit.*, p. 503.
freedom from structural restrictions that has occurred during this period of Western art music history. Hence it is still true that aleatoric music presents strong evidence for the trend to increasingly abandon traditional caution and restraint in musical composition during the twentieth century.

The attitude toward musical composition in the twentieth century is well summed up by Schönberg's admonition to his students: "Never do what a copyist can do."73 In former times to be divergent, to "do your own thing," as Gesualdo and di Lasso had done during the Baroque era, was to stand very much on one's own. However, to do the same today is to be numbered with the majority. Composers are increasingly inventing and relying on their own radically individualistic rules and conventions, rather than abiding by—or even modifying—traditional ones. This is undeniably evident in twentieth century twelve-tone composition, musique concrète, electronic music, and aleatoric music. During the twentieth century creativity has become a rubber stamp to endorse the validity of almost any compositional technique in the musical art.

This is not to infer that all traditional and historically affirmed principles and conventions of musical composition were and still are infallible, or that they ought to be continually and blindly enforced. However, it does seem significant that historically there has been an increasingly free attitude to the principles and conventions that control a composer's creative activity. That human characteristic, which desires complete freedom from externally

73Ibid., p. 52.
imposed restrictions, has become more and more intimately involved in the creation of Western art music. This factor, together with the desire to increase expressive potential, seems to be inseparably linked with developments in melody, harmony, rhythm, and dynamics, and together they seem to contribute substantially to the reason for discussing this trend in this chapter.

**Classicism versus Romanticism**

A study of Western art music history makes evident the fact that developments occur more rapidly in some periods than in others. The foregoing discussion of melodic, harmonic, and rhythmic developments, repeatedly makes reference to the latter half of the eighteenth century as being a time of establishment and consolidation for the innovations that had been introduced during the Baroque period. Previously the fifteenth and early sixteenth centuries had also been a period for sifting and consolidating the developments that had occurred during the fourteenth century. Similarly, the Neoclassicism of the 1920s functioned in the same capacity, after the period of development in the nineteenth and early twentieth centuries.

It has been suggested that the history of music is a continual swinging back and forth between the outlooks of Classicism and Romanticism. Alfred Lorenz floated the idea in 1928 and Machlis gives credence to it in his book on twentieth-century

---

music. Classicism is said to entail an objective, backward look to traditional standards, whereas Romanticism entails subjective emotional outbursts, a pulling away from the traditional standards to so-called freedom. Perhaps a more accurate description of the role of Classical periods in music history is suggested by Machlis in his description of neoclassicism in the twentieth century. He calls it a "period of consolidation," a period in which audiences and composers become accustomed to the new features that a Romantic period has brought to view. The Classical periods throughout music history have provided a controlled and restrained atmosphere, a time to stand still and informally sift through the developments of the previous Romantic outbursts. They have provided a foundation for future developments.

However, it would appear that the pendulum of change does not swing as far back in Classical periods as it swings forward in Romantic periods. In fact, music history reveals that stylistic developments never revert to what they were before a Romantic period erupted. Classical periods are periods of consolidation and not of back-tracking. For example, the composers of the late eighteenth century did not go back to composing sixteenth-century polyphony, nor did the neoclassic composers of the early twentieth century revert to the melodic, harmonic, and rhythmic styles of the late eighteenth century. The interaction between Classical and Romantic periods of music history is illustrated in Figure 5:

75 Machlis, op. cit., p. 7.
76 Ibid., p. 161.
As Figure 5 shows, the direction that the development of music takes throughout music history is really controlled and regulated by the Romantic periods. This is the time when the desire for greater emotional expressiveness and a freer, more individualistic attitude to the principles of composition has the most influence on the development of the art. Thus it could be said that, in general, the stylistic development of Western art music history has been directed by Romantic outbursts—the periods in which those factors which increase the psycho-physiological effect on the human organism are initiated and emphasized.

**Sacred and Secular Music in Western Art Music**

It would appear that the further one goes back toward the beginning of Western art music history, the more one hears and reads about sacred music. In fact, it seems as if early records of Western art music history register a preponderance of sacred music, whereas, the twentieth century reveals a preponderance of secular music. This is not to imply that no secular music was composed in
the eighth and ninth centuries, or that no sacred music is being composed in the twentieth century. What is inferred, however, is that in an art which claims its roots and foundation in early Christian chant, there seems to have been a gradual shift in emphasis from sacred to secular. It is interesting, for example, that one recent and respected book on twentieth century music, *Introduction to Contemporary Music* (2nd ed., 1979, 694 pp.) by Joseph Machlis, makes no reference at all to sacred music. It seems as if developments in sacred music are considered to be relatively unimportant in terms of the overall picture of twentieth-century music.

This is certainly different from any discussion of early Western art music where developments in sacred music form the bulk of the discussion. It may, of course, be partly due to the lack of documentation of early secular music. However, the importance of Christian chant as the basis for composition until at least the thirteenth century is indisputable. Even when records of secular music became more accessible in the fourteenth, fifteenth, and sixteenth centuries, sacred music forms such as the mass, motet, anthem, and chorale still held a firm and important position in the development of art music. However, it seems that particularly after 1750 "the production of great church music became more scarce, and the ensuing history is a somewhat thinly spread succession of isolated masterworks rather than a continuous development."^77

It has already been shown that particularly from the eighteenth century onward there was an escalation in those developments

in Western art music which tended to increase psycho-physiological involvement. It seems more than mere coincidence that this should synchronize with a decrease in emphasis on sacred music in Western art music history. During the long centuries when sacred music played a much more prominent role, there was a markedly slower rate of development of those stylistic features which are psycho-physiologically stimulating. Furthermore, there is abundant evidence that those styles such as the madrigal, the opera, the lied, and various instrumental forms such as the fantasias, preludes, theme and variations, concerto, suites, and overtures which are considered to be secular were consistently used as the vehicles for the development of the more stimulating stylistic features. Very rarely, particularly since the eighteenth century, does one find sacred music in the forefront of the development of stimulating stylistic features in Western art music. In fact, the opposite is true in that sacred music styles have consistently tended to imitate secular styles, especially from 1750 to the present. Consequently, most of the sacred music written since the mid-eighteenth century is more suitable for the concert platform than a church.

Could it be that this is yet another key to the understanding of the trend that has been traced in this chapter? Perhaps throughout history Western man's views about and attitudes toward God have had more than a casual influence on the development of Western art music. Perhaps Western man's concept of and attitude toward God is somehow linked to the nurture of those stylistic features of music that increase psycho-physiological response in the human organism.
Summary

The information presented in this chapter can be summarized as follows:

Melody

1. Early Western art music was almost entirely melodic. The pitch range (C-g₁) of early Western art music lies in and around the range that elicits least psycho-physiological response from the human organism.

2. Between the eighth and twentieth centuries the total pitch range expanded and intervallic progression became more disjunct. Melody became more angular and higher tessituras were exploited.

3. Since the mid-nineteenth century there has been a tendency to use smaller intervals, such as chromatic semitones, for their tension-producing effect. In the twentieth century intervals of less than a semitone have been utilized. This, together with the introduction of new scales such as the pentatonic and whole tone scales, facilitated the break up of the melodic element in the twentieth century.

4. In the 1920s the development of Sprechstimme, with its lack of any formal relationships between successive tones, brought wide pitch ranges and disjunct angular melody to a climax.

5. With the development of electronic music in the twentieth century the melodic element has ceased to be an integral part of Western art music. In the effort to make it an increasingly potent element in the musical communication, melody has collapsed and virtually disintegrated.
Harmony

1. Early Western art music did not contain a harmonic element, hence the effect of this element on the human organism was apparently negligible.

2. Between the tenth and twentieth centuries there has been a continuous and consistent trend to exploit increasingly complex and harsh dissonance. This has resulted in a concurrent increase in psycho-physiological impact.

3. With the development of the major/minor tonality system, and the resultant vertical concept of harmony in the seventeenth century, the harmonic element became capable of provoking more tension in the listener than had been possible with the intervallic harmony of the modal system.

4. The freer use of modulation and chromatic harmony in the nineteenth century, and the development of atonality and electronic music in the twentieth century have resulted in the virtual break up of tonal harmony. This has resulted in complex and harsh dissonance pervading the entire musical fabric. Emphasis has gradually been placed on sound sonorities, including complex tone combinations and clusters as well as non-tonal sounds. This makes the experimentation regarding the effects of noise on the human organism relevant and, in fact, importunate.

Rhythm

1. Early Western art music was measure free, the accents of which followed the prose rhythm of the Latin text. This measure-free music had a comparatively minimal effect on the human organism.
2. Between the ninth and twentieth centuries there has been a tendency to increasingly explore and exploit rhythmic complexity and irregularity. This has resulted in a concurrent increase in psycho-physiological impact.

3. During the seventeenth century a vertical, isometric concept of rhythm was developed, the regular accents of which pervaded the entire fabric of the music. Isometric rhythm was able to elicit much more response in the listener than the previous horizontal concept of rhythm, despite its complexity, had been able to achieve.

4. Once isometric rhythm was established in Western art music, rhythmic complexity was gradually increased. This was achieved by the breaking up of the beat unit into smaller units and by using dotted notes.

5. In the late eighteenth and early nineteenth centuries, rhythmic irregularity and complexity was increasingly exploited by means of cross rhythms and the displacement of the regular vertical accents by various types of syncopation.

6. In the nineteenth century sectional and temporary changes in tempo were increasingly utilized for deliberate effect.

7. During the twentieth century the rhythmic element has been extensively and consistently developed until it has become a prominent and powerful feature of twentieth century Western art music. New rhythmic schemes, asymmetrical beat groupings, multimetric and polymetric music, displacement of the barline, and non-metric music have been developed against the background of a vertical isometric rhythmic system. These developments have raised the potential
psycho-physiological effect of rhythm on the human organism beyond any previous level.

Other Factors

1. Since the late eighteenth century there has been an increasing demand for greater dynamic extremes in order to satisfy the desire for increased volume of sound and to provide greater possibility for contrast.

2. The broad outline of changes that have occurred in the evolution of Western art music reflect the same tendencies that are evident in the development of each of the elements of music. The trend to increase psycho-physiological response can be seen in the gradual change in emphasis from:

   (a) the melodic, to the harmonic, to the rhythmic element in music;
   (b) vocal to instrumental music in both style and purpose;
   (c) being tone-centered to being sound sonority-centered, including non-tonal, unordered sounds such as noise.

3. The stylistic developments of Western art music are undeniably linked with the consistent quest to achieve a greater capacity for emotional expression and sensory exhilaration.

4. Particularly during the nineteenth and twentieth centuries traditional conventions and structural rules of composition have gradually been modified and even discarded as composers have become increasingly independent and individualistic. This has culminated in the development of aleatoric or chance music in the twentieth century.
5. If the history of Western art music is viewed as a series of alternating Classical and Romantic periods, then it would appear that the Romantic periods in music history dictate the overall direction of musical development. Rather than backtracking, Classical periods sift and consolidate the developments that emerge in Romantic periods.

6. In that Western art music claims its origins in early Christian chant, there seems to have been a general shift in emphasis from a predominantly sacred orientation to a predominantly secular orientation. This shift coincides quite precisely with the escalation of those stylistic developments which intensify listener response.
CHAPTER IV

THE DEVELOPMENT OF INSTRUMENTS AND PERFORMANCE PRACTICES AS RELATED TO PSYCHO-PHYSIOLOGICAL IMPACT

In his book *Instruments in the History of Western Music*, Karl Geiringer asserts that "instruments should not be considered as independent objects of study but as an essential part of the history of music."¹ Geiringer maintains that the instrumental development of any given period should be viewed as a reflection of the aesthetic ideals and trends of that period.² There appears to be considerable support for this view in the context of the trend to increase and intensify the potential psycho-physiological impact of Western art music. This particular trend has been shown to be linked to what could be called a historically consistent aesthetic ideal to increase and intensify the expressive potential of musical communication.³ It would appear that the development of instruments associated with Western art music does reflect this aesthetic ideal very closely and at the same time provides abundant evidence in support of the trend to increase the response of the human organism.

2Ibid., p. 10.
3See p.181 of this thesis for a discussion of this point.
A study of the development and use of instruments throughout Western art music history reveals that instrumental developments have centered around two main factors—the extension of pitch range and the increase of volume capacity. Both of these factors are directly involved with eliciting increased psycho-physiological response. This seems to be more than mere coincidence, especially when developments can be shown to have consistently moved in the direction of evoking maximum response.

The developments in pitch range and volume capacity were achieved either by modification of the mechanism producing the tone or the exploitation of the latent capabilities of individual instruments. The gradual acquisition of the full chromatic range for each instrument was one of the by-products of the developments in pitch range. Once a full and reliable chromatic range became available in a majority of instruments, the exploitation of harmonic tension and its effect on the listener was expedited.

The years 1600 to 1900 stand out as the period of greatest activity in the development of instruments used in Western art music. While instruments were commonly used in music before 1600, there was no real idiomatic instrumental style until the late 1500s. Except in dance music, the majority of instrumental performances entailed either duplication of or substitution for vocal parts in vocal music. This

---

4See Chapter II of this study for a discussion of the psycho-physiological effect of pitch and volume on the human organism.

5Wold, Milo, and Cykler, Edmund, An Outline History of Music, p. 75.
implies that up to this time instrumental pitch range was not really required to go beyond F-g.\textsuperscript{2} With these tacit restrictions there was no real demand to develop instruments with large and versatile pitch ranges. This would also have ensured that the psycho-physiological impact of instrumental pitch range would have been comparatively minimal before 1600.

