Part 1

THE PURPOSES AND DESCRIPTION OF THE ADVANCED MEASURES OF MUSIC AUDIATION

Purposes of the Test

The words "talent" and "ability" are often used in a general way to describe musicianship that is demonstrated either formally or informally. Unfortunately, neither of those words has a specific meaning: both include, and thereby confuse, aptitude and achievement.

Music aptitude is a measure of a student's potential to achieve in music. Music achievement is a measure of what a student has learned. Music aptitude may be thought of as relating to the "inner possibility," and music achievement to the "outer reality." The **concealed** (hitherto unknown) music aptitudes of many students, regardless of whether they have received formal or informal instruction in music, are quickly **revealed** by a valid music aptitude test. Although students who score high on a music achievement test also score high on a music aptitude test, the reverse is not necessarily true. Not all students who score low on a music achievement test score low on a music aptitude test. The fact is that some students who demonstrate little or no music achievement score extremely high on a music aptitude test. It has been discovered that, unfortunately, almost 50 percent of 4th through 12th grade students whose overall music aptitude is at or above the 80th percentile do not receive special instruction in music, nor do they volunteer to enroll in music performance activities in school. They are not recognized by their teachers as having great potential for understanding and appreciating music, that is, for achieving in music. It is estimated that that percentage is even greater for college and university students.

Many qualified performing musicians and teachers find it difficult even subjectively to describe music aptitude apart from music achievement. They are unable to objectively define music aptitude and they do not know how to establish a process for reliably measuring music aptitude. Tests also have limitations. Neither teacher nor tests take into account all that can and should be assessed, but tests are less vulnerable than teachers to error of measurement. And tests, though they do so much less than do teachers, confuse aptitude and achievement. Fortunately, music aptitude tests are not as faulty in that respect as academic intelligence tests, many

of which are actually measures of academic achievement. In order to take an intelligence test, one must have acquired at least the ability to read and to establish verbal associations. In contrast, one need not be able to read or write music or have otherwise acquired formal training in music to take a music aptitude test. In fact, that the administration of a valid music aptitude test is not dependent upon music achievement can be shown by simply changing, for example, the option responses from "same" and "different" to "higher" and "lower" for the same questions; scores on the test will no longer significantly correlate with music aptitude, but will correlate significantly with music achievement. It has been found that scores on a valid music aptitude test can account for no more than 65 percent of the reason or reasons for students' success in music, therefore to assess music aptitude most validly, both an objective test and teachers' subjective knowledge and judgment are required. Using one without the other is inferior to using them in conjunction with each other, because it seems clear that music aptitude, in total, is represented by the interaction of several human attributes.

Although a valid music aptitude test can be of great educational benefit, there is always the possibility that such a test may be misused, either intentionally or unintentionally. Probably the two most grievous misuses of any type of music test occur 1) when a student is denied instruction in music or membership in a music ensemble because of his or her low scores, and 2) when a student is considered capable of self-instruction because of his or her high scores. Either set of conditions results in a student's being educationally deprived. Under no circumstances should a student, as a result of his or her low music aptitude scores, be prevented from receiving music instruction or participating in some music ensemble. And never should a teacher feel intimidated to the extent of not providing adequate instruction to a student who demonstrates high music aptitude scores. It is not unusual for there to be at least one student in a class who possesses higher music aptitude than the teacher does. Nonetheless, the teacher has the responsibility of helping that student achieve in music to the extent that the student's music aptitude will allow. Although a student may have greater music aptitude than a teacher has, the teacher has more experience and a fund of knowledge that must be imparted to the student. When the teacher's responsibility is appropriately fulfilled it can be expected that a student with a higher level of music aptitude than the teacher will in time achieve greater heights in music than did the teacher. That situation bears witness to a great teacher and a talented student.

Objective test scores can never replace the value of the subjective opinions of teachers, nor can the subjective opinions of teachers ever replace the value of objective test scores. Both make unique contributions to the evaluation procedure. Thus the use of objective test scores and subjective opinions together create the most ideal circumstances for counseling a student. Perhaps the greatest value of a student's objective test score is shown when it is found to be in disagreement with the subjective opinions of teachers. The resolution of such disagreement should result in a better understanding of the student and improved instruction for the student.

