PRESCRIPTIVE AND DESCRIPTIVE MUSIC-WRITING

By CHARLES SEEGER

THREE hazards are inherent in our practices of writing music. The first lies in an assumption that the full auditory parameter of music is or can be represented by a partial visual parameter, i.e., by one with only two dimensions, as upon a flat surface. The second lies in ignoring the historical lag of music-writing behind speech-writing, and the consequent traditional interposition of the art of speech in the matching of auditory and visual signals in music-writing. The third lies in our having failed to distinguish between prescriptive and descriptive uses of music-writing, which is to say, between a blue-print of how a specific piece of music shall be made to sound and a report of how a specific performance of it actually did sound.

I shall deal here with the writing of only the simplest kind of music — unaccompanied melody. All three hazards have combined to render probable that speech conceptions of melody have played an important part not only in the development of the technique of writing but also in the composition and performance of melodies in writing. And the conditions of the musicological juncture, in which we attempt to communicate in the art of speech relative to the nature of the art of music and what it communicates, render certain that speech-conceptions of melody may sometimes outweigh music-conceptions of it, particularly in any discussion of the problem of music-writing. We cannot, therefore, dismiss with a wave of the hand the questions 1) to what extent do our speech-conceptions of melody correspond to our music-conceptions of it, and 2) to what extent does the visual representation of melody condition both conceptions of it? While it is risky to think we can answer these questions definitively, we can at least bear them in mind and set ourselves seriously to consideration of ways and means of evading or offsetting the hazards of the task. I shall refer only briefly to the problem of multidimensional visual represen-

tation of melody. For technological advance, upon which we must depend for aid in this respect, has not yet overcome the difficulties in the visual representation of the composite melodic functions of tone-quality and accentuation. And since we cannot conceivably escape from the limitations of the musicological juncture, I shall single out two speech concepts of melody, not as comprehending the total range of the problem, but as underlying the two methods of music-writing now available to us — the one prescriptive and subjective, the other descriptive and objective.

On the one hand, let us agree, melody may be conceived (verbally, it must be remembered) as a succession of separate sounds, on the other, as a single continuum of sound — as a chain or as a stream. Conception as a chain tends to emphasize structure and entities that move; conception as a stream, function and movement itself. Neither, of course, tells the whole story as the musician knows it. Both distort this knowledge to extents we cannot precisely gauge. For many of the links of the chain may be fused together; and the stream may run through successions of comparatively stable levels. And there may be breaks in both. Like so many speech constructions, these verbal constructions are not mutually exclusive opposites, but can be shown to have possibilities of serving as complements to each other. And the truth may lie somewhere between them.

Visual representation of melody as a chain is comparatively easily done by a chain of symbols; as a stream, by a curving line. Symbolization inevitably results in sharp distinction between music space (tone) and music time (rhythm) as separate, independent factors; lineation, in non-separation of the two, as overlapping, interdependent factors. Within the incomplete frame of the two-dimensional page, both symbolization and lineation depend upon certain graphic conventions of obscure origin. One, identification of elapse of time with occurrence from left to right on the page, possibly borrowed from speech-writing, underlies both factors. Another, identification of height in pitch with height on the page underlies some symbolic and all linear music-writing. Uniform vertical coordinates for elapse of time (indicating tempo) and uniform horizontal coordinates for height of pitch form the basic chart for the most recent developments of linear music-writing known as "graphing."

The history of the European fine art of music shows that our conventional music-writing was first a predominantly symbolic, second a

predominantly linear, and third a mixed symbolic-linear notation. The Greek tradition, as made known to us most clearly by Alypius, was based upon the convention of representing elapse of time from left to right. Separate symbols for pitches of tones and for meter were placed accordingly. The accents and neumes of the early Christian era added the convention of identifying height of pitch with height on the page, but were linear in character, expressing movement rather than the points moved to and moved from. They seem first to have come into use to describe an existing practice of recitation. The notation became, however, more and more used for prescriptive purposes. First, ecclesiastical authorities and, later, composers began to specify exactly from where and to where movement was to go, and how long it was to take to do so. Addition of the lines of the staff and of the stems and barlines (prototypes respectively of the horizontal and vertical coordinates of the graph chart) were major steps towards the graph; standardization of the note-head and the metrical flags and beams was a reversion to symbolism.