Several other factors also contributed to a comparatively minimal psycho-physiological impact and the lack of any real demand for significant instrumental development before 1600. First, the medieval distinction between haut and bas (loud and soft) instruments prevailed up to the end of the Renaissance. This distinction was concerned with adherence to certain proprieties which governed the use of instruments with regard to time and place. It was considered that loud instruments should be used for small or confined assemblies. Mersenne makes a comment about shawms that reflects this practice:

\[\text{[Their tone] is proper for large assemblies, such as balls, for weddings, for village festivities, and for such-like public rejoicings, on account of the great noise they produce, and the great resonance which they set up, for they have the most powerful tone of all instruments, and the most violent except for the trumpet.}\textsuperscript{6}

To a certain extent this practice would have affected the overall impact of the sound volume reaching the listener. For example, the use of a loud instrument in the open air would have ensured the dispersal of the loud sound more than if the same instrument was used within the confines of a small room.

Second, a concept of gradual dynamic change had not yet emerged. Dynamics were limited to abrupt alternations between loud and soft. As Geiringer observed, "the majority of instruments in use were limited to their natural loudness and the performer had neither the desire nor the skill to vary the intensity of the tone." This would have helped to maintain the proprieties which governed the use of instruments in time and place as well as negating any necessity to develop individual instruments.

Furthermore, the horizontal conception of music before 1600 influenced what composers and listeners expected from their music and their musical instruments. The linear polyphonic textures of this music encouraged an interest in different tonal colors rather than large volume capacity or extended pitch range in any one timbre. Grout summarizes the situation by saying that "the volume of sound in the Renaissance was less and its range smaller: the colors within that range, although multitudinous and diversified were less penetrating, less charged with intensity than those to which we are accustomed." Nevertheless, during the sixteenth century the influence of these traditional concepts and ideals gradually waned, and a tendency to increase loudness and fullness of tone as well as to extend the pitch range of instruments became evident.

Initially, extension of pitch range was achieved by means of

---

7 Geiringer, op. cit., p. 97.
adding to existing families of instruments. Instead of developing existing instruments and making them more versatile, a separate instrument was provided for each tessitura. Each of these instruments retained a relatively limited pitch range and dynamic flexibility. However, in combination with the whole instrumental family or consort, a full spectrum of pitch range was made available within the one timbre. Thus consorts of viols, recorders, crumhorns, and shawms became quite popular.

Towards the end of the sixteenth century instruments began to acquire their own status and importance. They were increasingly seen not only as adjuncts to vocal parts but as entities in themselves, capable of different sounds and effects. As a more idiomatic instrumental style developed, the ties that held instruments to vocal parts, with their limited ranges, styles, and textures, were gradually broken down.

During the seventeenth century, the growing demand for greater versatility and expressive potential gradually focused its attention on the development of individual instruments, rather than on instrumental families. A growing interest in solo instruments and the associated exploitation of individual performing technique helped to foster this attention and spurred the instrument makers on to new inventions. As the flexibility and expressive potential of individual instruments increased, a corresponding increase in the flexibility and expressive potential of the orchestral ensemble became evident. New possibilities of instrumental combination and tonal color, dynamic contrast and technical proficiency were opened for exploration. In short, a new
concept of ensemble music was initiated. In the nineteenth and twentieth centuries composers became increasingly aware of the orchestra's potential and exploited it to the full.

It seems significant that these instrumental developments began to gather momentum at a time when the prevailing aesthetic ideal emphasized emotion and sentiment. At the beginning of his discussion of instrumental development in the Baroque era, Geiringer describes how the emphasis on what he calls "genuine language of the heart" influenced the development of instruments:

The Baroque preference for extreme contrasts had a decisive influence on the range of musical instruments. On the one hand there were determined efforts to provide ever deeper basses. The harpsichord and organ extended their range downwards; bass strings were added to the lute, and the lute family was enlarged by the addition of new and bigger members. In addition, powerful wind instruments, such as the double bassoon and the contrabass trombone were now constructed. . . . The inexpressive plucked instruments yielded pride of place to the bowed instruments, with their power of communicating every shade of feeling. The same tendency toward expressiveness and tenderness had its effect on the wind instruments. The rigid double reeds enclosed in a wind chamber with their inability to register any dynamic shades, disappeared without leaving a trace.11

It is interesting to notice that even at this point in the history of Western art music, developments centered on the extension of pitch range and capacity for dynamic power and variation.

Geiringer also notes that the popularity and use of individual instruments was affected by their ability to comply with demands for extensions in pitch range and dynamic capacity. This is verified throughout the subsequent history of instrumental development. Some

10 Geiringer, op. cit., p. 131.
11 Ibid.
instruments such as the double reed instruments, the lute, and the clavichord were by nature incapable of meeting the demands for greater dynamic contrast. Hence they were gradually put aside and finally discarded. This seems to merely confirm that the historical trend to increase the stimulative potential of Western art music is intrinsically linked to the development of the art in almost every detail. Not only the development of individual instruments but the very choice of the instruments to be used in Western art music seems to have been dictated by this trend.

In order to accurately monitor the evidence for this trend and to see how there has been a gradual yet consistent movement in one direction, the development of individual instruments and their family groups needs to be documented in some detail. It would appear that virtually all instruments used in Western art music were affected in some way by this trend and that developments were of a cumulative nature. Except for the deliberate reconstruction of historic performance situations, instruments did not revert back to their previous form once innovations were incorporated.

### Stringed Instruments

During the seventeenth century the violin family gradually replaced the viol family as the predominant stringed instrument family. Both performers and composers sought and exploited the louder, more brilliant, and more expressive tonal qualities which the violin family offered. The outmoded viols had a very delicate and soft timbre and lacked the brilliance and versatility of the newer instruments.\(^\text{12}\)

This furnishes another good example of how even the choice of instruments for the performance of art music was historically governed by the tendency to favor those qualities which simultaneously increased psycho-physiological impact. Even so, violins used in the late sixteenth and early seventeenth centuries were strung with gut strings at a low tension, and consequently the tone was probably quite small in comparison with that of modern instruments.\textsuperscript{13}

In general, the development of the violin family affected both the construction of the instrument and the technique of playing the instrument. Inventions such as metal strings and the concave bow as well as various aids to provide more relaxed and secure playing positions helped to firmly establish the violin family in both solo and ensemble performances. The high quality craftsmanship and artistry of men such as Niccolo Amati, Antonio Stradivari, Guiseppe Guaneri, and others, which attended the early production of these stringed instruments, set a high standard of excellence for both the quality of tone and potential capacity for volume and pitch range. Performers and composers were afforded every opportunity to realize any desires to further exploit the capabilities of the violin. Craftsman, performer, and composer all worked together to fulfill the prevailing ideals.

During the latter half of the seventeenth century and the first half of the eighteenth century, composers and performers such as Corelli, Torelli, Vivaldi, Tartini, and Veracini brought the violin to

\textsuperscript{13}Baines, Anthony, editor, \textit{Musical Instruments Through the Ages}, p. 115.
prominence as a solo and chamber music instrument. The fingering of the left hand was gradually extended to higher positions, which resulted in the lengthening of the fingerboard and neck. Thinner, longer, and more tightly strung strings came into use, the lowest pitched string being over spun with silver wire. The bridge was raised and more strongly curved, and the angle of the neck was thrown back. The bass bar and sound-post inside the instrument were strengthened to cope with the increased tension exerted by the strings. These modifications enabled the performer to play more forcefully on each string and thus increase the volume of sound.\textsuperscript{14} The chin rest was added to the violin to allow the performer to hold the instrument more firmly, and thus facilitate playing technique both in the extended tessitura and at different dynamic levels. The use of a concave rather than a convex bow also helped to increase the volume capacity of the violin. Consequently, the violin was fitted to adequately compete within the dynamic context of the large orchestras of the Romantic period.\textsuperscript{15}

During the Baroque period the third finger position was the upper limit of pitch range of the violin. Mozart and Haydn rarely took the solo violin higher than a\textsuperscript{3}.\textsuperscript{16} However, in the Romantic period Berlioz, in his \textit{Traite d'Instrumentation} (1844), asserted that the violin could go up a third higher to c\textsuperscript{4}. Strauss in 1909

\begin{itemize}
\item \textsuperscript{14}See Geiringer, \textit{op. cit.}, p. 175; Donington, Robert, \textit{The Instruments of Music}, p. 59.
\item \textsuperscript{15}Baines, \textit{op. cit.}, p. 120.
\item \textsuperscript{16}See appendix B for explanation of pitches.
\end{itemize}
revised this statement in his supplement to the same work by saying that members of symphony and opera orchestras of that time could play up to $g^4$. Thus, it is quite evident that there have been major modifications of both the volume capacity and pitch range of the violin. Virtually all developments in the instrument helped in some way to intensify its potential psycho-physiological impact on the human organism.

Although the viola was always a less spectacular instrument than the violin, probably because of its less stimulating mid-range tessitura, it was nevertheless also modified to keep pace with the trend. The addition of a chin rest, the use of a concave bow and an increase in body size contributed to the production of a larger tone. Towards the end of the eighteenth century, in the hands of composer and performer Carl Stamitz, the viola attained solo instrument status. The larger instruments, which had been temporarily set aside in the latter part of the seventeenth century, were restored to prominence, and the viola gradually acquired status and importance in the orchestra. In the nineteenth century the viola was given an even more prominent role, as can be seen, for example, in the second movement of Beethoven's Symphony No. 5 and in Herold in Italy by Berlioz. Emphasis was placed on the bigger instruments which had a more powerful tone, and it is these instruments which the twentieth century inherited and utilized.

---

17 Geiringer, op. cit., p. 212.

The pitch range and volume capacity of the cello were also increased. During the first half of the eighteenth century Franciscello developed the thumb position to expedite higher pitch possibilities. Michael Corrette (1741) and J. L. Duport in his *Essai sur le Doigter du Violoncelle* (1806-1819) developed and systematized a whole new technique of cello playing which incorporated the newly extended upper pitch range. Along with changes in fingering technique, the bow hold was changed to a palm-down position, which helped to simplify playing technique and undoubtedly aided the production of greater volume. In the nineteenth century, the addition of the spike and the use of wire for the topmost strings made the cello more stable and encouraged an even more forceful tone. All of these innovations helped to provide greater power and versatility throughout the extended pitch range.

The double bass, a remnant of the viol family, was brought into prominence during the latter half of the sixteenth century. "More than any instrument of the violin family, the double bass has been subjected to modification and experimentation in shape, size, number and tuning of the strings, etc." The development of technique by Dragonetti (1763-1846) and Bottesini (1821-1889), especially the concept of over-hand bowing, helped to achieve a far richer sonority and increase the volume capacity. Music written for the double bass during the Romantic period shows that pitch range was extended downward and that tone quality was improved. With an added string the double bass became capable of descending to low C— an octave below the

---

lowest note of the cello. Thus the double bass provided a firm, rich bass foundation for the expanding orchestras of the Romantic period and was increasingly exploited as such by composers of this era.

Two other stringed instruments also deserve to be mentioned, even though they do not hold the same position of prominence in Western art music history that is afforded to the violin family. Until the eighteenth century the lute was a very important and popular stringed instrument. Though instrumental developments were still in their infancy at that time, the lute had a comparatively large capacity for tonal flexibility. Because of this it was used extensively as a solo and accompanying instrument. However, during the early eighteenth century it became increasingly evident that the lute could not compete with other stringed instruments for volume and facility of handling. The attempts that had been made to modify the structure of the lute, in order to keep pace with developments in pitch and volume, had only resulted in a family of awkward and cumbersome instruments such as the theorbo and the chitarrone. It seems that the lute was incapable of keeping abreast of the rapidly expanding desires and ideals of the period, and, consequently, it gradually lost its position of prominence and was finally discarded altogether. It is interesting that even though the trend to increase volume capacity and pitch range precipitated the downfall of the lute, this trend nevertheless influenced its development while it was in vogue.

Harps are among the oldest of stringed instrument. In the
seventeenth and eighteenth centuries the pitch range of the harp was extended by an extra one and one-half octaves at the extremes—from six and one-half octaves ($c^b - g^b_4$) to nearly eight octaves ($c^b_2 - b^b_4$).  

The development of a pedal action by Cousineau and Erard provided the possibility of including all the notes in the chromatic scale at a time when harmonic developments in Western art music were making this facility imperative. The size and tension of the strings were also increased which expedited an increase in volume. Consequently, the harp of the nineteenth century "was a great deal more powerful in tone than the old." During the nineteenth and twentieth centuries the harp has been particularly valued for its special exhilarating effects. Examples of this can be found in the glissandos used at the beginning of the Dance of the Flowers from Tchaikovsky's Nutcracker.

Wind Instruments

The main factors contributing to the increase in pitch range and volume capacity in wind instruments are the improved methods of construction—the addition of keys and the means whereby they were attached to the body of the instrument, the use of more stable woods and the changes in bore and the size of holes. The Boehm system of keying a woodwind instrument was probably the most significant individual development. It allowed for correctly sized holes to be cut in the proper acoustical position on the instrument without making it

---

20 Geiringer, op. cit., p. 219.
21 Baines, op. cit., p. 194.
22 Ibid., p. 252.
difficult for the hand to reach the keys.

The oboe was introduced into Western art music by the French in the seventeenth century.\textsuperscript{23} At that time its tone was singularly docile and sweet. The tone has since been gradually increased in strength until the modern oboe has considerably more maximum volume.\textsuperscript{24} The range of the oboe was gradually extended by the addition of fourteen keys and by 1840 it was fully chromatic. By 1880 the Parisian "Conservatoire model" had acquired a complicated key mechanism with a compass of $b^b - a^3$.\textsuperscript{25} The oboe developed to be all but the equal of the flute with a much facilitated technique and increased tonal flexibility.