Although it was specifically designed for use with students in grades 4 through 12, for more than twenty years the *Musical Aptitude Profile,* either in total or two or more of its subtests, has been used in colleges and universities to assess the music aptitudes of music and non-music majors. The reason is that heretofore there has been no valid music aptitude test available for use with college and university students. Although the *Musical Aptitude Profile* was not validated for students beyond high school, the battery nevertheless has been used because teachers believed that a battery of such high quality could offer at least some useful information for guiding and counseling post high school students. It is recommended that the *Advanced Measures of Music Audiation* now be used with undergraduate and graduate students in colleges and universities, because it is designed specifically for those students.

It should be kept in mind that no meaningful purpose can be served by attempting a practical comparison of scores, either percentile ranks or raw scores, on the *Advanced Measures of Music Audiation* and the *Musical Aptitude Profile.* The two tests are designed and normed for different groups of students. Although results on the two tests share common features, the score distributions themselves are dissimilar. Because items constituting the *Advanced Measures of Music Audiation* are more difficult than those constituting the *Musical Aptitude Profile,* a student's scores on the two tests cannot be expected necessarily to be the same. One characteristic that makes the *Advanced Measures of Music Audiation* a more desirable instrument than the diagnostic *Musical Aptitude Profile* for use with college and university students is that it is a much shorter test. A theoretical comparison of scores on the two tests can be found in Part 7 in the discussion of the validity of the *Advanced Measures of Music Audiation.*

When evaluated with wisdom and judgment, scores on the *Advanced Measures of Music Audiation* may be used for one or more of the following seven purposes:

1) To serve as a part of the criteria for entrance to a college or university department or school of music. Music aptitude is at least as important as any type of music achievement for ultimate success in music.
2) To identify college and university students, non-music as well as music majors, who possess the music aptitude to achieve high standards in music. It is improbable that a student who demonstrates technical proficiency on a music instrument but who does not possess high music aptitude will become a fine musician.
3) To establish objective and realistic expectations for the music achievement of college and university music and non-music majors. A music aptitude test is more valid for this purpose than is a standardized academic aptitude test or an academic achievement test.
4) To efficiently and diagnostically adapt music teaching in private instruction and within a classroom or an ensemble to the individual musical differences found among college and university students.
5) To assign college and university students to specific music classes, ensem-

bles, and types of private instruction that are designed to meet their individual musical needs.

6) To assist college and university music students in making career decisions.
7) To efficiently and diagnostically adapt music teaching within a classroom or an ensemble and in private instruction to the individual musical differences found among high school students.

It should be kept in mind that although music aptitude and music achievement are different, they are not mutually exclusive. A music aptitude test is designed to measure music aptitude. It is not possible, however, to construct a pure test of music aptitude, just as it is it is not possible to construct a pure test of music achievement. If a test emphasizes music aptitude, it is considered to be a music aptitude test. If a test emphasizes music achievement, it is considered to be a music achievement test. The more a music test emphasizes aptitude or achievement, the more valid it is for its intended purpose. It is the overall validity, both subjective and objective, that actually establishes the quality of a music aptitude test. Information on the validity of the *Advanced Measures of Music Audiation,* as well as other pertinent technical information, may be found in Part 7.

Description of the Test

The *Advanced Measures of Music Audiation* is a cassette recorded test that requires approximately 15 minutes to administer. Included are 30 questions, each containing a pair of short musical phrases. In addition to the test questions, directions for taking the test, along with practice examples, are recorded on the cassette. (The text of the directions may be found in Part 4.) The *Advanced Measures of Music Audiation* may be given to small and large groups of students or to individual students. There are two subtests included in the *Advanced Measures of Music Audiation: Tonal* and *Rhythm.*

Formal music achievement is not a requirement for taking the *Advanced Measures of Music Audiation.* Regardless of whether a student can play a music instrument, sing, or read notation, or has taken courses in music theory, he or she may score high on the test. The student simply indicates by filling a space on the answer sheet whether two short musical phrases sound the same, whether they sound different because of a tonal change, or whether they sound different because of a rhythm change. There is only one correct answer for each question. Directions for hand scoring the answer sheets and for using the machine scoring service provided by the publisher, as well as for documenting the test results, may be found in Part 5. Guidance for interpreting the test results is offered in Part 6.