As we find it today, our conventional notation is still a mixed symbolic-linear music-writing in which the symbolic element is the more highly organized and therefore dominates. It is practically entirely prescriptive in character. Emphasis is upon structures — principally of pitch and meter. It does not tell us much about the connection of the structures. It does not tell us as much about how music sounds as how to make it sound. Yet no one can make it sound as the writer of the notation intended unless in addition to a knowledge of the tradition of writing he has also a knowledge of the oral (or, better, aural) tradition associated with it — i.e., a tradition learned by the ear of the student, partly from his elders in general but especially from the precepts of his teachers. For to this aural tradition is customarily left most of the knowledge of "what happens between the notes" — i.e., between the links in the chain and the comparatively stable levels in the stream.

In employing this mainly prescriptive notation as a descriptive sound-writing of any music other than the Occidental fine and popular arts of music we do two things, both thoroughly unscientific. First, we single out what appear to us to be structures in the other music that resemble structures familiar to us in the notation of the Occidental art and write these down, ignoring everything else for which we have no symbols. Second, we expect the resulting notation to be read by people who *do not carry the tradition of the other music.* The result, as read,

can only be a conglomeration of structures part European, part non-European, connected by a movement 100% European. To such a riot of subjectivity it is presumptuous indeed to ascribe the designation "scientific."

There are three ways out of the dilemma, for that is what it is, so rare is the carriage by any one person of more than one music tradition and so difficult the correction of the bias typical of that one.[1] On the one hand, we may increase the already heavy over-load of symbols in the notation, with a resulting increase of difficulty in reading and but little, if any, gain in accuracy or objectivity. On the other hand, we may dispense with many of the symbols and extend the graphic potentialities of the notation. The hand-made graph based upon the notation has its uses. But for purposes of formal description — our main concern here — the objectivity of the electronic reduction of the oscillographic curve, especially of the sound-track of high-fidelity sound-recording, is vastly superior. As Bartók has rightly said, "The only true notations" (music-writing is what he might have said) "are the sound-tracks on the record itself."[2] These, unfortunately, are legible only through laborious mathematical calculation. For when large enough to be seen in detail by the human eye they are several feet long per second. Electronic analysis can reduce or compress them automatically, as desired. Compression within a range of about 2.5 to 25mm per second produces a graph legible by anyone who can read conventional notation and is willing to do a little practice.

The time has not yet come, of course, for abandonment of our conventional notation. It has come, I aver, for development of the graph. Structure and function are equally important methodological concepts. Prescriptive and descriptive uses of music-writing are equally necessary and not necessarily incompatible. Musics surely differ from one another in their adaptability to one or the other kind of music-writing. But surely, also, we may hope, they resemble each other in this respect. The important thing for study is to know objectively wherein they differ and resemble, regardless of their being written one way or another. Furthermore, as a means of communication among people, music must be expected to have its subjective aspects. The least we should expect of the scholar is that he will not be a party

[1] E. von Hornbostel, *Fuegian Songs,* in *American Anthropologist,* XXXVIII (July-Sept., 1936), 357, note.

[2] Béla Bartók and Albert B. Lord, *Serbo-Croatian Folk Songs,* New York, 1951, p. 3.