The flute became a permanent member of the orchestra during the time of Haydn. Lully, in the mid-eighteenth century, had been the first to introduce the louder, more versatile transverse flute into the orchestral ensemble. In the latter part of the eighteenth century the flute was lengthened and extra fingerholes were added to increase its pitch range. Beginning c. 1800 attempts were made to improve the flute's mechanism.\textsuperscript{26} Elaborate keywork was added to it to make it fully chromatic and to extend the range.

These developments culminated in the development of the Boehm system (1846-1847) which provided greater accuracy in pitch

\begin{footnotes}
\item[23]Ibid., p. 241; Dart, Thurston, \textit{The Interpretation of Music}, p. 35.
\item[25]Geiringer, \textit{op. cit.}, p. 231.
\end{footnotes}
designation as well as facilitating technique for the performer. The Boehm flutes were produced featuring the cylindrical bore and a parabolic head which further facilitated accuracy of pitch. This new flute was remarkable for its tonal purity and evenness throughout its compass. It also had a much fuller and more powerful tone.  

During the nineteenth and twentieth centuries the flute came to be viewed as an increasingly important instrument, because of its capacity for producing a great variety of expressive tonal nuances.

The piccolo came into prominence at the end of the eighteenth century and the beginning of the nineteenth century. It was first used in military bands, and it gradually found its way into art music and the orchestra. Its sharp and powerful tone is pitched an octave higher than the flute and "reaches almost to the upper limit of recognizable pitch." Because of the shrill quality of these upper tones it flourished in the Romantic period when it was used for the expression of wild passion, the description of storms, and so on. Its compass is d⁵-c⁵, although g²-g⁴ is the usual range used. When the piccolo is used it dominates the whole orchestra. It seems significant that this instrument was introduced into art music and the orchestra at a time when increased expressive potential was a specific aesthetic ideal. Its singular and forthright contribution to the high frequencies in the orchestral pitch range greatly enhances psychophysiological impact on the human organism.

---

27 Geiringer, op. cit., p. 229.
28 Ibid., p. 186
The range of the clarinet has also been gradually extended, until in the twentieth century it spans almost four octaves—e–c\textsuperscript{4}.\textsuperscript{29} In the years between 1690 and 1720 the addition of keys made the full chromatic range possible, which opened the way for participation in chromatic melody and harmony. In the 1840s the Boehm system was applied to the clarinet and a uniformity of tone throughout its compass was achieved.

Of all the instruments in the clarinet family, the B-flat clarinet—a more powerful instrument than its predecessors—has emerged as the most common and important. Because of its capabilities of dynamic contrast from pianissimo to the shrillest fortissimo, this instrument became a favorite with Romantic composers. Richard Strauss commented that its dynamic flexibility enabled the clarinet to "transmit to the listener's senses the finest nerve vibrations in the beautifully articulated body of the modern orchestra."\textsuperscript{30}

The bassoon is the bass of the oboe family. The tone of the eighteenth century bassoon is described as sweet, cello-like, and softer than the modern French bassoon.\textsuperscript{31} The sound quality was gradually stabilized throughout its compass and the pitch range was extended upwards so that by the mid-nineteenth century it covered more than three octaves—B\textsubscript{b}–c\textsuperscript{2}. Because of its increased dynamic proficiency it has been utilized as a solo instrument. It is capable of portraying a wide range of moods and emotional nuances. Being

\textsuperscript{29}Ibid., p. 188
\textsuperscript{30}Kroll, Oscar, The Clarinet, translated by Hilda Morris, p. 92.
\textsuperscript{31}Donington, The Interpretation of Early Music, p. 559.
penetrating and almost menacing in forte passages, it can at the same time be gentle and tender in soft passages. Slight modifications to pitch range continued up to the 1900s when it was specified at $B_1-f^2$, a range of three and one-half octaves. Keys were also added to provide security for chromatic semitones and to facilitate technique. Composers such as Wagner exploited it in its extreme upper and lower registers to enhance certain expressive passages. For example, $e^2$ is employed in the Tannhäuser Overture and $A#$ is employed in the opera Tristan and Isolde and Die Walküre from the Ring Cycle.

Although it had been used in Handel's Coronation Anthem (1727) as well as in Haydn's Creation and Beethoven's Symphony No. 5 and Symphony No. 9, the contrabassoon or double bassoon did not gain prominence until c. 1877 when it emerged with a keyed mechanism and a compass of $B^b-f$. Pitched an octave lower than the bassoon, its pitch has nevertheless been consistently extended downwards from $G_1$ to $F_1$ in the seventeenth century instrument to $B^b_2$ in the late nineteenth century instrument developed by Heckel. As the deepest-toned instrument in the orchestra it is mainly used to fill out the low bass and louder passages. Because of the difficulty of playing extremely low tones at a soft dynamic level, the contrabassoon is only used in the mezzo forte to fortissimo volume range. Not only is this instrument played in an extremely low register, but performance in this extremely low register is coupled with a necessity for it to be played at a fairly loud volume. This would undoubtedly

---

help to compound the effect of the low pitch. It seems significant that an instrument with these characteristics should be developed and become more prominent in the performance of Western art music in comparatively recent times. Its late inclusion in art music and the orchestra confirms the direction of the historical trend toward increased psycho-physiological impact.

Brass Instruments

Because of their loud and penetrating tone, brass instruments have a long history of association with heraldry and soldiery. Although trumpets and horns in particular were used in many ancient cultures, they were very late in acquiring attributes that made them useful as regular musical instruments in Western art music performance. It was not until the nineteenth century that the brass section of the orchestra was fully developed and exploited for the unique and exciting effects it could produce.

The development of modern brass instruments began c. 1650. The evidence suggests that even with this initially loud group of instruments the same tendency to increase volume capacity and to extend pitch range has occurred. For example, the size of the bore and the flare of the bell were gradually increased to provide greater volume and depth of tone. The use of thinner walls in the tubing and refinements in the shape of the mouthpiece increased the resonance quality, thereby adding to the strength and penetration of tone. But the most important development to affect brass instruments was the

---

33 See p. 49 of this thesis for a discussion of this point.
invention of valves and pistons c. 1813. Before 1813 brass instruments had been limited to the particular tones available in the predetermined harmonic series for which an instrument had been prepared, either in its original length or by means of interchangeable crooks. This made it virtually impossible to utilize brass instruments other than in a supporting role. However, with the invention of valves and pistons the situation was dramatically changed. This facilitated the whole playing technique and made available the full chromatic range throughout the pitch range of the instrument. The way was thus opened up for composers to exploit without restraint the powerful sounds of which brass instruments are capable.

When the $B^b$ valve trumpet emerged in the early nineteenth century it was able to carry, on its own and throughout its range, important melodic and motivic material. At this time it had a full chromatic range of $f-d^3$. With its facilitated playing technique it had the capacity for quick, brilliant movement through both upper and lower registers. The tone quality in the extended lower register, which had not been available before, was full and pealing, becoming sharp and penetrating with a rise in pitch. $^{34}$ In general, the nineteenth century $B^b$ trumpet, which is still substantially the same in the twentieth century, was capable of greater volume than its earlier counterparts. $^{35}$

The trombone was one of the first of the modern orchestral instruments to appear in its present form. During the fifteenth

$^{34}$Geiringer, op. cit., p. 251.

$^{35}$Donington, The Interpretation of Early Music, p. 561.
century it developed from a large trumpet through the addition of a slide, exhibiting at this time all the essentials of the present instrument. Owing to the narrower bell which resulted in a softer sound, it was mainly used for sacred music in the seventeenth and eighteenth centuries when its quieter and more mellow characteristics were explored. Towards the end of the eighteenth century attempts were made to develop the trombone for general use. Developments included widening the bore and increasing the flare of the bell. The tubing walls were made thinner and the mouthpiece was deepened. As a result of these modifications the tone of the trombone became more powerful and the volume capacity was increased. While the trombone maintained its sonorous quality it was at the same time capable of a loud, brassy, blaring tone which had been impossible to achieve with earlier instruments.\(^{36}\) Beethoven introduced trombones into the final movement of his *Symphony No. 5*, and Berlioz and Wagner (1850) established the trombone as a member of the orchestra. Its capacity for dynamic contrast, from the delicate *pianissimo* to the menacing *fortissimo*, was relished and exploited. (For example, see Ravel's orchestral arrangement of Mussorgsky's *Pictures at an Exhibition*.)

The horn has developed from being a rather rarely used instrument in Western art music to being the favorite, most often used, brass instrument in the nineteenth century. Having undergone various modifications (e.g., wider bell, smaller size), toward the end of the seventeenth century the horn was introduced into art music and the

orchestral ensemble. In the eighteenth century crooks were added in an effort to increase the pitch range of the horn.

However, it was the construction of a valve mechanism by Blühmel (or Stölzel?) which really revolutionized horn playing. The valves bridged the gaps between the natural tones and the tones of the full chromatic scale, enabling composers to use the horn much more frequently and consistently. After the valve mechanism was added, the strong and noble tone of the horn was increasingly used in important melodic roles in both loud and soft passages of music. Of all the brass instruments, the horn is the most versatile melody instrument. It is capable of transmitting many shades of feeling and creating various moods and atmospheres. With the extended lower range made possible by the valves, the horn's compass comprised $G^1-f^2$.

The nineteenth and twentieth centuries have experienced an unprecedented interest and development in the brass section of the orchestra. This is particularly evident in the works of Berlioz, Wagner, Richard Strauss, and Mahler. Because brass instruments invariably enhanced the volume of sound, they were generally employed by Romantic composers for this purpose. An example of this can be found in Berlioz' Requiem, Op. 8 (1837) in which four extra brass groups were added to an already sizeable orchestra.

Romantic composers often utilized the brass section of the orchestra as the last and crowning burst of power to heighten the impact of an already brimming orchestral sound. For example, one notices the use of the brass at the end of Rachmaninov's Piano

---

37 Baines, op. cit., p. 295.
Concerto No. 2 and Piano Concerto No. 3. It seems that the deliberate intention is to overwhelm the listener with a ravishing tidal wave of sound. This type of appeal to the senses certainly seems to have achieved the desired effect, judging by the number of times it has been used in the literature of the nineteenth and twentieth centuries.

Towards the end of the nineteenth century the brass section or the orchestra was enlarged by the addition of the bass tuba and the Wagner tuba, as well as by the duplication of instruments. Wagner sometimes utilized eight horns besides trumpets, trombones, and tubas. The Prelude to Das Rheingold is a good example of his use of the brass section of the orchestra. The works of Richard Strauss and Mahler afford similar examples.

Mussorgsky's Night on a Bald Mountain provides an example of another device that was used by composers to exploit the power of brass instruments. A prominent melodic theme was assigned to the brass section while the rest of the orchestra was used in a supporting role. This example provides further evidence that the comparatively late arrival of the brass section into Western art music and its subsequent intensive development and exploitation underlines the trend to increase psycho-physiological impact.

Percussion Instruments

There are two main reasons why the use and development of percussion instruments are particularly significant to a discussion of the potential psycho-physiological effect of music on the human organism. First, an instrument with non-tonal or indefinite pitch affects the human organism more, because of the spectrum of
frequencies which simultaneously bombard the brain. Second, an instrument that is physically struck or shaken is potentially more capable of a sudden and penetrating volume of sound than an instrument which has to be blown or bowed. Thus, the potential impact of percussion instruments on the human organism is relatively high.

The percussion family is probably the most ancient instrumental family that is still in existence. Even from early times these instruments have a history of association with the dance "in which the sound is made in response to, or to emphasize bodily movement." Untill the eighteenth century percussion instruments were used very rarely in Western art music, and it was not really until the nineteenth and twentieth centuries that they gained a prominent position in the orchestra. The fact that percussion instruments, with their increased potential for psycho-physiological stimulation, were exploited relatively late in Western art music history provides strong evidence for the trend to heighten stimulative capacity. This means that the two potentially most stimulative sections of the orchestra--the brass and the percussion--were both developed late in Western art music history. Surely this must indicate the broad direction in which the aesthetic ideals and trends of Western art music were moving. Furthermore, even in the introduction and development of percussion instruments, a progression toward increased impact is discernible. During the Baroque period the number and variety of percussion

39Baines, op. cit., p. 25.
instruments in use was fairly limited. Their main involvement was in
the association of trumpets and drums. Two drums of definite pitch
designation were used—one tuned to the tonic and the other to the
dominant. These kettledrums (timpani) were smaller and more uniform
in size than the ones used in the twentieth century. Early in the
nineteenth century a third drum was introduced and c. 1830 a controlling pedal was invented to enable the performer to quickly alter the
pitch of the drum. This facility provided the opportunity of utilizing the timpani throughout a piece of music.

In the eighteenth century composers only scored for the kettledrum in compositions or sections where rhythmic emphasis was required. An example of this can be found in Music for the Royal Fireworks by Handel. However, in the nineteenth century the kettledrum "roll" was introduced to intensify climactic sections (e.g., the climax in the Prelude to Act I of Die Walküre by Wagner). Composers also began to notate solo sections for timpani (e.g., the end of the third movement of Symphony No. 5 by Beethoven). In the twentieth century, timpani have been exploited even more fully in both orchestral pieces (e.g., Bartok's Music for Strings, Percussion and Celesta) and in solo pieces (e.g., Eight Pieces for Four Timpani [1950-1966] by Elliot Carter).