Part 2

THE NATURE, CHARACTERISTICS, AND DESCRIPTION OF MUSIC APTITUDE, AND THE ROLE OF AUDIATION

Music Aptitude

Systematic research has provided substantial information about the nature and characteristics of music aptitude, particularly with regard to its sources, function, and development.* Although it can be said that the level of one's music aptitude is commensurate with how well one audiates (hears, feels, and comprehends music for which the sound is not physically present),** a satisfactory verbal description of music aptitude, that is, a definition of its elements, has not yet been given. An understanding of music aptitude is best acquired by an examination of the content and psychological constructs of valid music aptitude tests. Knowledge about the nature and characteristics of music aptitude is best derived from the use of valid music aptitude tests under experimental conditions.

Early psychologists whose primary interest was in music disagreed about the difference between music aptitude and music achievement. But from the beginning to the middle of this century there was general agreement that music aptitude is hereditary and dichotomous: as a birthright, one is born either with music aptitude or without music aptitude. It was steadfastly believed that environmental factors, including music instruction, had no effect on music aptitude. During the second world war years, opinions among music psychologists changed in support of the belief that the source of music aptitude is entirely environmental. That may have been because it was timely to believe literally that all men are created equal, because behavioral psychology was becoming more fashionable, or because music educators began to wonder why they were teaching students who supposedly could not learn as a result of their being born without music aptitude, The "nature-nurture" issue took on new dimensions and the debate became intense. Philosophical arguments again overshadowed the need for systematic research. During the third quarter of the present century, music psychologists renewed their interest in the source of music aptitude by engaging in controlled research. Sophisticated techniques provided for efficient objective investigation.

Research in psychoacoustics, sociomusicology, and cognitive psychology contributed little to identifying the source of music aptitude. The indirect findings of

neurophysiologists in regard to auditory asymmetry and lateral dominance in the cerebral cortex, coupled with the direct findings of music psychologists, produced a more comprehensive explanation of the source of music aptitude. Music aptitude is a product of nature and nurture: both contribute in unknown proportions to music aptitude. The role of inheritance, however, is far from clear. Although part of music aptitude is innate, the level of music aptitude one is born with cannot be determined accurately on the basis of ancestry. That is not to say that latency may not play a crucial role in the matter. Nevertheless, regardless of the level of music aptitude one is born with, unless early informal environmental influences in music, influences that promote instinctive, intuitive, and cognitive learning, are favorable, that level will never be realized in music achievement. Conversely, regardless of how favorable early informal environmental influences are, one's music aptitude will never reach a higher level than that with which one was born.

The importance of early childhood informal and formal guidance (not necessarily formal instruction) in music cannot be over-stated. The younger a child is, the more and the more quickly his or her music aptitude may increase. That is true for every child, regardless of how low a level of music aptitude he might have been born with. There is reason to believe that, because of a lack of understanding of how to complement the music aptitude of a newborn child, the level of innate music aptitude the neonate possesses begins to decrease shortly after birth. Possibly as a result, it seems that none of us has developed his or her music aptitude to its highest possible level. That of course restricts the level of music achievement that one may hope to attain.

From birth to age nine, one is in the developmental music aptitude stage. Music aptitude does not continue to develop after one is about nine years old. It stabilizes: the level of music aptitude one has at age nine remains ostensibly the same throughout life. From age nine on, one is in the stabilized music aptitude stage. That is, although one's music aptitude scores increase from year to year, one's percentile ranks remain relatively stable. That should not be interpreted to mean that after age nine one cannot learn music. What it does mean is that one can be expected to reach in **music achievement** a level no higher than that at which his **potential** (music aptitude) to achieve has stabilized.