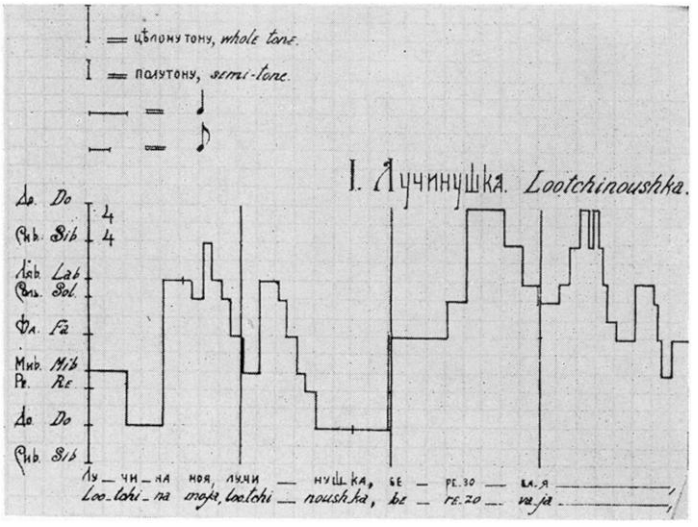
to the passing off of his own subjectivity as someone else's or that he will fail to report objectively upon the subjectivity of that someone else. My recommendation for the foreseeable future, then, is to employ the notation and the graph concurrently.

Correlation of the graph and the notation depends in great measure upon recognition of their relative capacities and limitations. Both are based upon the conventions of identifying elapse of time with left to right on the page and height in pitch with height upon it. They differ in that spacing is irregular in the notation, but uniform in the graph. The comparative efficiency of the two methods of writing in handling the six principal functions of the single melody may be summarized as follows:

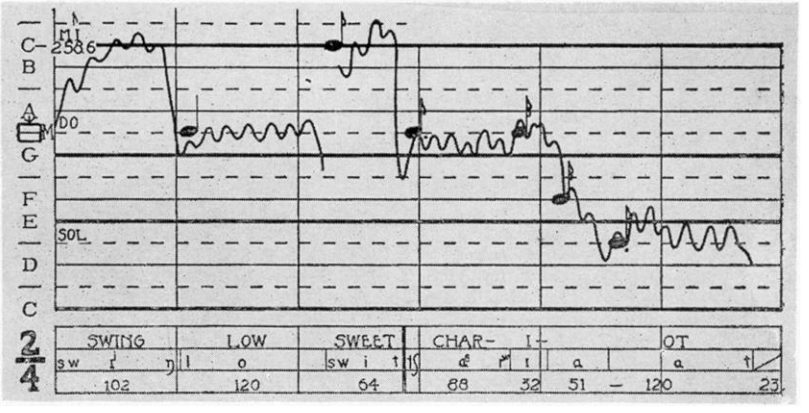
TONAL FUNCTIONS. 1) *Pitch* is only roughly indicated, i.e., within a half tone by the notation. The attempt to increase accuracy by superscription of additional symbols such as cents numerals, arrows, plus and minus signs, modifications of accidentals, etc., found in many ethnomusicological works is severely limited by the decrease in legibility. My present fundamental frequency analyzer, which is a mere Model T in the way of graphing devices, has a top discrimination of about 1/14 tone.[3] 2) *Amplitude* (dynamics) is only roughly indicated by the notation. My present amplitude graphs show changes in dynamics far beyond what the ear can detect. 3) *Tone-quality* cannot be shown at present by either method of writing. Ample acoustic research has been completed and engineering applications are already in use permitting rough but meaningful graphs of tone-quality. A practical device is still to be designed and manufactured.

RHYTHMIC FUNCTIONS. 4) *Tempo* is only roughly indicated in the notation, even with the aid of the metronome. It is very accurately indicated upon the chart in both frequency and amplitude graphs by the analyzer I am using. The margin of error seems to be about 1/100 second. 5) *Proportion* is easy to read in the notation, but difficult, in the graph. 6) *Accentuation,* for the present, is problematic in both notation and graph — in the notation, because of the multiplicity of symbols; in the graph because of its representation of stress solely in terms of amplitude. The notation can lay down an unheard basic pulse, certainly as prerequisite to the perception as to the performance of some musics. This the graph can do only by manual superscription of

[3] Charles Seeger, *Toward a Universal Music Sound-Writing for Musicology,* in *Journal of the International Folk Music Council,* IX (1957), 63.