Traditionally, kettledrums were tuned in fourths and fifths. However, Berlioz, Wagner, and Mahler used kettledrums tuned to the sixth and the octave. This further reflects the desire to make maximum use of the timpani's resources. It seems that the timpani is one of the most versatile of percussion instruments, and since

---

40 Geiringer, op. cit., p. 260.
its inclusion as a performing instrument in Western art music, its increased use has undoubtedly aided dynamic impetus and added to the overall stimulative potential of the expanding orchestra.

The admission of the bass drum into the orchestral ensemble also increased the potential impact of Western art music. Mozart was one of the first composers to incorporate the sound of the bass drum in Die Entführung aus dem Serail (1782). It was not until the nineteenth century, however, that this instrument was permanently established in the orchestra. The sound produced is "dull and explosive, indefinite in pitch and sometimes extremely loud." Because of its low pitch, which is made up of many different frequencies sounding simultaneously, and its capacity for an extremely loud explosive sound, it can transmit tremendous sound energy to the human brain. Neher observed that the low frequency receptors of the ear are more resistant to damage than the delicate high frequency receptors, and can withstand higher amplitudes of sound before pain is felt. It should therefore be possible to transmit more energy to the brain with a drum than with a stimulus of higher frequency. The bass drum is thus perfectly suited for the portrayal of strong emotions such as terror or intense excitement. Both Richard Strauss and Mahler used the bass drum to express great power and energy as well as to portray mournful and mysterious effects in soft passages.

Several other instruments capable of producing a large volume of sound were also added to the orchestral palette. Although Gossec

---

41 Ibid., p. 19.
and Lesueur (eighteenth century) used the gong in their compositions to add explosive excitement and color to climactic sections, the gong was not fully exploited until the late nineteenth and early twentieth centuries. Geiringer observed that the persistent "clangor of the gong, now mysterious, now ominously solemn, then again throwing off scintillating sparks, found ready acceptance in dramatic and symphonic compositions."43 Examples of the use of the gong can be found in Le Valse by Ravel and in Tod und Verklärung by Richard Strauss.

The first cymbals to be used in Western art music were small and of the "soft-ringing type."44 During the late seventeenth and early eighteenth centuries the larger twelve-inch-diameter cymbals gradually found their way into the orchestra. They were used in three different ways: (1) by gently brushing the two plates together to produce a soft vibration, (2) by clashing them together with a brushing movement to produce a loud violent sound, and (3) by striking a single cymbal hanging freely on a stand with snare-drum or timpani sticks. Since the latter half of the nineteenth century the most renowned use of cymbals is the singularly terrifying, but brilliant and lasting, clash. "Such sound is useful in imitating storms or thunder clashes or to enhance the loudest passages in orchestral music. A familiar example is found in the well-known overture to Tannhäuser in which the cymbals heighten the climax to a deafening tumult."45

43 Geiringer, op. cit., p. 267.
44 Paetkau, op. cit., p. 30.
Particularly during the late nineteenth and early twentieth centuries there were other additions to the percussion section of the orchestra. These additions included the chimes, xylophone, triangle, celeste, glockenspiel, tambourine, and others. The combination of pitch frequencies in the sounds they produced and the fairly loud, penetrating tone of some of these instruments made them capable of being heard above a full orchestra. The chimes and the xylophone, for example, can be heard above a full orchestra in the 1812 Overture by Tchaikovsky and the Danse Macabre by Saint Saëns. This undoubtedly helped to increase the stimulative potential of orchestral music.

**Keyboard Instruments**

Keyboard instruments probably exemplify the trend to increase volume capacity and extend pitch range more dramatically than any other instruments used throughout the history of Western art music. For example, the development of the modern pianoforte from instruments such as the clavichord shows a remarkable transformation. The clavichord was incapable of producing more than a mezzo forte volume intensity and initially had a pitch range of about three octaves. On the other hand, the pianoforte received its very name as a result of its singularly large dynamic flexibility. It also has a pitch range of over seven octaves. With the exception of electronic instruments, the modern pianoforte is only exceeded by the organ in dynamic capacity and pitch range. The development of the Romantic organ from its early counterparts embodies a similarly remarkable increase in volume capacity and tonal flexibility. However, these remarkable and, indeed, big changes are composed of many small developments which occurred

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
gradually, step-by-step. Thus the trend in one direction is quite
easily recognizable.

The fretted clavichord, used in the seventeenth and early
eighteenth centuries, gradually gave way to unfretted models to
satisfy demands being made for greater volume of tone as well as
increased size. The compass of the clavichord was eventually exten­
ded from three octaves to around five octaves. However, its popular­
ity and usefulness began to wane, and after 1812 it seems that pro­
duction of the clavichord ceased altogether, because it was unable to
comply with the demands for greater volume capacity and extended pitch
range. Throughout the eighteenth century attention had gradually
focused on the more powerful and versatile harpsichord, and once the
first pianofortes were constructed the clavichord was all but for­
gotten.

Throughout the Baroque period the harpsichord, by nature a
potentially louder instrument than the clavichord, gained prominence
in both solo and ensemble performance. Apart from the organ it prob­
ably became the most frequently used keyboard instrument. Its capa­
city for being able to blend with other instruments secured its posi­
tion in the Baroque instrumental ensemble, especially as the concept
of thorough bass developed at the beginning of the eighteenth century.
The ability of the mechanism of the harpsichord to incorporate two,
three, or even four strings to each note made it more versatile and
increased its potential pitch range, and thus, also, its capacity for
expressive contrast. As the range of the harpsichord was extended,

46 Geiringer, op. cit., p. 120.
some large German instruments included not only the two unison registers and an octave register, equivalent to two eight-foot stops and one four-foot stop, but also a Bourdon answering to a sixteen-foot pitch such as that owned by J. S. Bach.\textsuperscript{47} The addition of a pedalboard and double keyboard further increased the pitch range and contrast possibilities. Those instruments made in Paris c. 1740 and also those Flemish models which were later subjected to the process known as \textit{mettre a revalement}\textsuperscript{48} had much greater power of tone than had previously been attained. As the developing pianoforte became a serious rival, \textit{crescendo} and \textit{diminuendo} were incorporated by means of a swell. However, it gradually became evident that the harpsichord and its relatives (spinets, virginals, and cembals) could not compete, and in the late eighteenth century the harpsichord was gradually displaced by the pianoforte.

As the pianoforte developed, the extension of pitch range and volume capacity seemed to be firmly in the forefront of the manufacturer's ideals. Piano builders working in many different countries contributed innovations which have become part of the instrument's structure and have fashioned its tonal capabilities. During the late eighteenth century English makers such as John Broadwood and others extended the compass of the piano and refined and perfected the action, increasing the striking power of the hammer on each string. The action of English instruments required a heavier touch than that

\textsuperscript{47}Hipkins, A. J., \textit{A Description and History of the Pianoforte}, p. 91.

\textsuperscript{48}Closson, Ernest, \textit{History of the Piano}, p. 43. This process involved rebuilding the old instrument by lengthening the case and extending the keyboard to around five octaves to include 61 keys.
of the delicate Viennese action, but "it proved capable of giving greater volume and a wider dynamic range to the performer." The English action is the ancestor of that found in all modern pianos.

The French piano builder, Erard, gave the piano thicker strings and bigger hammers which allowed greater volume and strength. The American piano builders strengthened the framework and increased the compass, sometimes up to eight octaves. Alpheus Babcock introduced the heavy cast-iron frame (1825) to replace the wooden frame. This allowed the strings to be tightened at much greater tension and thus further increased potential volume capacity. Babcock also introduced cross-stringing which increased the overtones of each string and resulted in a more penetrating, richer sound. Thus, the pianoforte developed into an instrument capable of competing with a full Romantic orchestra as well as filling large concert halls with a powerful sound. The large potential volume capacity, the tremendous pitch range and the fact that it could be controlled by one performer made the piano an instant favorite with composers who lost no time in exploiting its capabilities. The piano has become one of the most popular and most used household instruments in Western society.

The organ has a long history of association with Western art music, particularly within the church. The fact that even from earliest times the organ seems to have been associated with loud volume seems to add significance to the later development of this instrument. To develop the volume capacity of an initially soft instrument may be considered as somewhat inevitable and quite probable,

Despite any particular trend to increase the psycho-physiological effect of Western art music. But when an instrument, initially considered to be very loud, is developed even further in that direction along with all other instruments, then it appears to be more than a matter of mere coincidence. Rather, it seems to provide even firmer evidence that a definite trend is occurring.

In the seventh century the English bishop, Aldhelm, made mention of the organ in his writings, praising it for its "mighty voice."

The monk Wolstan records that a large organ was erected at Winchester Cathedral while Bishop Elphege (d. 951) was prelate. "It supposedly had 400 pipes and 26 bellows, was played by two organists on two keyboards of 20 keys each and had an exceedingly powerful sound." Nevertheless, in the succeeding centuries the desire to further increase the volume capacity of the organ became more and more evident.

The pitch range of the organ was also dramatically extended. Until the fourteenth century the pitch range was limited to approximately three octaves at a fundamental eight-foot pitch. However, during the fourteenth century the organ began to increase in size as various higher pitched ranks of pipes were gradually added—for example: 4', 2', 1', 2 2/3', and 1 3/5' ranks. In order to facilitate the variation of the loudness and timbre of the sound, additional manuals were fitted. Stops were introduced in the fifteenth century to allow the player to select different ranks of pipes. All of these mechanical developments increased the expressive potential of the organ and gradually opened the way for full exploitation of the

50 Ibid., p. 616. 51 Ibid.
increased flexibility in the eighteenth, nineteenth, and twentieth centuries.

By the seventeenth and early eighteenth centuries, when much important organ music was composed by composers such as Sweelinck, Scheidt, Pachelbel, Buxtehude, and J. S. Bach in northern Germany, the organ had developed into a fairly large instrument. It usually incorporated at least two manual keyboards of around five octaves each, "a versatile pedal keyboard and an advanced and quite varied collection of stops of different pitches and colors." This organ had a capacity for both very loud and very soft volume and a pitch range that extended from the lowest note in a sixteen foot rank (about C) to the highest note in a one foot rank (around C⁶). Thus, at this time the organ had the most flexible pitch range and was potentially the loudest of all instruments.

It was during the nineteenth century and at the beginning of the twentieth century, however, that the organ developed into a mammoth instrument capable of tremendous volume capacity and tonal variety. Increasingly it was used outside its former ecclesiastic setting. Organs were set up in theaters, concert halls, and even in department stores. Both inside and outside the church they increased in size, often to include between 4,000 and 10,000 pipes. The change from tracker to pneumatic and electropneumatic action facilitated the increased number of ranks of pipes. Their pitch range was extended to include a 32' rank of pipes, and in some

---

52 Ibid., p. 617.
53 Geiringer, op. cit., p. 254.
instruments even a 64' rank was installed. This made possible a total range from approximately C₂ or even C₃-C⁵—at least nine or ten octaves. The bellows were mechanized and proliferated to supply immense quantities of even-flowing air at a higher pressure which helped to increase potential volume output. The "Venetian Swell" was developed to control dynamics and to allow fluent crescendo and diminuendo. Couplers and pistons were developed to facilitate instant changes of registration. The crescendo pedal was also developed to allow the rapid, smooth addition of a large number of stops resulting in a tremendously stimulating surge of sound. A concave pedal board was also constructed to allow the player easier access to the extreme registers which were being increasingly utilized. Altogether, a very powerful and dynamic king-of-instruments emerged with a vast capacity for stimulating sound effects. It would appear that an attempt was being made to put all the resources of the orchestra at the disposal of one player.

These developments have been described as sweeping "headlong into decadence, seeking novelties for their own sake and cultivating a generally gross tonal quality along with an emphasis on orchestrally imitative stops."\(^54\) This seems significant in light of the fact that the developments in the organ were only reflecting the same trend that was evident throughout instrumental development. It could be argued that developments in the organ were exaggerated and simply overdone. Nevertheless, it must be remembered that manufacturers

\(^54\) Harvard Dictionary, op. cit., p. 617. This comment was made particularly with regard to the developments in German organs.
merely explored the potential of this instrument along the lines of the prevailing aesthetic ideal, just as they had done with every other instrument. The only difference seems to be that the organ, by nature, had a greater capacity for development than any other instrument. Could it be that the direction of the trend in instrumental development comes more sharply into focus when it is so intensely developed and exemplified in one supreme example?

**Instrumental Development in the Twentieth Century**

In the twentieth century instrumental development has particularly revolved around the use of electronic devices. When these devices are incorporated in traditional instruments, the original sound box is eliminated and replaced with a system of electronic amplifiers and loudspeakers. The volume capacity is then controlled by a simple dial on an amplifier and the tonal quality can be treated much more flexibly than on the original instrument. This allows for large increases in potential volume capacity throughout the entire compass of the instrument, because the technique of the performer and any natural mechanical limitations on the instrument itself no longer impose any restrictions.

Since c. 1950 developments have increasingly centered on purely electronic instruments in which the sound itself is electronically contrived. At first, tape recorders were utilized to modify and electrically reproduce ordinary natural sounds as was the case with musique concrète. As interest in pure electronic sounds developed, new instruments were created in which the sound itself was
produced by oscillators which are specially designed electrical circuits producing alternating currents of controlled frequency. The pitch depends only on the frequency of oscillation and changes if the frequency is modified. Thus, by means of the oscillator and the amplifier, both pitch and volume can be electrically controlled and vastly expanded in comparison with the possibilities afforded by traditional instruments. The R.C.A. Synthesizer of Columbia University is an example of this type of instrument. Because it is controlled by a computer, the composer can also become the performer, controlling all facets of performance himself from the computer console.

