TOWARD AN EPISTEMOLOGY-BASED THEORY OF METER

by

Robert E. Cunningham, Jr.

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As William Rothstein has observed, the investigation of meter and particularly hypermeter raises significant unexplored epistemological issues.[1] Meter, most theorists agree, is constructed in the mind of the listener based on cues in the music.[2] If such construction is not totally arbitrary, if it represents any kind of objective awareness of the actual music, then metric structure qualifies as a kind of knowledge, and hence the origin, nature, and limits of such structure are, in the last analysis, matters of epistemology. Moreover, as Rothstein also observes, the widely conflicting hypermetric analyses offered by various music theorists "fairly cry out for some objective means of verification."[3] Insofar as the methods of objective knowledge fall within the domain of epistemology, the latter field must provide the ultimate basic principles underlying such analysis.

It would exceed the scope of this brief overview to provide the validation of basic epistemological principles or to trace all of their detailed implications for the theory of meter. Rather, this study will merely indicate some of the useful connections between the two areas, applying some of the insights thus acquired to the analysis of a Chopin prelude. It should also be cautioned that many of the problems in the theory of meter are ultimately musical rather than philosophical and thus cannot be solved by epistemology alone. Epistemology cannot, for instance, provide a quick and simple formula for determining metric accent or the boundaries of metric units; it can, however, provide a framework for understanding the nature of meter, thereby helping to clarify such issues. In particular, as will be illustrated below, certain previously observed determinants of meter, including many of those expressed by the "well-formedness" and "preference" rules of Fred Lerdahl and Ray Jackendoff,[4] can actually be viewed as consequences of epistemological requirements.

Metric Recognition As a Cognitive Process

Knowledge, which is the object of epistemological investigation, is the integrated mental awareness or grasp of facts and features of reality (see Figure 1).[5] That awareness must therefore begin with some form of direct contact with reality, which is embodied in the stream of raw data provided us by our senses.[6] A listener's awareness of the shape of a musical composition, for instance, must ultimately derive from the stream of perceptual cues in the music's surface. Sensory data, however, tells us (on a pre-conceptual level) only that something exists, but not what that something is. In other words, further mental processing is required to convert this data into true information.

Knowledge is therefore built hierarchically from sensory evidence, as one integrates sensations into percepts, percepts into concepts, and concepts into more and more abstract concepts.[7] In the strictest sense, the term "perception" applies only to the low-level integration of sensations into percepts; however, the term is often used more broadly to encompass much conceptual integration as well. It is said, for instance, that a listener can "perceive" the background structure of a musical work, even though this process clearly demands many levels of abstract conceptual inference.

Conceptual awareness involves two complementary processes: concept-formation and measurement.[8] Valid concepts are neither intrinsic nor subjective, but objective: that is, a concept does not exist in some prior Platonic reality, but must be created in the consciousness of an observer; however, such creation must derive from verifiable similarities of kind among the units subsumed under that concept. Measurement, in contrast to concept-formation, is based on the recognition of differences of degree among attributes similar in kind. Musical experience involves both facets of conceptual consciousness. Much of our experience of harmonic relationships, for instance, seems to arise from recognition of similarities and differences of kind (quality), rather than of degree (quantity). The listener directly senses a qualitative connection between tones a perfect octave apart; although science establishes that this connection derives from a 1:2 ratio between frequencies, this numerical relationship is not directly perceived by the listener[9] (a fact historically overlooked by theorists such as d'Alembert and Euler). In the experience of surface rhythm, on the other hand, we seem to sense proportions among time spans directly, provided that the time intervals involved are neither too large nor too small.[10] Thus rhythmic experience is based largely on processes of measurement, which in most Western tonal music are facilitated by time units defined through "meter" (note the etymology of the latter term).

Both concept-formation and measurement are methods by which human beings can handle the enormous complexity of the real world, organizing vast amounts of sensory data (according to certain principles) into abstract units which relate to one another in a hierarchical manner. Both methods enable the individual to expand his awareness beyond the immediate perceptual level, to grasp mentally that which is beyond the range of his direct perception. For example, a hierarchy of related units of measurement enables us to comprehend (at least, abstractly) distances of parsecs or of microns, even though we cannot perceive those units in the same concrete sense that we can perceive the span of a centimeter. Similarly, metric relationships in music enable us to extend our grasp of time spans beyond the most tangible unit, or tactus, in order to recognize proportions among much larger or smaller musical units. The hierarchical nature of conceptual consciousness is reflected directly in a metric hierarchy, where beats and their subdivisions, measures, and hypermeasures relate from level to level by simple arithmetic ratios. Thus meter is the hierarchy of units by which the listener measures time, enabling him to localize and interpret musical events with respect to their temporal positions.[11]

This facility of hierarchical consciousness is utilized most efficiently when the ratio of time-span units from level to level is not too extreme. For example, as Carl Schachter has noted, duple meter holds "an important advantage" in hypermetric perception "because it can proliferate over many levels" and therefore can be grasped more clearly by the listener.[12] Thus the much-discussed prevalence of duple meter, particularly at higher levels, seems to have a clear epistemological foundation. At lower metrical levels, duple and triple ratios are far more readily grasped and commonly used than quintuple or septuple meter, while quadruple and sextuple meter are usually organized in two hierarchical levels. Where quintuple and septuple meter do occur, they are often subdivided into smaller units.