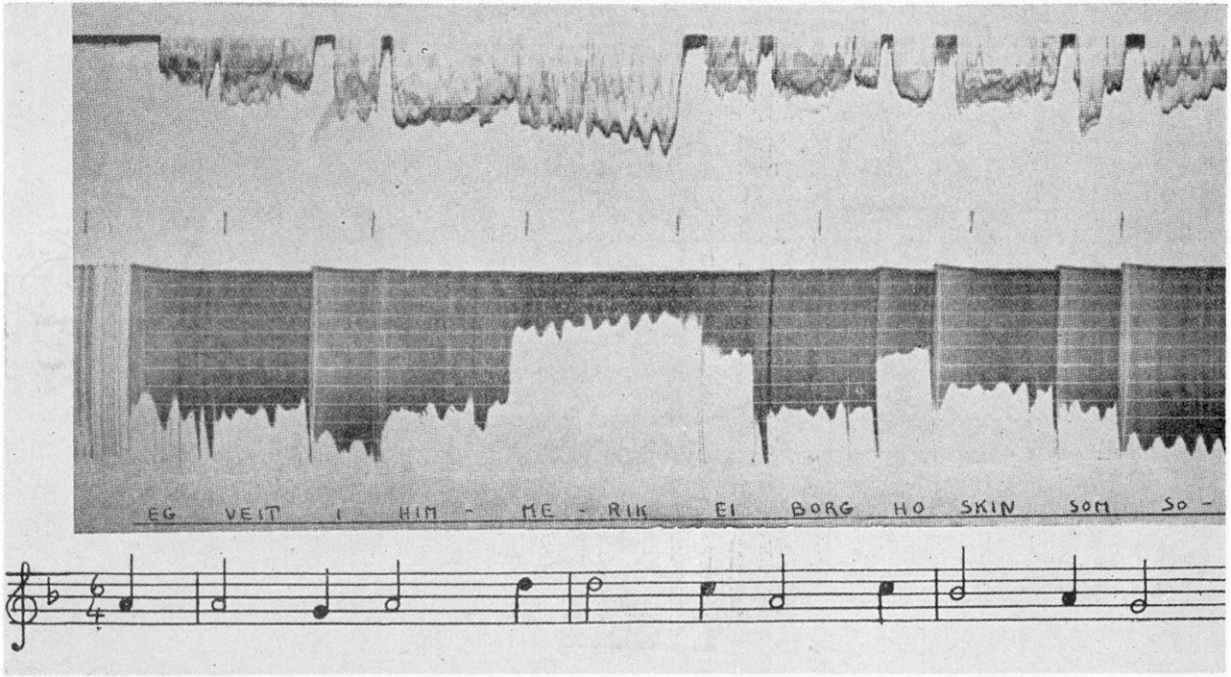


Hand Graph, made by ear from phonograph recording. Excerpt of Diagram 1, in *The Peasant Songs of Great Russia,* by Eugenia Eduardovna (Paprik) Lineva. Moscow, 1912. The vertical lines are music bars. Rectangular chart, in color, not reproducible.