It appears that these electro-mechanical and electronic instruments have an even greater potential to affect the human organism than have traditional instruments. The increased capacity for stimulative power in volume, timbre, and pitch variation in these instruments seems to confirm yet again that there has been a trend to increase psycho-physiological impact on the human organism. The fact that these potent instruments can be operated by a single performer seems to be in line with the move toward greater individualism that is briefly discussed at the end of Chapter III.

Performance Practices

In general it appears that the history of instrumental development is, in fact, the history of the development of those instrumental characteristics which evoke increased response in the human organism.

55 Geiringer, op. cit., p. 268.
The history of the development of certain performance practices reveals a similar tendency supporting the proposed trend toward increased stimulative effect even further.

**Standard Pitch**

The establishment of an international standard of concert pitch did not become a viable proposition until well into the nineteenth century. Despite the evidence that there were many different pitches in use both above and below the eventually established a¹=440, it appears that from c.1600 to 1820 the average pitch used in the performance of Western art music "remained fairly steady at rather more than a semitone below the one in use today." The tuning fork, which provided a means of more consistently accurate pitch designation, was not invented until 1711. Even then it was not until 1859 that the Paris Academy fixed a standard of a=435. This was confirmed in Vienna in 1885. Eventually, at a conference of the International Standards Association in London (1939), standard pitch was fixed at a¹=440. There seems to be a general consensus among music historians that the standard pitch used in the twentieth century is higher than that used several centuries ago. Sachs, observing this particular development, commented that it is "indicative of the general tendency towards a stimulating tone." The increased effect

---

57 Part, *op. cit.*, p. 56. 
58 Ibid., p. 56.
of this development would, of course, be most noticeable at the upper extremities of pitch range. Even though the overall effect of this rise in standard pitch may not be a large factor in itself, it is, nevertheless, significant in the light of all the other developments that have already been discussed. It provides yet another strand of evidence and points in the same direction—towards an increasingly stimulating tone.

**Vibrato**

The use of vibrato in music performance always seems to have been associated with an expressive function specifically designed to "increase the emotional quality." The exploitation of this device has become more liberal and widespread, especially since the seventeenth century.

Initially, vibrato was used very selectively and the amplitude of the actual undulation was relatively slight as is evident in the use of *bebung* in clavichord playing. There are repeated references to the fact that vibrato was far more rarely used and strictly controlled in earlier times. Gannassi (c. 1540), Mersenne (c. 1640), and Rousseau (1687) all recommended that it be used discreetly. In writing about the flute, Geminiani (c. 1745) directed that vibrato must be used on long notes only in solo playing.

With the addition of a chin rest to the violin and a spike to the cello, the use of vibrato as well as tremolo (the rapid iteration of a note) was made easier on these instruments. Gradually, more

---

62 Dart, op. cit., p. 34.  
63 Ibid., p. 35.
pronounced, wider, and quicker vibrato was developed. Nevertheless, even Paganini's manuscript of his Caprices is quite specific about where to use vibrato and where not to use it. However, during the latter half of the nineteenth century and early twentieth century vibrato became much more generally accepted and freely used in both vocal and instrumental music. It was incorporated as part of the playing technique of most if not all instruments which had the capacity for it. The use of the tremulant stop of the organ also became less restrained. Generally, vibrato has become a much more consistently pervading element in vocal and instrumental art music in the nineteenth and twentieth centuries.

The Ensemble

The increase in size and change in composition of the orchestral ensemble has made a major contribution to the increase in volume capacity and pitch range, and the resultant increase in the potential psycho-physiological impact of Western art music. These historical changes are best illustrated in tabular form as shown on table 4.

The orchestras chosen for comparison and contrast in table 4 are generally rather large. Even so, the trend to increase ensemble size is quite noticeable, particularly when it is considered that the typical ensembles used in the seventeenth and eighteenth centuries were often smaller than those represented on table 4.

In describing the musical concepts of Berlioz, Dorian talks about a passion for "power and fantastic emotionalism." It seems

---

64 Ibid., p. 34.

240

19(1

tn tm a n

00(1fy

to a tfm iu

irui*a
9« iimad •

- I •N4 .•2- —•••.

I

*

... S ilt•
*e*

A OOKFAJUSCS

Of

IMTHAUSTAl* M K ItlU t 9IBS

FSOH TMS IWfAAIBWIM

CBIIUST

10

AC

TMKTXSIM

C O W IT *

aTwamitT'W «m»u

•••ant »v*<

( N«

inmaM tmm

1

a tu n a fT i d n t <U4

ZB S I& t? UaSfrf

ivwtaic

ttmUi) cut
tmU-UUKM

/iamn«i inioq
mR

nHoMJ
•.iim
»«»«Bs
«n««OM

• N 1^1

alA»t AnvnMaa

(tmmiM)
tom «fen

Kit wmn*i«J

H*tMm
itp tf

TAIU

b.

a y a n a « m i« i» j o j

» » in n q a n w ta n i ja
aanawoaaai in t n q

t

{

!i III

35 Sj j
^
•s .J.S i
-S
-sum

*5{

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.


that this comment could well be applied to the historical development of the orchestral ensemble. From Monteverdi, one of the pioneers of orchestration, to Wagner, Richard Strauss, and Mahler, the unmistakable tendency has been to develop the ensemble in the same way that each individual instrument has been developed. The developments that have occurred on the micro level and the developments that have occurred on the macro level correlate and run parallel with one another. The gradual strengthening of the extreme pitch registers of the orchestral ensemble is seen in the utilization of more cellos, double basses, and the contrabassoon in the bass, and the strengthening of the first violin section as well as the inclusion of the piccolo in the treble. The higher registers of most orchestral instruments were also generally exploited. Dart observed that the modern orchestra is "bottom heavy" in comparison with those of previous centuries, and also that a slight predominance of first violins has become evident.

This increase in the potential volume capacity has resulted from merely increasing the ensemble size as well as the development of greater volume capacity within each individual instrument. Add to this the tremendous expansion of the size and capability of the brass and percussion sections of the orchestra and it becomes quite evident that the orchestral ensemble has indeed become a fantastically potent means of communication.

66For example, the violin's upper extremity was extended from less than \( a^3 \) during the Baroque period to \( g^4 \) by the beginning of the twentieth century.

67Dart, op. cit., p. 55.
Berlioz' "Dream Orchestra" may have been extravagant in the extreme; however, Sachs points out that often "dreams are more characteristic than facts, as they do not depend on the impediments which restrict reality. The truest mirror of what the time desired was Hector Berlioz's vision of an ideal orchestra." From this it would appear that the direction of the trend is unmistakable. Mahler eventually amassed almost one thousand performers in a real performance ensemble of instruments and voices for his Symphony No. 8 which was first performed in 1910 in Munich. This was indeed an attempt to overwhelm the listener by the sheer magnitude of a stupendous musical experience.

It could be argued that the rise in potential volume capacity evident in the development of individual instruments and the ensemble could be partly due to the use of bigger concert halls where more sound was needed to fill a larger space. This is undoubtedly true but it is not the complete explanation for the trend. It should be remembered that in earlier times composers were very much aware of the effect of surroundings on the performance of their music, and they shaped and suited their music accordingly, using particular instruments and styles for particular performance situations. Commenting on this Dart observes that the modern age has "grown very insensitive to nuances of this kind."69 It seems that the nineteenth century tendency to view music as a total emotional experience that was intended to envelop the listener in sound minimized considerations about

---

68 Sachs, op. cit., p. 389.
69 Dart, op. cit., p. 56.
balance in ratios of volume output to the situation in which the music was performed. In fact, new concert halls were built so that the acoustical intimacy of the musical sounds would be more or less the same at any point throughout the hall. Thus, in general, the relative volume ratios of musical sounds reaching the listener would still be more in the late nineteenth century and twentieth century than in the seventeenth century.

Geiringer's view that instrumental development reflects historical aesthetic ideals and trends in the art certainly appears to be accurate, regarding the trend being traced in this study. It is evident that the historical development of instruments and various performance practices associated with Western art music do reflect the same tendencies that are evident in the development of the actual music. The trend to increase and develop those factors that have a psycho-physiological impact on the human organism has now been established in the development of the stylistic features of Western art music and confirmed in the development of instruments associated with Western art music. What remains to be considered is what does all this mean? What are some of the possible implications of such a trend?

**Summary**

The information presented in this chapter can be summarized as follows:

1. Musical instruments are an essential part of the history of music, and their development reflects the aesthetic ideals of any given period in history.
2. The period from c. 1600 to the present is important regarding the development of instruments used in Western art music.

3. Up until the seventeenth century instrumental development was restricted by a lack of idiomatic instrumental style and strongly entrenched proprieties regarding the use of instruments in time and place.

4. The developments in instruments begun in the seventeenth century were a result of an emphasis on emotion and sentiment in music. Developments were associated with their capacity for evoking an emotional response.

5. Historical instrumental developments have resulted in an increased stimulative potential of individual instruments as well as in the orchestral ensemble. This is evident in the increase in both pitch range and volume output and in the development of a full chromatic range in all instruments. This has been achieved either by modification of the mechanism producing the tone, or the exploitation of the latent capabilities of individual instruments. The development of some instruments such as the piano, the Romantic organ, and several of the percussion instruments that were introduced into Western art music exhibited this trend to the extreme. Twentieth-century electronic instruments have merely continued the trend to encompass vastly increased possibilities for extended volume and pitch range.

5. Those instruments incapable of complying with the trend such as the viols, clavichord, harpsichord, lute, and the recorders were gradually discarded, while those instruments with great potential
to fulfill the demands of the trend such as the brass and percussion instruments and the piano and organ were exploited and emphasized.

7. There has been a tendency to adopt and develop those performance practices which have an increased psycho-physiological impact on the human organism. These performance practices include:

(a) the establishment of a higher standard pitch
(b) the increased use of vibrato
(c) an increase in the size and range of the orchestral ensemble.
CHAPTER V

IMPLICATIONS TOWARD A PHILOSOPHY OF MUSIC HISTORY

It would appear that throughout history most cultures have had some belief regarding the effect of music on the human organism.\(^1\) Furthermore, some cultures seem to have considered the effects of music to be so important that their entire philosophy of music was drafted by this consideration. For example, the doctrine of ethos, founded on the conviction that music affects character, influenced the whole understanding of music in ancient Greece. It appears that the Greeks, in turn, obtained much of their understanding from the ancient Mesopotamians and Egyptians.\(^2\)

In studying the background to the development of Western art music the twentieth-century student and scholar is often puzzled by the apparent preoccupation with the effects of music on the individual that were so rife in the ancient Greek philosophy of music. However, whatever the twentieth-century opinion of the Greek concepts may be, it is clear that the ancient Greeks had some understanding of an aspect of the nature of music which seems to have been neglected or even ignored throughout the history of Western art music.

A firm foundation for a discussion of Western art music in

\(^1\)See Chapter II, pp. 30, 31 of this study for a discussion of this point.

the context of its effect on the individual is provided by the research of Jansen, Welch, Misbach, Winold, Neher and many others. This research demonstrates that the musical elements of volume, pitch, harmony, and rhythm do evoke psycho-physiological response in the human organism. The response varies with the quality of the stimulus. It is evident that the "function of every system in the body is affected to some degree." Furthermore, music is perceived through that portion of the brain receiving the stimuli of emotion, sensation, and feeling, without first being subjected to the brain centers involving reason and intelligence. This research indicates beyond question the significance of the every-day impact of music in Western culture.

It has also been shown that the stylistic development of Western art music reveals a consistent tendency to increase the potency of musical stimuli. This tendency has permeated the

---

3 Stewart-Gordon, James, "We're Poisoning Ourselves with Music," Readers Digest p. 188, February, 1970.
6 Winold, C. A. The Effects of Changes in Harmonic Tension Upon Listener Responses, 246pp.
8 Welch, op. cit., p. 533.
10 See Chapter III of this study for a discussion of this point.
development of each individual musical element as well as the overall development of the art. As the melodic factor has developed, it has moved from a point of relatively minimal impact to a point of maximal impact. The development of the harmonic, rhythmic, and dynamic factors show the same consistent trend.

The overall development of the art reflects the same directional tendencies. The gradual change in emphasis from the melodic to the harmonic to the rhythmic element, the gradual shift from a predominantly vocal style to a predominantly instrumental style, and the move from tone-centeredness to sonority-centeredness—in which non-tonal and unordered sounds such as noise are admitted—also display a tendency to increase the psycho-physiological response in the human organism.

It has also been shown that the increase in psycho-physiological impact is linked to the search for greater expressive power in the musical communication and the growing emphasis on individualism which entails a more relaxed attitude toward traditional principles of composition. These points appear to be connected with the gradual move toward secularism in Western art music.\(^\text{11}\)

The development of the individual instruments associated with Western art music also confirms the direction of this trend. It has been shown\(^\text{12}\) that individual instruments have developed from possessing relatively small pitch ranges and restricted volume capacity suited to perform vocal melody lines to possessing large

---

\(^{11}\)See Chapter III of this study for a discussion of this point.

\(^{12}\)See Chapter IV of this study for a discussion of this point.
pitch ranges and substantial volume capacity designed to explore a unique, idiomatic, instrumental-style of music. A full chromatic range was also developed for each instrument to enable it to be used in conjunction with the harmonic developments in music composition.

There has also been an overall move toward a higher standard pitch, an increased use of vibrato, and the development of very large and powerful ensembles. The ensemble has gradually incorporated not only a greater number of "improved"--or potentially more stimulating--instruments, but also additional instruments such as the piccolo and contrabassoon which have strengthened the overall effect of the extreme pitch ranges. All of these developments have increased the potential impact of the performance of Western art music. The trend in instrumental development is further underlined by the fact that those instruments incapable of keeping pace with the desire for greater dynamic power and flexibility have been discarded.