Current research renders the idea suspect that one is born either with music aptitude or without music aptitude. Actually, music aptitude, like all other aptitudes, is normally distributed. As there are no unintelligent persons, so there are no unmusical persons. Everyone has at least some music aptitude. Most persons have average music aptitude. Relatively few persons have a very high level or a very low level of music aptitude. Everyone is capable, to some degree, of learning music. If the quality and quantity of informal and formal guidance and formal instruction in music should increase through age nine, the average level of music aptitude would undoubtedly rise.

As to the description of music aptitude, there are two general points of view: the Gestalt and the atomistic. The Gestalt group holds that music aptitude is a unitary trait of which overall intelligence is a substantial part. The atomistic group con-

tends that music aptitude is multidimensional; that is, that it has various parts, none of which is significantly related to overall intelligence. Just what all of the parts are remains unknown. Nevertheless, both schools of thought make provision for the measurement of tonal, rhythmic, and aesthetic-expressive-interpretive qualities, either separately or collectively, and it is agreed that music aptitude is manifested in subjective understanding (preference) as well as objective understanding. It is further agreed that for a music aptitude test to serve its intended purpose, it must include actual music that is performed and to which the listener responds. Gestalt psychologists, however, insist that a music aptitude test must yield only a total score (no subtest scores), that the content of the test questions be in a music context, that each test question include as many music dimensions (such as tonal and rhythmic) as possible, and that the stimulus for each question be a music instrument. On the other hand, if indeed music aptitude has many parts, as the atomists believe, subparts also must exist and need to be considered. Some researchers have addressed themselves to that concern. For example, they suggest that pitch discrimination, pitch recognition, pitch memory, and "absolute" pitch are all subparts of the tonal dimension, and that there is a difference between melodic aptitude and harmonic-contrapuntal aptitude. As to the rhythm dimension, they suggest that rhythm recognition, rhythm memory, and time discrimination are all parts of the rhythm dimension, and that there are differences between aptitudes for melodic rhythm, meter, and tempo. For the aesthetic-expressive-interpretive dimension, differences in aptitudes for phrasing, balance, style, melody, harmony, rhythm, and intensity have been established. Recent, but not conclusive, research findings suggest that although there are probably not separate aptitudes (but possibly personality traits and psychomotor abilities) for composition, improvisation, conducting, and instrumental and vocal performance, still there are separate parts and subparts of music aptitude, including preference as well as non-preference measures. There probably are not, however, as many subparts as initially anticipated by researchers; some subparts have been found to be irrelevant and others to overlap. Although a student might score high on a pitch discrimination test, he or she may not score high on a test of melodic or harmonic audiation; but one who scores high on a test of melodic or harmonic audiation will score high on a pitch discrimination test. That one can hear a difference in pitch between two isolated pitches ten cents apart (one-tenth of a half step) does not necessarily mean that one will listen to or perform music with good intonation. If one cannot hear such a difference, it is certain that one will not listen to or perform music with good intonation. Hence it may be said that a pitch discrimination test can have only negative validity. That is, it can predict only whether one will not profit from music instruction; it cannot predict whether one will profit from music instruction. The same logic applies to rhythm and time discrimination tests as compared with tests of meter and tempo audiation, and to timbre and loudness discrimination tests as compared with a phrasing preference test. After music aptitude has stabilized, if a student does not have reasonably high subjective understanding (as measured by preference aptitude tests), his music aptitude will limit

his music achievement regardless of how high he or she scores on objective understanding (as measured by non-preference tests which constitute the *Advanced Measures of Music Audiation).*

Audiation

Audiation is the basis of music aptitude. Thus it becomes the basis of music achievement. To audiate is to hear and comprehend music for which the sound is not physically present. Audiation is to music what thinking is to language. Because the ability to imitate represents only the readiness to learn how to audiate, audiation is different from imitation. To imitate is simply to perform vocally or on an instrument without musically understanding what was heard just a few moments ago. For example, many persons can imitate what they heard just a few moments ago and nonetheless be unaware of the tonality and the meter of what they are imitating, and they may not know that a modulation has taken place in the music. Audiation is also different from memorization. Many persons can memorize music through imitation or from notation without audiating what they are performing. Unless one can audiate what one is imitating or has memorized, one will most likely perform at best with poor intonation, with inaccurate rhythm, and without expression.