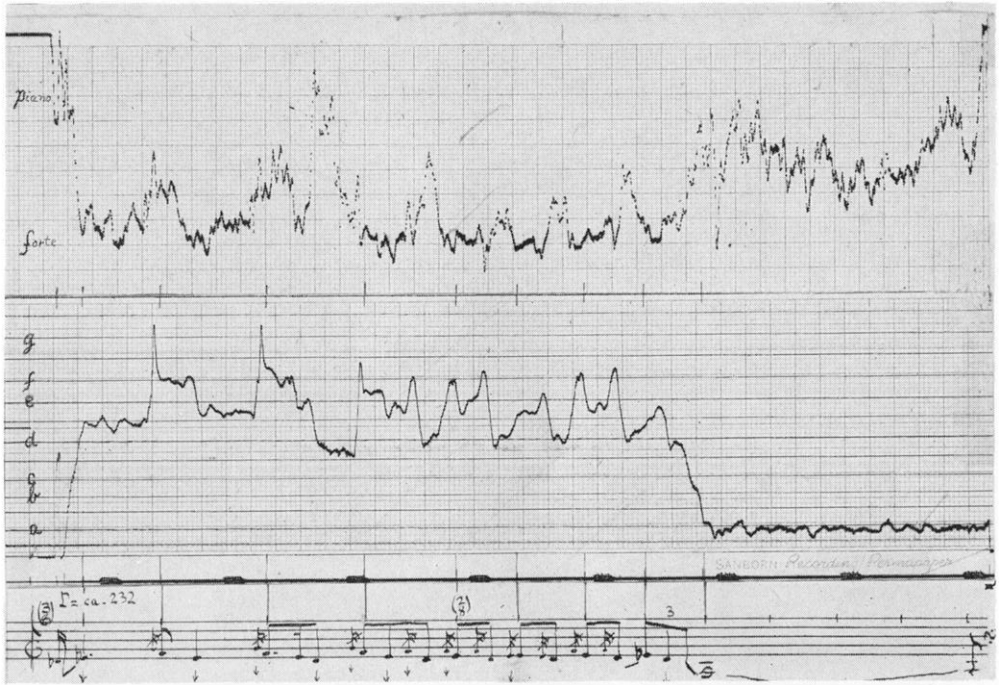
Hand Graph, made by mathematical reduction of a "sound wave photograph." Fig. 29, in *Phonophotography in Folk Music,* by Milton Metfessel. Copyright 1928 by the University of North Carolina Press. Reprinted by permission. The light vertical lines are seconds; the heavy one, a music bar.

Plate I



Automatic Graph (oscillogram) made by electronic-mechanical reduction, photographed on film, of Norwegian folksong, sung by woman's voice. Excerpt of Fig. 3, in *Photography as an Aid in Folk Music Research,* by Olav Gurvin, in *Norveg,* III (1953), 181-96. Reprinted with permission. Upper, shaded, outline shows intensity (amplitude); lower, white, outline, pitch (fundamental frequency) upon ruled, semitonal staff, with seconds marked by timer. (Enlarged?)

Plate II



Automatic Graph (oscillogram) made by electronic-mechanical reduction written directly on paper (see footnote 3), of Abatutsi Traditional Song, sung by man's voice. Excerpt of Band 16, in *Voice of the Congo, Riverside World Folk Music Series,* RLP 4002, recorded in Ruanda by Alan P. and Barbara W. Merriam, 1951-52. Upper, broken, line shows amplitude; lower, continuous, line, fundamental frequency, upon rectangular millimeter chart (green) with ruled, semitonal staff, and with seconds marked by timer. (Reduced)

Plate III

notational symbols, as, for example, of meters, bars, etc. But it can show, with surprising accuracy, the fluctuation of a basic pulse so symbolized. And this, the notation cannot do.

On the whole, the student will find the pitch and the beat more accurately shown in the graph than in the notation, but less independently delimited. As conceptions of verbal thinking, he will find both becoming less rigid and absolute. Also, he will find the gross formal aspects of melody more readily perceivable in the graph. But he will have some difficulty in fitting conventional terminology with what he sees in the graph. The problem is most clearly presented in all its complexity in the sung melody. For it is there that the tonal factor of vibrato meets the rhythmic factor of rubato head-on, in the most diverse and subtle manners.

First, let us consider the sung melody as a chain. From this viewpoint, vibrato and rubato are separate, unrelated factors.

Surely, all students of Occidental music know that the actual variance of the vibrato is an alternation of adjacent pitch frequencies customarily perceived, i.e., musically thought of, by us as one salient pitch about the mean of the variance.[4] (Variance of loudness and of tone-quality in the vibrato are secondary and need not detain us for the moment.) It is this mean, not the actual, variance that we identify as a "note" and relate to a norm of our music theory such as a degree of a scale and, so, as a link in the chain.