Finally, it has been shown that not only has the trend to increase stimulative potential occurred, but the closer we come to the twentieth century the more rapidly this trend has accelerated. It appears that the period since the Baroque era--from 1600 to the present--has been the most significant and the most eventful within the total history of the development of Western art music. Even within these four hundred years, the nineteenth and twentieth centuries could be singled out as the most eventful of all. The predominantly horizontal conception of music before 1600 kept the least stimulative musical element--the melodic element--in the forefront of developments. Once a vertical conception of music became established in the seventeenth century, the more stimulating developments
in harmony and rhythm were thrust into prominence. In general, all the major developments in instruments and performance practices have been achieved since 1600. Most of these developments really gathered momentum during the nineteenth century. The comparatively late development of the powerful brass and percussion sections of the orchestra, and the development of electronic instruments, which are capable of producing a much louder volume than most other instruments, also supports the notion of an accelerating trend.

Thus, in tracing this trend it is clear that developments that occur on the macro level reflect developments on the micro level and vice versa. Developments have also been shown to have a compounding action resulting in a graph of geometrical progression being drawn in the direction of maximum impact. Whether in stylistic structure or performance practice, the trend to increase psychophysiological impact is thoroughly embedded in the very fibre of Western art music development.

A Philosophy of Music History

In that this trend so thoroughly permeates the entire fabric of Western art music development, and in that it consistently drives in one direction, it can only be accounted for by a philosophy of music history which is directional. Certainly, the evidence for this trend seems to preclude the view that Western art music history displays neither progression nor regression,\(^\text{13}\) or even that it has maintained a dynamic equilibrium while alternating between antipoles.

\(^{13}\)See Chapter I, pp. 14-16 of this study for a statement of the philosophies of music history.
For example, it has been shown that if music history is viewed as a series of alternations between Classicism and Romanticism, the directional element is not reduced to a horizontal line. On the contrary, the Romantic periods in music history definitely appear to dictate the overall direction of developments, while Classical periods merely shift and consolidate rather than completely reverse the innovations that emerge. Thus, there is still a direction in which developments move.

It appears, therefore, that the trend to consistently increase the stimulative potential of Western art music throughout its history can only be explained in terms of either a philosophy of evolutionary progress or a philosophy of degeneration and deterioration. The choice between these two basic philosophies of music history must be a matter of interpretation, based on careful evaluation and assessment of the trend itself.

At this point in the discussion, it is illuminating to consider a strangely similar and parallel trend to the one being analyzed here that occurred in the cultures of ancient Egypt and ancient Greece. The same general trend shown to have taken place in the developments of Western art music can be demonstrated to have been present in the musical development of both of these cultures.

Prior to the eighteenth century B.C. music scholars have noted that Egyptian music was relatively "quiet and reserved." The

---

14 See Chapter III, pp. 191-193 of this study for a discussion of this point.

main instruments in use were small harps and flutes which appear—from reproductions of them—to have "been incapable of great sonority." Sachs notes that drums and clappers were probably not used at this time. This lack of percussion instruments would undoubtedly have helped to maintain a generally quiet and mellow type of music.

From around the sixteenth century B.C.—with the gradual infiltration of Asiatic instruments and musical concepts—"a new kind of noisy, stimulating music seems to have taken possession of the Egyptians." Slowly and step-by-step the face of Egyptian music completely changed. The orchestra was greatly enlarged to include large harps, lutes, oboes and percussion instruments such as castanets, cymbals, bells, drums, and rattles, including sistra. A study of the numerous instruments preserved from this era suggests that there was a definite trend toward a preference for small pitch intervals, including quarter tones. By contrast the older Egyptian music was probably devoid of semitones. It seems that a multiplicity of new scales were introduced and new instruments were constructed to cope with the new trend. Reese states:

16Reese, Gustav, Music in the Middle Ages, p. 7.
17Sachs, op. cit., p. 98.
18Ibid., p. 98.
19Reese, op. cit., p. 7.
21Reese, op. cit., p. 7.
All evidence points to the rise of music of an entirely different character, full of ecstasy and passion. As later in Greece, the "Appollinarian" element was superceded by the "Dionysian." The trend towards individual and unrestrained expression and the consequent dissoluteness of civilisation led around 600 B.C. to a reaction and the re-establishment of the old sacred rites.22

Egypt was conquered by Persia c. 525 B.C. and never really regained its distinctive culture. In 332 B.C. Alexander the Great subjugated Egypt, and for several centuries Greek attitudes and ideals dominated Egyptian life.

Beginning in the fifth century B.C. a similar trend can be traced in Greek music. While classical music proper had been perfected in the early part of the century, the latter part of the century witnessed the beginning of a musical revolution. This development in the history of Greek music has been compared to the Baroque period in Western art music history. "Its chief characteristics are subjective expression, free forms, more elaborate melody and rhythm, the introduction of chromaticism and even quarter tones, the emergence of the professional musician and the virtuoso."23

This musical revolution rejected all tradition and broke the old association of poetic and musical forms. Instrumental improvisation came to the fore, gradually overshadowing the vocal emphasis that had previously dominated Greek music. Sound effects imitating nature, modulation, extravagant coloratura, and "wobbly tuning" were exploited.24 After this revolution, history records a gradual

---

23 Ibid., p. 302.
It seems significant that in both of these cultures this trend, with its rather close parallels to the history of Western art music, has been associated with the demise of the Egyptian and Greek cultures. It is also rather interesting that intellectuals such as Plato and Aristotle seemed to sense the direction in which developments in the Greek culture were heading, and on the basis of the effect these developments had on the individual, they spoke out against them and their degenerative influence. In commenting on this, Grout observes:

It may be that in thus limiting the kinds of music allowable in the ideal state both Plato and Aristotle were consciously opposing certain tendencies in the actual musical life of their time, particularly the use of enharmonic intervals, the use of certain rhythms connected with orgiastic rites, the independence of instrumental music, and the rise of professional virtuosos.26

If these philosophers were able to recognize this trend as being deleterious to Greek society, and if in subsequent history their views were confirmed by the breakup of Greek culture, then it seems that it may be time to re-evaluate the effects of the same trend in Western art music on Western society. It would be unfortunate, perhaps even disastrous, if the oft repeated adage "One of the only things we learn from history is that we don't learn from history" should be proved true again in the development of music in Western civilization.

25 Robertson and Stevens, op. cit., p. 97.
26 Grout, D. J., A History of Western Music, p. 9.
In the light of the close parallels between the history of Western art music, the weight of evidence strongly suggests that the trend that has been traced in Western art music is indicative of a degenerative rather than a progressive incline. However, in evaluating the direction of this trend, there is another strand of evidence which must be considered which derives from the trend itself. On its own the trend to increase the stimulative potential of Western art music could be interpreted either as progressive or regressive. It could be seen as a sign that Western art music has increasingly become a more potent and efficient vehicle for the expression of the thoughts, feelings, and ideals of Western society. On the other hand, it could also be interpreted as being part of a desensitizing process in Western society whereby an increasingly potent stimulus is required in order to maintain a uniform level of communicative power. There seems to be some rather significant evidence in support of this latter view.

Schönberg observed that familiarization with tonal relationships results in a certain boredom and ennui. "Every tonal relationship that has been used too often must finally be regarded as exhausted. It ceases to have power to convey a thought worthy of it. Therefore every composer is obliged to invent anew." It has been shown that each of the new innovations in Western art music has consistently moved in the direction of increased psycho-physiological impact in order to regain that "power" of communication. The fact

---


28 See Chapter III, p. 112 of this study.
that Winold's research (1963)\textsuperscript{29} detected that harsher dissonances were needed to evoke the same responses to dissonance that Hevner had observed thirty years earlier seems to provide documented evidence of this habituation occurring in the twentieth century.\textsuperscript{30}

Could it be that the process of listener habituation with musical developments can be compared to the process of drug addiction? Drug addiction occurs as an individual moves from assimilating a comparatively "harmless" drug to assimilating increasingly stronger substances. To begin with, the comparatively "harmless" drug provides strong stimulation, and the desired effects result. In time, however, the "harmless" drug fails to produce the initial experience. Stronger drugs, taken in larger doses, are needed to bring about the same response. This pattern reproduces itself until large doses of "hard" drugs are being assimilated. However, just because an individual is taking a "hard" drug does not mean that a comparatively "harmless" drug has no effect. The effect of the less potent drug is merely stifled by a chemically modified organism that has become tolerant to much more potent substances. The less potent substance is interpreted as being uninteresting, boring, and non-stimulative. By inurement the organism has become desensitized, and increasingly potent substances are needed to produce the desired effect.

Although an illustration of this kind may prove inadequate in some respects, it does provide a useful analogy by which to explain

\textsuperscript{29} Winold, \textit{op. cit.}, pp. 201-202.

\textsuperscript{30} See Chapter II, pp. 75-77 of this study for a discussion of this point.
the developmental trend in Western art music. Throughout the history of Western art music, individuals have become increasingly used to and tolerant of developments. At the beginning of Western art music history, comparatively insignificant innovations would have brought about the same strong reactions that much bigger innovations have precipitated in the nineteenth and twentieth centuries. Perhaps this is also part of the reason for the consistently violent reactions to innovation that have occurred throughout the history of Western art music, particularly from those individuals who had not reached the "saturation point" with the effects of the prevailing styles.

Music historians have consistently noted the stubborn refusal of music critics and the general public to accept the music of their time. Machlis, for example, begins his book on twentieth century music with a series of quotations which illustrate that the distaste and contempt of the music critic for new music has always existed.\(^{31}\)

\(^{31}\)“Music was chaste and modest so long as it was played on simpler instruments, but since it has come to be played in a variety of manners and confusedly, it has lost the mode of gravity and virtue and fallen almost to baseness.\(^{31}\) Boethius (c. 480-524)

Music was originally discreet, seemly, simple, masculine, and of good morals. Have not the moderns rendered it lascivious beyond measure?\(^{31}\) Jacob of Liege (c. 1425)

They are so enamored of themselves as to think it within their power to corrupt, spoil, and ruin the good old rules handed down in former times by so many theorists and most excellent musicians, the very men from whom these moderns have learned to string together a few notes with little grace. For them it is enough to create a tumult of sounds, a confusion of absurdities, an assemblage of imperfections.\(^{31}\) C. M. Artusi (1600)
Modern composers and scholars have come to look rather disparagingly and disdainfully at such opinions, generally interpreting them as being immature and unjustly negative. Such comments are viewed as evidence that, although individuals may not like change, change is historically inevitable and artistic creation must go ahead, despite the lack of comprehension of the public at large. There is a general belief that new music has never been initially accepted, but that with time it will be recognized and acclaimed as it should be.

While this view has become entrenched in historical interpretation, could it be that this seemingly arbitrary rejection of contemporary music by critics and the public at large has some legitimate psycho-physiological foundation? It is certainly true that sometimes the reasons initially offered as the basis for the rejection of new music are rooted in nothing more than preemptory taste and opinion and that they lack sound reasoning. However, reactions to new things are rarely scholarly or carefully considered. Perhaps the consistently offended critic has unwittingly been emphasizing

The Overture to Beethoven's opera *Fidelio* was performed recently, and all impartial musicians and music lovers were in complete agreement that never was anything written in music so incoherent, shrill, muddled, and utterly shocking to the ear.

*August von Kotzebue (1806)*

Serious music is a dead art. The vein which for three hundred years offered a seemingly inexhaustible yield of beautiful music has run out. What we know as modern music is the noise made by deluded speculators picking through the slagpile.

*Henry Pleasants The Agony of Modern Music (1955)*

*Machlis, op. cit., p. 1*
something about the direction of developments in Western art music? Maybe what has been consistently expressed in the simple language of "I don't like it," and is therefore rejected as merely stubborn prejudice, is really unconsciously highlighting the trend towards an increasingly potent stimulation.

Studies such as those done by Schmale\textsuperscript{32} show that musicians, as a result of their involvement with and proximity to the music during performance, are affected by music even more than the audience. This may well cause the composer and musician to feel that the pungency and zest of a particular stylistic feature in the music is exhausted well before the general public or the critic reach the same level of saturation and come to the same conclusion. Thus, it is only natural that the composer will initiate a more stimulating practice in his search to eclipse the stale effects of the prevailing style. However, in that the listener is rarely at the same level of saturation as the composer and musician, he or she reacts to the new innovation with a sense of shock.

This discrepancy between the "saturation level" of composers and musicians on the one hand, and listeners and critics on the other hand seems to justify the offence and outrage listeners and critics express when confronted with changes and innovations. The habituation concept also explains why critics rejected comparatively smaller changes in earlier periods of Western art music history with just as much vehemence as larger changes are discredited in the

twentieth century—the desensitizing process has increased in strength throughout Western art music history.

Changes in Western art music have occurred more and more rapidly throughout its history. There has been less and less time for assimilation and acceptance, and the desensitizing process has gradually gathered speed. Perhaps the acceleration in the rate of change in the development of Western art music is just a small part of an all-embracing sweep of change in Western society. Toffler considers the effects of such rapid changes to be very real.