What is imitated or memorized without audiation is quickly forgotten. What is audiated in improvisation and creativity or recalled as a result of audiation may be remembered for a long time. Further, unless an instrumentalist or a vocalist can notationally audiate (hear what is seen in notation before it is performed), he or she will be unable to bring meaning to notation as he or she attempts to read it; he or she will be able only to recite the letter names and time value names of the notes and to theoretically define signs and symbols seen in the notation. Just as important is that unless a performer can audiate, he or she will not have the ability to improvise or create.

There are seven types and six stages of audiation. The types of audiation are easily observable. Though they are not hierarchical, some types of audiation serve as readinesses for others. The stages of audiation are hierarchical, and they are not exactly the same within each type of audiation.

The *first* type of audiation takes place when we are listening to familiar and unfamiliar music. As we listen, we give syntactical meaning to the music by audiating and connecting tonal patterns and rhythm patterns that were just heard in the music, but, of course, the sound for which is no longer physically present. A *second* type of audiation takes place when we are reading the notation of familiar and unfamiliar tonal patterns and rhythm patterns in familiar and unfamiliar music. It is called notational audiation. A *third* type of audiation takes place when we are writing from dictation the notation of familiar and unfamiliar tonal patterns and rhythm patterns in familiar and unfamiliar music. That too is called notational audiation. A *fourth* type of audiation takes place when we are recalling without the

aid of notation familiar tonal patterns and rhythm patterns in familiar music, and performing them silently, vocally, or on an instrument. Each of the familiar patterns in the familiar music that we are audiating guides us in recalling and organizing the remaining patterns in the music. That process of recalling through audiation, which continues throughout the piece of music, is different from the process that leads to the memorizing of a piece of music. A *fifth* type of audiation takes place when we are writing familiar tonal patterns and rhythm patterns that we are recalling through audiation. That too is referred to as notational audiation. A *sixth* type of audiation takes place when we are creating and improvising unfamiliar music, using both familiar and unfamiliar tonal patterns and rhythm patterns, and performing the music silently, vocally, or on an instrument. Each of the tonal patterns and rhythm patterns that we are recalling, creating, and improvising through audiation guides us in organizing additional patterns that we will recall, create, and improvise through audiation. That process continues throughout the piece of music. A *seventh* type of audiation takes place when, using both familiar and unfamiliar tonal patterns and rhythm patterns, we are writing unfamiliar music that we have just recently or are presently creating or improvising. Each of the tonal patterns and rhythm patterns that we are recalling, creating, and improvising through audiation guides in organizing additional patterns that we will recall, create, and improvise through audiation. That process continues throughout the piece of music. That too is called notational audiation.

The six stages of audiation are hierarchical and cumulative. Each stage of audiation becomes the basis for and combines with the next higher stage of audiation. All of the stages of audiation are explained below as they occur in the first type of audiation. In the *first* stage of audiation, we retain short series of pitches and durations that were heard just a moment earlier in the familiar or unfamiliar music to which we are listening. We retain the short series of pitches and durations in terms of immediate impressions without giving them any musical meaning. Unless musical meaning is given in the next stage of audiation to what we are retaining, within a few seconds, what is being retained will be lost. In the *second* stage of audiation, we silently imitate the series of pitches and durations that we are retaining from the previous stage of audiation. Then we organize through audiation the short series of pitches and durations into one or more tonal patterns and rhythm patterns on the basis of pitch center and the placement of macro beats in the music to which we are listening. In the *third* stage of audiation, we establish through audiation, as a result of the interaction of the tonal patterns with one another and the rhythm patterns with one another, the tonality and the meter of the music to which we are listening. We are aware of tonal, metrical, and temporal modulations that may take place in the music. In the *fourth* stage of audiation we retain in audiation the tonal patterns and rhythm patterns, in relationship to the tonality and meter that they have established, that we have already organized in the music to which we are listening. In this stage of audiation, we may assess, restructure, and clarify the tonal patterns and rhythm patterns, in relation to tonality and meter, that we are retaining in audiation. In the *fifth* stage of audiation, we recall