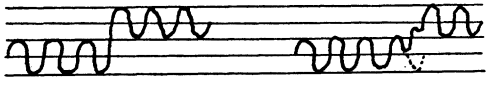
Surely, also, all students of this music know that the actual variance of the rubato is an alternation of anticipation and delay (or delay and anticipation) of successive beats customarily perceived by us as one salient deviation from the mean of the variance, or tempo. (Variance of accentuation need not detain us for the moment.)

Operation of the vibrato is mostly below the threshold of deliberate control. That is, it is largely autonomic, customarily thought of as a characteristic of voice-production, as, for example, of the single note or link in the chain. It can be modified — even acquired — by conscious effort, but not so much in terms of its actual as of its mean variance. Once acquired, it is set in its pattern and persists throughout the process of rendition, regardless of changes of pitch or loudness. The singer does not, and perhaps cannot, change its rate, span, or regularity as we are accustomed to change the rate or regularity of divisions of a beat, by deliberate control.

[4] Carl E. Seashore, ed., *The Vibrato,* Iowa City, n.d., p. 369.

Operation of the rubato, on the other hand, is mostly above the threshold of deliberate control. It is thought of as a characteristic of the sequence of notes or links in the chain. While factors of which we are largely unconscious are constantly deflecting it in minute ways, our deliberate control of it is mainly in terms of its actual variance with respect to whole beats and, in slow tempos, of divisions of beats. As to its mean variance, the Grand Tradition, as I received it from my most admired teachers, requires that it be 1) continuous in all but very strict tempos and 2) compensatory, for "the music should come out with the metronome at the end" — a quaint, but tenaciously held bit of musical folklore. The notation does not even attempt to show this; but the graph can submit it to an acid test. It can also show any unevenness in vibrato or rubato that is musically significant.

Now, the attack upon the next succeeding note in any melodic process, the more so if it is accented, long held, dissonant, or unusual in some respect, is very much a matter of deliberate attention and control on the part of the executant. But according to the Iowa and other students of the vibrato, we customarily vastly underestimate 1) the extent of its actual variance, which may be commonly 40-200 cents, i.e., from one-fifth to a whole tone, 2) its rate, which may be 4-10 per second, and 3) its irregularity in both respects. Such variances might be expected to modify the expectations of the singer, automatic as they are and occupied as he may be with the mean variance of the tone he is producing with the intention of arriving within the mean variance of beat required in the rendition of the melody he is carrying. Seashore and others have pointed out that singers — even the best — habitually over- or under-shoot both upward and downward melodic progression. The fundamental frequency analyzer that I have been using shows this also. I would like, therefore, to advance the hypothesis that when the phase of the actual vibrato is in the direction of the melodic progression the establishment of the mean variance of the new note upon the beat expected is more likely to occur, whereas if it is contrary the new note may not be established until after the beat, a slide being interposed.



Schematic diagram of vibrato and upward melodic progression, in phase (left) and out of phase (right)

If the slide, which is typical of legato singing, is fairly slow or covers a

wide interval, the graph may show little jagged points where the continuation of the vibrato may have forced an interruption of the progression. Over- and under-shooting may also involve or be involved in difference in phase and progression. Thus, rubato may be influenced by vibrato.

Conversely, if the attack upon a higher or lower note is anticipated or delayed by rubato, a vibrato that might have facilitated a decisive attack may be upset. A slide or over- or under-shooting may result. Thus, vibrato may be influenced by rubato.

It is not only in the attack or release of substantial notes (links in the chain) that vibrato and rubato may meet head-on. A very common complication seems to result within the beat when the rate of actual variance of the vibrato and a division of the beat by articulated notes are within the 4-10 alternations of the vibrato and the 2-16 (approximately) of the beat division. For example, a vibrato of five actual variances per second will produce a very different rendition of a group of four sixteenth notes at a quarter = 60 from that of a vibrato of seven per second.