"By stepping up the pace of scientific, technological and social change, we are tampering with the chemistry and biological stability of the human race." 33 Perhaps the reason why twentieth-century audiences seem to be responding less and less favorably to contemporary music is because Western society is almost at the limit of its adaptability. Perhaps we are approaching the finite boundaries of our flexibility with very little resilience remaining to cope with more radical changes. Maybe the adaptive psycho-physiological reactions to developments in Western art music have worn down the body's machinery "bit by minute bit until imperceptible tissue damage" 34 has actually already resulted. 35 It is possible that

---

33 Toffler, Alvin, Future Shock, p. 311.

34 Ibid., p. 311.

35 The psychiatrists Marie-Luise Fuhrmeister and Eckart Wiesenhuetter (1974) observed that the harsh atonal sounds of twentieth century music "can actually make members of the orchestra sick." ("Song is Ended but the Malady Lingers On." Variety 274:2, March 2, 1974.) This occurred particularly in groups that frequently or exclusively played modern art music. It is significant that members of such groups reported a definite improvement in their health when they performed music of the older classical repertoire. Leonid
Western society is already suffering from future shock in the area of art music appreciation. Maybe some individuals are out of breath with trying to keep up, and have opted out of the process of trying to cope with the radical and rapid changes in Western art music, by simply standing still and indulging in the excesses of popular music. Could it be that even the "best" and the "fittest" of composers and musicians will some day find that they also can no longer keep up? And then . . . will the whole structure of art music collapse?

Whatever the future holds, it is evident that the trend to heighten the stimulative potential of Western art music has already resulted in an increasing loss of sensitivity in the human organism. It seems that on the one hand Western society is becoming increasingly hardened to the brute force of stimulation in art music, and on the other hand individuals are increasingly reacting in terms of "I don't like it" and yet not being able to explain why. It certainly appears that Western art music has not become a more efficient vehicle of expression, despite the increasing potency of its communication. Rather, the hardening, desensitizing process has produced an increasingly insensitive society.

To accept the view of degeneration as being a valid

Melnikov's research into the psycho-physiological responses of listeners supports these conclusions. (Melkinov, Leonid, "USSR: Music and Medicine, Music Journal 28:18 November, 1970.) Thus, there is definite evidence that the music of the twentieth century is interfering with and having a negative influence on the human organism. The effect of twentieth-century rock music has also been shown to concur with this conclusion. (Larson, Bob, The Day Music Died, pp. 115-125 and "Medico Finds Root of Many Evils in a Pesty Rock Beat," Variety 288:1,88, September 28, 1977.)
interpretation of Western art music history creates some problems and questions. Not the least of these problems is the implication that the quality and value of Western art music decreases as we approach the twentieth century. There are also many practical and poignant questions regarding the role and work of the contemporary composer which emerge. Such questions and problems are valid and deserve adequate study and good answers. However, it would be dishonest to reject the whole concept of degeneration on the basis of some tricky questions which arise from it. Whatever philosophy of music history one adopts, some problems and difficult questions will arise. The fact remains that a significant amount of telling evidence in support of a concept of degeneration certainly exists. Furthermore, the Christian perspective provides some additional evidence which also points in the direction of a decline. This will be discussed later on in this chapter. In that several strands of evidence can be shown to point in the direction of degeneration, the concept demands some serious consideration.

The impact of this trend in Western art music on the whole of Western culture must also be ascertained. In determining this impact it may be profitable to consider the words of the ancient Greek philosopher Plato: "Let me write the songs of a nation and I care not who makes its laws." Walter Dinsdale, a member of the Canadian Parliament in 1974, made the following comment about Plato's claim:

That's hard adage for the law makers to swallow, because

Grout, op. cit., p. 8.
it says in effect that the musicians of the nation, the music makers of the nation have a stronger influence on molding the life of their day and generation than do the politicians and the law makers. This is true from the historical perspective, as well as the contemporary perspective.37

Dinsdale goes on to support this idea by referring to the influence that popular music groups, such as the Beatles, have exerted over Western youth. He suggests that music may be one of the best gauges of the spiritual health of a nation.38 The state of a nation's music may indicate fairly accurately the state of the nation itself. This certainly appears to be true of the demise of the ancient Egyptian and Greek cultures. The move toward greater emphasis on increased stimulation in musical development coincided with the degeneration of their entire civilization. Could the same be true of developments in Western culture?

There is a need to reappraise the whole concept and function of Western art music and its role in Western civilization. It is hoped that the trend highlighted in this study will supply motivation for such a discussion. It is also hoped that it will help in facing Barbara Tuchman's challenge "To recognize and to proclaim the difference between what is good and the shoddy, the true and the fake, as well as between right and wrong,"39 in the future development of Western art music.

38 Ibid., p. 9.
The Contribution to the "Unexplored Field of Musicology"

It has been shown that the desire to increase the stimulative potential of Western art music is intimately connected to the development of its stylistic features. It may prove to be fruitful and rewarding to study the entire history of Western art music from this standpoint. The perspective gained from the study of the psycho-physiological impact of music opens up the understanding of how particular stylistic features in music are constructed and sheds light on the creative process itself. For example, the doctrine of ethos, the Affektenlehre, and the Empfindsamkeit might originally have had a legitimate psycho-physiological foundation. It is possible that the particular stylistic features to which these concepts referred were originally developed for their particular stimulative effect. If indeed the human organism has grown more insensitive to the effects of smaller changes as a result of being increasingly bombarded by more powerful and stimulating changes, then the twentieth century listener may not be capable of fully assessing the concepts and beliefs of earlier periods. What we in the twentieth century may perceive as mere philosophical speculation about the effects of musical characteristics might once have had a more tangible basis. It is easy to presuppose the law of uniformity and to assume that people have always felt and reacted to things as we do now. However, Zofia Lissa observed in her study of changes in musical perception that this is simply not true. If sensitivity to music has changed

then in all probability this has modified the perception of particular musical effects.

For this reason the Dorian and Phrygian modes might once have been more capable of producing particular effects than we perceive them to be able to do today. Similarly, it might have been for some good reasons that the *aulos* was associated with the Dionysian cult. The rapid rhythmic music, the particular tonal quality, and the slight pitch changes associated with this instrument was possibly perceived as being more sensually evocative than other instruments of the time. Thus, because of its greater effect on the human organism, it was considered to be very appropriate for use by the licentious and extravagant Dionysian cult. While it cannot be denied that certain philosophical concepts were intertwined with the Greek understanding of music and the universe, these need not preclude us from gaining the valuable insights into the human response to music at that time. In the light of the "process of desensitization," the writings of Plato and Aristotle on the effect of music are rendered quite understandable and can possibly be accepted as an accurate account of what the actual perception of music was like two millennia ago.

Similarly there is reason to believe that initially there was some psycho-physiological basis for the *Affektenlehre* and the *Empfindsamkeit*. It is possible that the characteristics ascribed to different keys, especially when used in meantone temperament, were based on more than conjecture. Particular rhythmic and melodic figures were probably associated with particular affects because they carried a much more real and valid communication to the audiences of
the Baroque and Rococo periods than they do to the blunted sensibilities of people who have been exposed to the huge effects of late nineteenth century and twentieth century music.\(^\text{41}\) This is not to deny that with time certain motives and figures—which originally might have been consciously or unconsciously created and used for their particular effect—became stale and came to be used merely as stylized forms. However, in the light of the trend that is evident in the stylistic development of Western art music, it may be fruitful to study the origins of these stylistic motifs. It would be valuable to determine whether or not they also initially stemmed from the desire to increase the expressive capacity of musical communication.

It would also appear that a psycho-physiologically-based, empirical understanding of the development of music confirms much of Derycke Cooke’s work. Cooke attempts to show “that the conception of music as a language capable of expressing certain very definite things is not a romantic aberration, but has been the common unconscious assumption of composers for the past five-and-a-half centuries at least.”\(^\text{42}\) By utilizing a host of examples from musical literature, he demonstrates that composers have persistently used “various procedures in the dimensions of pitch, time and volume”\(^\text{43}\) in order to communicate certain emotional characteristics, although the actual expression of these procedures may have become more intense throughout the centuries.

\(^{41}\) Guernsey, Martha. “The Role of Consonance and Dissonance in Music,” American Journal of Psychology 40:197, April, 1928. (Citing On Sensations of Tone, by H. L. von Helmholtz translated by Ellis, pp. 225f.)

\(^{42}\) Cooke, Derycke, The Language of Music, p. xi.

\(^{43}\) Ibid., p. xi.
Cooke's thesis supports the idea that certain musical stylistic features consistently affect the human organism in a particular way. If this is not the case, Cooke argues, why are certain stylistic features used so persistently and consistently to achieve specific affects century after century and by many different composers? However, it seems that a study of the development of these stylistic features in the context of the historical trend to increase the impact of musical stimulus provides Cooke's argument with an empirical foundation. Conceivably the specific meanings of various intervals which Cooke refers to, and for which he is criticized,\(^\)\(^4^4\) were once much more specifically communicative than they are in the twentieth century. To the twentieth-century listener, whose sensitivity to fine nuances of tonal meaning is blunted, these sound combinations do not necessarily "communicate so specifically."\(^\)\(^4^5\) But to reject the possibility that they did once communicate more specifically, and that they may still communicate something, even if we do not consciously perceive it in the twentieth century, is also possibly going "a little bit too far."\(^\)\(^4^6\)

\(^{4^4}\) "Derycke Cooke, in The Language of Music, may go a little bit too far in his theory of emotion and meaning of music, by indicating that intervals themselves have definite characteristic traits, or that music intervals can portray a specific mood, a specific meaning. For instance, he says that a 'monir third is not concord but a "depression" of natural third, stoic acceptance, tragedy.' (Cooke, The Language of Music). Whereas he says major thirds are 'concord, natural thirds, and joy.' (Ibid.) Even though his tremendous references from outstanding literature are impressive, one cannot really expect sound combinations to communicate so specifically." Goodman, A. H., "On Applying the Psychological Theory of Emotions to Music," The Instrumentalist 21:38, February, 1967.

\(^{4^5}\) Ibid., p. 38.

\(^{4^6}\) Ibid., p. 38.
The link between the desire for greater expressive potential in musical communication and the resultant increase in the stimulative impact of music on the listener that has been established in this study appears to shed some light on the understanding of the language of music. Furthermore, this connection illuminates the understanding of the creative process itself as to how certain stylistic features were initially developed. There is reason to believe that the desire for greater stimulative power has, in fact, been a primeval urge behind the desire for greater expressive potential and the development of different stylistic features throughout the history of Western art music.

Implications for a Philosophy of Ethics in Music for the Christian

The Bible provides no specific and tangible criteria by which the Christian can evaluate music. It merely offers certain general principles by which to appraise specific situations in the Christian life. Thus, a certain amount of personal interpretation is both inevitable and imperative. To be fair, however, all evaluation and interpretation needs to be made on the basis of firm evidence and in line with Biblical precedent and understanding, rather than on the basis of personal taste and opinion.

In this study, the basis for the discussion of a Christian philosophy of ethics in music has been established on the basis of empirical research into the effects of music on the human organism and a study of facts that are evident in the actual music and historical records of the various periods of Western art music development. It would appear that this is a sufficiently firm and objective
platform on which to base evaluation and interpretation.

All music—even Gregorian chant—has some stimulative impact on the human organism. This fact derives from the very nature of music. The human response is the simple result of the operation of the law of cause and effect—as music is produced, sound waves interact with and elicit a response from the human organism. Nowhere in the Bible is music, or anything else for that matter, condemned simply because it affects an individual. In fact, the Bible record indicates that both vocal and instrumental music were repeatedly utilized for their effect in particular situations. Throughout the Bible, especially in the Old Testament, music is referred to as being a natural and meaningful part of the worship of God and the life of the people. Therefore, the real issue for the twentieth-century Christian, and also for the non-Christian, is not so much the fact that Western art music affects him or her, but rather that the way in which it affects him or her must be evaluated. This involves assessing the direction of the trend that has occurred in the development of Western art music.

The escalation in the trend to increase psycho-physiological impact and the change in emphasis from sacred to secular music throughout the history of Western art music are closely correlated. In view of this interconnection it has been suggested that Western man's concept of and attitude toward God may somehow be linked to the nurture of those stylistic features of music that increase

---

47 See, for example, II Samuel 6:5, 15; II Chronicles 7:6; I Samuel 16:14-23.
response in the human organism.\textsuperscript{48} In a discussion of the effect of upheavals of thought throughout Western history, particularly noting the effect of these upheavals on the arts, Martin Cooper makes a telling comment that is relevant to the understanding of Western art music history:

Man's progressive deprivation of the supernatural, the progressive starving of an innate appetite, led to a gradual depraving of that appetite, to craving for strange foods and to attempts to satisfy by other means an instinct which finds itself denied natural satisfaction. In place of food and drink for his spirit man has looked in the arts for spices, stimulants or narcotics. Taught to expect neither help nor sympathy from outside or above himself, he takes to worshipping his own image and investing his own emotions with an absolute value, rating them simply by their intensity and no longer referring them to absolute standards of good or evil.\textsuperscript{49}

Here Cooper appears to be forging the same link between the indulgence of what is stimulating and the deprivation of the supernatural. Indeed, it seems that the more the spotlight in Western art music development shifted away from sacred music and a God-centered approach to music composition to secular music and a man-centered approach, the greater was the escalation in the development of those stylistic features that increase human response.

Commenting particularly on events in the nineteenth century, Cooper goes on to point out that associated with man's worship of himself and his own emotions there was, at that particular time, a move toward individual self-sufficiency and personal freedom.

This was something new not only in art but in the experience of humanity since the Christian era. Compare it with Milton, with the grandest Bach or with the introduction to Haydn's Creation. Milton, Bach and Haydn are centered on something outside themselves, they are consciously creatures.

\textsuperscript{48}\textsuperscript{48} See Chapter III, p. 195 of this study.