tonal patterns and rhythm patterns that we have audiated and organized in other pieces of music perhaps hours, days, or years ago. The process of determining the similarities and differences among tonal patterns and rhythm patterns in different pieces of music allows us to assess, to restructure, and to clarify further the tonal patterns and rhythm patterns, in relationship to tonality and meter, that we are retaining in audiation. In the *sixth* stage of audiation, we predict the tonal patterns and rhythm patterns that we will hear next in the music to which we are listening. The more accurate our predictions, the better we understand the music to which we are listening. If our predictions are not accurate, we will encounter some difficulty in listening to the music. If only a few of our predictions are inaccurate, we will continue the cyclic process of engaging in the stages of audiation, and we will make only simple alterations in predictions. Should our predictions be grossly inaccurate or should we be able to make no predictions at all, the audiation process will revert to, and probably remain at, the initial stage.

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* A complete discussion of music aptitude may be found in either of the following books: Edwin E. Gordon, *Musikalische Begabung. Beschaffenheit, Beschreibung, Messung und Bewertung,* trans. by Michael Roske (Mainz: Schott, 1986) and Edwin E. Gordon, *The Nature, Description, Measurement, and Evaluation of Music Aptitudes* (Chicago: GIA, 1987).

** More information about audiation is presented in the following section. For a detailed description and explanation of the types and stages of audiation, see Edwin E. Gordon, *Learning Sequences in Music: Skill, Content, and Patterns* A Music Learning Theory (Chicago: GIA, 1989), Chapter Two.

Part 3

THE RATIONALE, CONTENT, AND DESIGN OF THE ADVANCED MEASURES OF MUSIC AUDIATION

Rationale of the Test

Audiation is the basis of developmental and stabilized music aptitudes as well as of music achievement. The level of a student's developmental music aptitude at age nine becomes 1) the student's level of stabilized music aptitude throughout life and 2) the level above which the student's music achievement will never rise. Thus audiation is fundamental to all music endeavors. It is for that significant reason that the word "audiation" rather than the word "aptitude" is used in the title of the *Advanced Measures of Music Audiation,* although that test is essentially a music aptitude test.

The *Advanced Measures of Music Audiation* (AMMA) is considered advanced because it is designed primarily for use with college and university students and high school students. The *Primary Measures of Music Audiation** (PMMA) is designed for use with students who are in the developmental music aptitude stage (ages five through eight). The *Intermediate Measures of Music Audiation*** (IMMA) is designed for use with students who are making the transition from the developmental music aptitude stage to the stabilized music aptitude stage (ages six through nine), or who are in the stabilized music aptitude stage (ages ten and eleven). The *Musical Aptitude Profile**** (MAP) is designed for use with students who are in the stabilized music aptitude stage (grades four through twelve). MAP is particularly suited to diagnosing the musical strengths and weaknesses of individual students.

A developmental music aptitude test, for example PMMA and IMMA, consists of a separate tonal subtest and a separate rhythm subtest. All of the pitches in a tonal subtest question are of the same length, and all of the durations in a rhythm subtest question are of the same pitch. Thus in a developmental music aptitude test the student hears tonal aspects and rhythm aspects apart from each other. Moreover, the student responds only to tonal aspects in questions in the tonal subtest, and only to rhythm aspects in questions in the rhythm subtest. A stabilized music aptitude test, for example MAP, also consists of a separate tonal subtest and a separate rhythm subtest. The student, however, does not hear tonal aspects apart

from rhythm aspects and rhythm aspects apart from tonal aspects. Nonetheless, the student responds only to tonal aspects in questions in the tonal subtest, and only to rhythm aspects in questions in the rhythm subtest. In an advanced stabilized music aptitude test, for example AMMA, there are not separate tonal and rhythm subtests. The two aspects are combined in one test. That is, the student does not hear tonal aspects and rhythm aspects apart from each other. Moreover, the student responds to either tonal aspects or rhythm aspects in questions in that one test. In an advanced stabilized music aptitude test such as AMMA, a student is expected to audiate concurrently tonality, keyality, melody, implied harmony, rhythm, meter, and tempo in a test question. In a developmental music aptitude test and in a stabilized music aptitude test a student deals only with two option responses of same or different or same or like to a test question. In an advanced stabilized music aptitude test a student deals with three option responses of tonal, rhythm, or same to a test question.