Next let us consider the melody as a stream, broken only by the necessity to take breath, as at the end of a phrase, or by the briefer closures of the vocal apparatus in enunciation of certain consonants, or the making of exceptional effects such as staccato, etc. From this viewpoint, vibrato and rubato are closely related factors in a continuum. For here, melody is not viewed as a jagged rising and falling but as a sinuous flowing along a course. In what may be the vast majority of cases, the glide between levels, their over- and under-shooting, and the various inflections given them are not exceptions to theoretical norms but integral characteristics of the stream, intentional and cultivated. Except in the most strict *tempo giusto* and marcato, which are rare in singing, the manner of proceeding between levels and of modifying the levels themselves are, then, often quite as important data for the student as are the levels themselves.

In instrumental performance, the collision (in the chain) or interplay (in the stream) of vibrato and rubato is modified or even broken variously by movements of fingers, changes in bowing or embouchure, etc., peculiar to each technique. Approximation of many of the devices of singing style above mentioned can, however, be noted in instrumental playing — as on the vina and sitar, the ch'in and koto, and even in our own banjo and guitar playing — where slide-fretting, pressing down on

strings and pulling them sidewise are common, as are tightening, relaxing, and shaping the embouchure on the trumpet, clarinet, and other wind instruments in our jazz bands. The almost infinite variety of this interplay between and within beats defines more closely the fault so often found with the unskilled performer: that he rendered the notes correctly but "left out what should have come between them," which is to say, he did not connect them in accordance with the appropriate aural tradition. Each of the many music traditions in the world probably has its own distinctive ways of connecting or "putting in what should come between the notes." Conventional notation can give no more than a general direction as to what these ways are, as, for example, by the words and signs for portamento, legato, détaché, staccato, spiccato, crescendo, diminuendo, accelerando, rallentando, etc. In the graph they are all there for anyone to see, in clear detail. If it causes us some trouble to find out just what the notational equivalents are, we must not complain that the performer did not render notes. Rather, we should be glad that instead of rendering notes he rendered music, and that we may set ourselves with greater assurance to the task of finding out what he did sing, without preconceptions that he meant to, or should, have sung notes.

At this point it is necessary to say a word of warning about the fetish of extreme accuracy in the writing of music. Physics can determine and engineering can reproduce incredibly small difference of pitch and time. Psychology (and rare musical experience) can prove that human beings — not necessarily with talent or training in music — can perceive differences beyond 1/100 of a tone or of a second.[5] But the great music traditions, their practice by those who have carried them, and the phenomenological and axiological norms[6] incorporated in them were not determined by the exceptional human being. He contributes to them. We may never cease the controversy how much.

[5] See, for example, one of the most valiant attempts at descriptive accuracy using conventional notation (Bartók-Lord, *op. cit.*), in many of whose transcriptions there are passages in which it is difficult or impossible to decide to what extent the notes represent 1) unequal articulated divisions of a beat sung in strict time, 2) equal articulated divisions sung with rubato, 3) either of these with written out or partly written out vibrato, 4) an uneven vibrato, or 5) a vibrato that a less sensitive ear would hear as a single tone, i.e., whose mean, instead of actual, variance would be the musical fact.

[6] The elasticity with which our notational norms are actually made to sound by competent professionals has recently been measured with great accuracy by Charles R. Shackford in his doctoral dissertation (Harvard, 1954), *Intonation in Ensemble String Performance—An Objective Study.*

The same is true of our notation, which is, *par excellence,* a matter of norms determined by the vast aggregate of practice and codified by generations of workers. The graph, on the other hand, shows individual performance. Each graph, whether of the exceptional performer or the merest tyro, is unique. Norms can be arrived at by comparative studies of large numbers of graphs. But these norms may differ in many important respects from the norms embodied in the notation. Or they may confirm them. In any event, where the individual notation may give too much norm and too little detail, the individual graph may easily give too little norm and too much detail. It is well, therefore, especially in these pioneer stages of the development of the graph not to look for too much detail or, better, detail too far beyond the norms of general practice, except for most carefully considered ends. For the present, I am inclined to set 1/10 of a tone (20 cents) and 1/10 of a second as fair margins of accuracy for general musicological use. Detailed study may go beyond these at the discretion of the student.