\textsuperscript{49}\textsuperscript{49} Cooper, Martin, \textit{Ideas and Music}, p. 5.
creature-like, dependent and humble. Beethoven's center lies in himself, he refuses to be dependent; almost he persuades himself—and has persuaded others—that he is creator, not creature. And so, in the words of a recent American historian of literature, 'the so-called Romantic movement represents the turning-point of a Titanic assertion of human self-sufficiency.' In fact Pride, the sin of Milton's Satan (a character significantly admired by the Romantics) received a new name and became one of the cornerstones of the romantic artist's religion, a religion of which even orthodox Christians like Gounod are sometimes happy to call themselves priests.50

Although this description applies particularly to nineteenth century Romanticism, it is relevant to and significantly fulfilled on the macro scale of Western art music history as well. It has been shown that just as there has been a continual and accelerating tendency to increase the stimulative potential of Western art music, so also there has been a steady tendency toward greater individualism, marked by a freer attitude toward principles of musical composition.51 Composers have become more and more intent on establishing their own rules and conventions stamped by their own personality, rather than abiding by traditional practices and restrictions. This is not meant to imply that all traditional practices and restrictions should be retained; rather the point is made merely to highlight the historical fact.

In addition to the general tendency toward greater individualism, it has also been shown that it is the Romantic outbursts in music history—those periods when individualism and freedom from restriction are rife—that really control the overall direction of musical development. Thus, twentieth century art music is a result

50 Ibid., p. 6.

51 See Chapter III, pp. 186ff. of this study for a discussion of this point.
of the combination and infusion of these factors and trends that have been in operation throughout Western art music history.

For the Christian these facts sound a note of caution. The direction of musical development has been historically influenced by factors which could be considered from the Christian standpoint to be erosive and detrimental—a move toward total secularization of the musical style and the aggrandizement of human pride and narcissism. Although the stimulative effect of music cannot in itself be considered to be deleterious, the consistent development and emphasis in that direction, motivated by the desire for greater zest, pungency, and expressive power, suggests that there could at least be a possibility that it has all gone in the wrong direction. Harold Best seems to be hinting at this when he comments:

To be sure, man is a fallen creature. Sin leads to deviation in what he does. His ideas are often at cross-purposes. What he creates is often bent in its content, purpose and direction. Man's ability to criticize and judge art is just as fallen as his other faculties.52

The belief that man is a fallen being is by no means meant to suggest that the Christian believes that creativity is bad. Man's genius of creativity is considered to be a direct gift from God. In fact, it is probably one of the facets in which man—the creature—is most like his Creator. However, the gift of creativity has been perverted by sin and therefore, for the Christian, it cannot be allowed to function purely in accordance with human desire. Because man cannot trust his tastes and feelings as a safe guide to truth and goodness, he must receive outside revelation to guide and direct

the output of his creativity. Yet, as has been shown, musical creativity has persistently developed in the direction of sensuality and freedom from outside restriction.

All the evidence that has been considered indicates that from the Christian perspective there is overwhelming reason to interpret the history of Western art music development in terms of a gradual process of degeneration and deterioration, rather than in terms of evolutionary progress or a balanced and non-directional process. This concurs with the general Christian belief that since the Fall a diffuse and all-pervading process of degeneration has occurred throughout this world's history. A general view of this magnitude is, of course, virtually impossible to prove. However, the developments throughout Western art music history can be and need to be assessed and evaluated apart from the bias of any such general view.

The hierarchy of values which a view of degeneration suggests implies that a progressively better quality of music is to be found the further one goes back in music history. The implications of such an inference obviously need further study. The conclusion that Western art music is in decline has been reached on the basis of factual evidence derived from the history of music and empirical research. It should be remembered that the "backward look" has been advocated before in the twentieth century in the Neoclassic movement of the 1920s. Perhaps it needs to be applied more generally with more fixedness of purpose and thoroughness in order to recapture the essence of the quality of music in previous periods. If this is done in the realization that the very life of Western art music is
at stake, rather than for purely aesthetic reasons, it may prove to be a valuable life-begetting exercise.

It is not the purpose of this study to reinvoke Neoclassicism or any other particular style. Nevertheless, without advocating the imitation of earlier styles, a thorough study of the way in which less stimulating stylistic features were used in the music of earlier periods may be a means of beginning to rectify this degenerative trend. To begin with, this may be distasteful and stale—perhaps even akin to the withdrawal symptoms that result from deprivation of stimulants. However, it may also mark a new beginning.

Occasionally it is suggested that the direction of the history of musical development is somewhat inevitable—that Schönberg's twelve-tone system was the inevitable outcome of Wagner's chromaticism, and that this led inevitably to developments in musique concrète and electronic music. However, the Christian belief in free will and the power of choice for every individual negates this sense of being locked into a system, of being a pawn in a process over which one has no control. Certainly, once a particular direction is taken and becomes well-trodden by succeeding generations, it becomes increasingly difficult to alter the course. However, man has chosen the path which Western art music development has taken and so he can also choose a different path.

It is at this point that the solemn responsibility of the composer comes to the fore. As the initiator he chooses how he molds the direction of the art, the perception of the listeners, and the effect of music on the culture as a whole. Therefore, above anyone else the composer needs to evaluate the direction in which
developments in music are heading and to form his creative work accordingly. He is the one who decides whether inclination, feeling, and desire will rule his composition, or whether a genuine concern for the art as a whole and its effect on man will control those natural impulses that may lead to further corrosion and decline. For a Christian composer this responsibility is even more pressing.

It is sometimes proposed that a reliable yardstick by which to evaluate whether a certain piece of music is "good" or "bad" is to assess the tenor of the life of the composer. If the composer has claimed to be a Christian and lived a so-called "good life" then it is assumed that his music must be good and wholesome. If he/she has not lived a "good life," then his/her music is not uplifting and is possibly even "bad." However, this rather arbitrary judgment is based on an erroneous understanding of Christianity itself. A central tenet of the Christian faith is that all men have sinned and come short of God's ideal.\(^{53}\) Hence, even the creative genius of the best Christian composer is affected by the taint of sin. The Christian composer is not like the legendary King Midas. Everything he composes does not turn to gold just because of his profession of faith. It is the musical style itself, not the composer's life, which must be evaluated and appraised according to its place within the historical framework and the trend that has occurred. Furthermore, no one can judge the motives and life of another person. The individual composer is a child of his time and is cast in the general mold of composition that prevails during his lifetime. However, the

\(^{53}\)See, for example, Romans 3:10, 23.
effect of a particular composer's ideals and philosophy of life can be seen to a certain extent in the imprint left by him/her on the style of music which he/she inherited and how it is handed on to the next generation. 54

A more objective guideline for a standard of ethics in music for the Christian composer, musician, and listener is urgently needed. In that there has been a trend towards increased potential impact on the human organism throughout Western art music history and that this trend has been evaluated as degenerative on the basis of Christian belief, then the historical trend itself could become a standard for judging the relative quality of a particular musical style. Such a standard would be based on objective facts from empirical research into the effect of music on the human organism and the historical data of the development of Western art music. It should be stressed that this would be a standard of relative quality and not a dividing line between "right" and "wrong." Stylistic features in the music would need to be distinguished and then evaluated as "good," "better," or "not-so-good" according to their relative position on the historical time line. This would provide one consistent standard by which all music--art music and popular music--could be appraised. Such an

54 See, for example, the life and work of Richard Wagner. Wagner desired great dramatic expressiveness in order to portray intensely strong passions and he chose to develop the powerful tension of chromaticism for this purpose. At the time when he wrote Tristan and Isolde, his most radical experiment in chromaticism, he was having a passionate love affair with Frau Mathilde Wesendonck. It has been said that "Wagner poured his passionate yearning for her into the score of Tristan." (Brockway, Wallace and Weinstock, Herbert, Men of Music, pp. 424-425.) Hence, Wagner's attitudes and lifestyle certainly influenced what he did with musical style as it was left in his hands.
appraisal would be based on stylistic features and not on a subjective parameter which is based on taste or opinion.

The only place where opinion and interpretation have entered into the formulation of this standard is in the evaluation of the trend itself as being degenerative, and therefore this could be open to further discussion. However, there are two facts in the discussion which are inescapable:

1. There are only three basic ways of viewing music history. All other views are variations on or combinations of these views:
   a) evolutionary progress
   b) degeneration
   c) non-directional dynamic balance.

2. The historical and psycho-physiological facts presented in this study are extensively documented. Any philosophy of music history and standard of music ethics must take these facts into consideration. The view of music history that is adopted must align honestly and totally with the facts of history and scientific research.

Regardless of any academic discussion of the trend toward increased stimulative potential of music, the fact remains that music is having an effect on the individual and society in general. This is true of both art music and popular music in that they both reflect certain similar characteristics. In that an individual cannot shut out the effect of music if it is within audible range—a fact that is
widely capitalized on by business enterprises—music in the twentieth century must still be evaluated and classified by some means. The research cited in Chapter II of this study has clearly shown that twentieth century art music and twentieth century popular music can have a negative influence on the human organism. Therefore, the effect of music on the human organism cannot be simply ignored.

It is not enough to simply observe and document the effects of music and the developments that have taken place in the musical art. Clearly, some positive and specific action is necessary in order to stem the tide of decline. This study has been conducted because of a real love for Western art music and a sincere desire to see it develop in the best possible way; hopefully it will provoke thought and constructive discussion to this end.

---


<table>
<thead>
<tr>
<th>Appendix A</th>
<th>Henver Adjective Circle (Revised Version)</th>
</tr>
</thead>
<tbody>
<tr>
<td>triumphant</td>
<td>forceful</td>
</tr>
<tr>
<td>forceful</td>
<td>powerful</td>
</tr>
<tr>
<td>vigorous</td>
<td>martial</td>
</tr>
<tr>
<td>martial</td>
<td>ponderous</td>
</tr>
<tr>
<td>ponderous</td>
<td>emphatic</td>
</tr>
<tr>
<td>emphatic</td>
<td>majestic</td>
</tr>
<tr>
<td>majestic</td>
<td>exalting</td>
</tr>
<tr>
<td>exalting</td>
<td>bright</td>
</tr>
<tr>
<td>bright</td>
<td>vivacious</td>
</tr>
<tr>
<td>vivacious</td>
<td>sprightly</td>
</tr>
<tr>
<td>sprightly</td>
<td>cheerful</td>
</tr>
<tr>
<td>cheerful</td>
<td>happy</td>
</tr>
<tr>
<td>happy</td>
<td>soaring</td>
</tr>
<tr>
<td>soaring</td>
<td>gay</td>
</tr>
<tr>
<td>gay</td>
<td>sparkling</td>
</tr>
<tr>
<td>sparkling</td>
<td>playful</td>
</tr>
<tr>
<td>playful</td>
<td>merry</td>
</tr>
<tr>
<td>merry</td>
<td>jovial</td>
</tr>
<tr>
<td>jovial</td>
<td>humorous</td>
</tr>
<tr>
<td>humorous</td>
<td>whimsical</td>
</tr>
<tr>
<td>whimsical</td>
<td>hilarious</td>
</tr>
<tr>
<td>hilarious</td>
<td>fanciful</td>
</tr>
<tr>
<td>fanciful</td>
<td>quaint</td>
</tr>
<tr>
<td>quaint</td>
<td>dainty</td>
</tr>
<tr>
<td>dainty</td>
<td>delicate</td>
</tr>
<tr>
<td>delicate</td>
<td>light</td>
</tr>
<tr>
<td>light</td>
<td>graceful</td>
</tr>
<tr>
<td>graceful</td>
<td>lyrical</td>
</tr>
<tr>
<td>lyrical</td>
<td>poetic</td>
</tr>
<tr>
<td>poetic</td>
<td>leisurely</td>
</tr>
<tr>
<td>leisurely</td>
<td>feminine</td>
</tr>
<tr>
<td>feminine</td>
<td>gentle</td>
</tr>
<tr>
<td>gentle</td>
<td>calm</td>
</tr>
<tr>
<td>calm</td>
<td>serene</td>
</tr>
<tr>
<td>serene</td>
<td>soothing</td>
</tr>
<tr>
<td>soothing</td>
<td>dreamy</td>
</tr>
<tr>
<td>dreamy</td>
<td>tender</td>
</tr>
<tr>
<td>tender</td>
<td>sentimental</td>
</tr>
<tr>
<td>sentimental</td>
<td>longing</td>
</tr>
<tr>
<td>longing</td>
<td>romantic</td>
</tr>
<tr>
<td>romantic</td>
<td>plaintive</td>
</tr>
<tr>
<td>plaintive</td>
<td>sad</td>
</tr>
<tr>
<td>sad</td>
<td>pathetic</td>
</tr>
<tr>
<td>pathetic</td>
<td>mournful</td>
</tr>
<tr>
<td>mournful</td>
<td>melancholy</td>
</tr>
<tr>
<td>melancholy</td>
<td>depressing</td>
</tr>
<tr>
<td>depressing</td>
<td>gloomy</td>
</tr>
<tr>
<td>gloomy</td>
<td>heavy</td>
</tr>
<tr>
<td>heavy</td>
<td>tragic</td>
</tr>
<tr>
<td>tragic</td>
<td>frustrated</td>
</tr>
<tr>
<td>frustrated</td>
<td></td>
</tr>
</tbody>
</table>

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.
APPENDIX B

EXPLANATION OF PITCHES

Symbol: \[ \text{C} \quad \text{G} \quad \text{C} \quad \text{G} \quad \text{C} \]

Hz: 49.125  65.0  98.25  131.0  196.5

Symbol: \[ \text{C} \quad \text{G} \quad \text{C} \quad \text{G} \quad \text{C} \]

Hz: 262  393  524  786  1046  1572  2096
BIBLIOGRAPHY


"When You Care Enough to Sing the Very Best," Christianity Today 21:8-11, August 26, 1977.


"Song Is Ended but the Malady Lingers," Variety 274:2, 61, March 6, 1974.