The general rationale of the *Advanced Measures of Music Audiation* is based on the following principles:

1. The audiation of music, not imitation, memorization, or the discrimination of musically isolated pitches or durations, should be the integral element of the test.
2. The test should be designed to be administered to a group of students or to an individual student.
3. The test should be short enough so that it can be administered in a complete session that is less than a half hour.
4. The answer sheet should be designed for electronic scoring as well as for hand scoring.
5. Students should not need to be able to read or write music in order to take the test.
6. Students should not need to be able to perform vocally or instrumentally to take the test.
7. Students should not need to be familiar with the theory of music or the history of music in order to take the test.
8. All music in the tests should be specially composed for the specific purposes of the test. The use of original music prevents giving some students an advantage as a result of their familiarity with existing music.
9. All music in the test should be performed by a professional musician.
10. The reproduction of the music on the test should be of the highest technical quality obtainable under practical conditions.
11. Students should enjoy listening to the test. The test should provide students with educational listening experiences. A variety of tonalities, keyalities, meters, and tempos should be included in the test.
12. The test should be eclectic, incorporating the best aspects of Gestalt and atomistic theories.
13. The test should be suitable for assessing a wide variety of music aptitudes.

14. Test questions should not be arranged from "easy" to "difficult." Rather, item difficulty should vary throughout the test to stimulate and maintain student interest.
15. The types of responses needed to answer the test questions should not be so complex as to require abilities extraneous to music aptitude.
16. Students should not be forced to respond to test questions. They should be permitted and encouraged not to respond to a question if they are uncertain of the correct answer.

Design and Content of the Test

The *Advanced Measures of Music Audiation* is a cassette recorded test that is sixteen minutes long. The cassette may be used with either a monaural or stereo cassette player. Included on the cassette are the directions for taking the test, three practice exercises, and the thirty questions that constitute the test. Each test question was programmed on an Apple Macintosh computer and performed by a professional musician on a Yamaha DX-7 synthesizer. It consists of original music composed specifically for the test.

Whether administered to a group of students or to an individual student, the test requires no more than 20 minutes of overall administration time. Besides the actual giving of the test, that includes the distribution of the answer sheets, the writing of names and other relevant information on the answer sheets, and the collection of the answer sheets.

Each test question consists of a short musical statement followed by a short musical answer. The number of each test question is announced on the cassette before the question is heard on the cassette. The student is asked to decide whether the musical answer and the musical statement are the same or different for each test question. If the musical answer is different from the musical statement, the student is then asked to decide whether the difference is a result of a tonal change or a rhythm change. There may be one or more tonal changes in a musical answer or there may be one or more rhythm changes in a musical answer. Never, however, are there both a tonal change and a rhythm change in a musical answer.

What is meant by a tonal change or a rhythm change is made clear in the practice exercises. The first practice exercise includes a rhythm change in the musical answer. The second practice exercise includes neither a tonal change nor a rhythm change in the musical answer. The musical answer is the same as the musical statement. The third practice exercise includes a tonal change in the musical answer.

If the musical answer is the same as the musical statement, the student fills the blank in the 'Same' column on the answer sheet after the number for the test question. If the musical answer is different from the musical statement as a result of a tonal change, the student fills the blank in the 'Tonal' column on the answer sheet after the number for the test question. If the musical answer is different from

the musical statement as a result of a rhythm change, the student fills the blank in the 'Rhythm' column on the answer sheet after the number for the test question. If a student is unsure of an answer, he or she is directed not to guess; the blank should be left unfilled for that question.