As a strictly musicological tool, the graphing apparatus brings to our existing notational techniques the needed complement to show "what happens between the notes" and what any departures from their theoretical norms really are in terms of actual hearing — and what these norms should be in terms of musicological thinking. For lexicographical and many classificatory uses, the pitch-time graph will probably be the most useful. Used side by side with the amplitude-time graph, a beginning can be made in the all-important exact study of performance style, especially of singing-style, without which the infant discipline of comparative melodic research cannot hope to do more than half a job. But as yet, this can be only a beginning. For its full study, graphing of tone-quality and "visible speech," both now in advanced stages of development, will be necessary.

We are, then, at last nearing the time when scientific definition of the world's musics and comparative studies of them can, and should, begin in earnest. Extrinsic contributions in terms of culture history, of geographic extent, and of social depth are being made by anthropology, sociology, psychology, physiology, physics, and other non- or extra-musical disciplines. Musicology is hardly ready yet to attack the necessary definition and comparative study in intrinsic terms. We have not more than coined a word when we speak of the concept "music" or even "a music." We do not even know whether our basic categories of music "idiom" — fine, folk, popular, and primitive arts of music — hold everywhere outside of the Occidental culture community.

The volume of data now already at hand shows that in the near future we shall be compelled to adopt statistical techniques such as those being developed by anthropology.[7] These will increasingly employ the kind of thinking and operating that depends upon precise visual representation of the most detailed observation as well as of the most generalized synopsis or synthesis. Musicologists will have to learn to read the graphs of non-musical sciences. And it is not impossible that non-musical scientists might learn to read the music-graph more readily than the conventional Occidental notation.

As a descriptive science, musicology is going to have to develop a descriptive music-writing that can be written and read with maximum objectivity. I believe that the graphing devices and techniques, above referred to, show the way towards such an end. But it must be remembered that technological aids of this sort report only upon the physical stimulus to the outer ear. At present, too, it is possible to put into visual form only fractioned aspects of this, such as pitch and time, amplitude and time, etc. One can conceive, though scarcely imagine, an automatic music-writing that would comprehend the total physical stimulus in a single, continuous process of writing or reading. But even if this present impossibility were to be realized, we would still have to take pains lest the visual representation of the stimulus were mistaken for the full sensory and perceptual reaction of a person conditioned by the particular music-cultural tradition of which the stimulus were a product. For perception does not accept sensation without change. Put bluntly, "we do not hear what we think we hear." Just what is the nature of the change is one of the things we most want to know. For culturally unconditioned listening to music, unless by "wolfboys," congenital idiots, or the like, is not known to us. If the stimulus is a product of the particular music tradition that we carry, we perceive it as such. If it is a product of a tradition we do not carry, we perceive it as we would a product of the one we do carry, making such changes as we are accustomed to. Therefore, automatic music-writing by such aids as those referred to must no more be taken for what we think we hear than most conventional notation. But even in its present pioneer stage of development, such writing must be accepted by us as a far truer visual portrayal of what we actually hear than is the notation. By comparing the two, we may achieve several useful ends: 1) we may learn more about the divergence of

[7] Linton G. Freeman and Alan P. Merriam, *Statistical Classification in Anthropology: An Application to Ethnomusicology,* in *American Anthropologist,* LVIII (June, 1956), 464-72.

sensation and perception in our own music; 2) we may take steps towards the discovery of how a music other than our own sounds to those who carry its tradition; 3) we may begin to correct our misperception of other musics than our own by cultivating "bi-musicality" — surely, one would think, a prerequisite for musicological work. For the automatic graph can serve as a bridge between musics — a common denominator, as it were. The physical stimulus constituted by a product of any music tradition is identical to those who carry the tradition and to those who carry another. It is the perceptions of it by the respective carriers that are different. Is there not a clue here to the vexing problem of form and content in music, and perhaps an indispensable guide to the present almost abandoned effort to develop a world-wide philosophy of music upon a rational rather than a mystical base?