In each test question the musical statement and the musical answer always have the same number of notes. Thus a student cannot arrive at a correct answer simply by counting the number of notes in a musical answer as compared to the number of notes in a musical statement. Moreover, the difference between the musical statement and the musical answer may occur at the beginning, in the middle, and/or at the end of the musical answer.

A musical answer may be different from a musical statement as a result of a tonal change of one or more pitches, tonality, and/or keyality, or as a result of a rhythm change of one or more durations, meter, and/or tempo. Various tonalities, keyalities, meters, and tempos, as well as tonal and rhythm modulations, are represented in the test questions. The music in some of the test questions is indicative of contemporary sound, that is, what might be referred to as atonal or arrhythmic. The test questions are clustered neither in terms of difficulty nor in terms of tonality, keyality, meter, or tempo.

At first the music that constitutes the test questions was performed by musicians using actual instruments. It was soon discovered, however, that it was impossible for a musician to perform all parts of each musical statement and musical answer exactly the same except for the intended difference. Because unintended as well as intended differences were always present in the musical answer, in terms of expression as well as of intonation or rhythm, the test questions had poor validity. Thus the test questions were programmed on a computer and performed on an electronic instrument. As a result, all parts of each musical statement and each musical answer are perfectly consistent except for the intended difference.

Typically, subtests constitute a test battery that is designed to yield two or more scores. That is not the case for the *Advanced Measures of Music Audiation,* which is actually only one test. Thus it is considerably shorter than a battery of tests. Because of the unique process for scoring the *Advanced Measures of Music Audiation,* a Tonal score, a Rhythm score, and a Total score (the total of the Tonal score and the Rhythm score) are derived from the same thirty test questions. *The Advanced Measures of Music Audiation* would need to be much longer and the design radically different in order for it to yield preference scores.

The *Advanced Measures of Music Audiation* is not a music achievement test. It is a music aptitude test. There are various reasons for this. First, the skills measured by the test are not formally taught to students. Second, because it is original, a student could not have achieved familiarity with the music that constitutes the test questions. Third, although because of formal or informal music instruction some students may have theoretical knowledge of the words "tonal" and "rhythm," other students will quickly acquire the necessary simple understanding of the words when listening to the practice exercises. It is conceivable that the rapidity with which and the extent to which a student learns how the words "tonal"

and "rhythm" are used for purposes of taking the test, regardless of how much music instruction he or she may have had previous to the administration of the test, are a measure of the student's music aptitude, which is appropriately reflected in his or her test results. Of course, if a teacher should "teach to the test," that test, like any other test, regardless of whether it is an aptitude test or an achievement test, would become invalid.

Considerable experimentation was undertaken to determine the most desirable length of silent time needed to separate the musical statement from the musical answer in each of the test questions in the *Advanced Measures of Music Audiation.* Given too much time, a student might be able to imitate or even memorize the musical statement before comparing it with the musical answer. Should that happen, the test might become a measure of music achievement rather than of music aptitude. Four seconds of silent time were found to be optimal for a student to be able to audiate, but not to imitate or memorize the musical question, before he or she hears the musical answer. That is, the four seconds of silent time between the musical statement and the musical answer is not long enough for a student to repeat any musical question at the actual tempo at which it was heard. There is, however, just enough time for a student to audiate the musical statement before the musical answer is heard. Audiation is accomplished by the student as he or she syntactically generalizes and summarizes the essential features of what he or she heard in the musical statement (without regard, of course, for consistent tempo), and then comparing that information in audiation as he or she is hearing the musical answer. Audiation leads to understanding, whereas imitation and memorization apart from audiation lead at best to emotional reaction. The fact that the student must be listening simultaneously for either a tonal change or a rhythm change, even if the musical statement and musical answer prove to be the same, further encourages the student to audiate rather than to imitate or memorize.

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* Edwin E. Gordon, *Primary Measures of Music Audiation* (Chicago: GIA, 1979).

** Edwin E. Gordon, *Intermediate Measures of Music Audiation* (Chicago: GIA, 1982).

*** Edwin Gordon, *Musical Aptitude Profile* (Boston: Houghton Mifflin Company/The Riverside Publishing Company, 1988, 1965).