Epistemology also offers strong logical arguments against any possibility of interpreting conceptual cognition in deterministic or formalistic terms. It is highly improbable, for instance, that a formal system of rules (such as some future refinement to the rules suggested by Lerdahl and Jackendoff) will ever fully explain metric recognition. Although such rules may be useful heuristics, they necessarily require thoughtful, nonmechanical interpretation. The nonautomatic nature of conceptual consciousness also implies that not all individuals will always integrate fully and correctly the data of their experience. As a consequence, different listeners will occasionally infer different structures from the same musical surface. The fact that a particular inference is not universal, however, does not necessarily mean that it is not valid or objective. Because this author is primarily concerned with the positive potential of musical experience, he will follow Rothstein's lead by positing a skilled listener who makes sophisticated and valid inferences concerning musical structure.[13] (A less competent listener, of course, may be assisted in this process by a skillful performer.)

Although epistemology is concerned with valid inferences, it also recognizes that there will sometimes be "borderline cases," where multiple interpretations are rationally defensible. For example, even after all factors are properly considered, the hypermeter in a given musical passage may ultimately be found to be ambiguous. In such cases the theorist can only indicate alternative interpretations and describe the factors supporting each.

Objective knowledge does require, however, the elimination of the arbitrary or nonessential; this principle (commonly called "Ockham's razor") was formerly understood in metaphysical terms but is now recognized as an epistemological requirement.[14] The epistemological razor, required for effective functioning of a conceptual consciousness, applies directly to musical perception, including the recognition of meter. Thus if each of several metrical structures is fully consistent with the musical evidence, then objectivity requires that we avoid any gratuitous or unnecessary complexities by following the simplest interpretation. From this principle of minimal complexity derive many of the recognized tendencies of metric inference – for instance, the preference for regular, periodic structures, the relative simplicity of which can be precisely defined and demonstrated by information theory. The razor principle does not, however, override the necessity of properly integrating new data into one's knowledge: epistemology also requires that the observer remain sensitive to changes in his context of experience. For example, proper integration of shifting patterns of musical cues will often require that deviations from regularity or periodicity be recognized. The hypermetric structure illustrated in Figure 3, for instance, will be seen to be predominantly regular and periodic, yet flexible enough to accommodate those irregularities which are implied by musical factors.

Many musical structures are highly complex, demanding extremely intricate and rapid mental integrations by the listener. (This demand of active involvement may be an important and pleasurable component in the experience of certain listeners, and the relationship of the listener's psycho-epistemology to his enjoyment of particular musical styles is certainly an area meriting further research.) The lightning-like speed and complexity of these integrations, however, often causes them to be experienced as if they were instinctive or unconscious. Low-level meter in particular may be mistakenly regarded as a purely visceral phenomenon, as a felt alternation of strong and weak beats not subject to rational analysis. This misapprehension may make it difficult to recognize that high-level hypermeter, which more obviously demands abstract thought, is similar in kind to low-level meter. Joel Lester, for example, argues that "we may perceive . . . large-scale regularity as something other than meter in the sense that we mean meter at the measure level."[15]

Certainly there exists an automatic, perceptual level, where the awareness of surface musical cues and of their temporal spacing arises from the integration of sensations. From this data, however, _tactus_-level beats and then beats at other levels must then be inferred – a process which (in the opinion of this author) requires an increasing degree of conceptual abstraction on the part of the listener.

Consequently, our experience of hypermeter is similar in kind to that of lower-level meter, despite obvious differences in degree of abstraction.

Metric Determination and Accent

The term "beat" is commonly used in two senses, referring either to the time spans in a metric hierarchy or to the initial time points of those spans. Inasmuch as the metric structure can be fully defined by specifying "beats" in either sense, both meanings are useful. Metric accent, however, is specifically associated with the initial time points of the spans. As Schachter points out, such accents "result from the heightened attention attracted by the boundary points of the spans," particularly by "the beginning of [a] new span," and especially when that beginning coincides among several hierarchical levels.[16] In other words, metric accent is an expression of the cognitive significance of a time point in musical context. On the other hand, as Schachter also observes, "some kind of [musical] emphasis is required initially to make the listener aware of the spans."[17] Such musical emphasis, called a "phenomenal accent" by Lerdahl and Jackendoff,[18] may be created by virtually any musical parameter and occurs at or near a time point which is thereby marked for attention.

In order to be utilized as units of measurement, the time spans at any given level must be regarded as homogeneous in constructing the next higher level (as various theorists have observed or implied).[19] This requirement does not mean, however, that discrepancies in the length of successive units at any level are discarded entirely from the listener's awareness. One can consider, as an example, a listener seeking to interpret a series of primary-level beats during a long, gradual accelerando. If he attempted to impose metronomically equal time-spans upon the passage, he would soon become entangled in unnecessary rhythmic intricacies, thus violating the epistemological razor principle. Therefore the intelligent listener infers a pattern of non-metronomic beats (similar to the composer's notation) and treats these as equivalent in interpreting higher-level meter and rhythm. Nevertheless, the accelerando is included in the listener's awareness, perhaps as a sense of rising excitement or tension. As the analysis below will illustrate, the same principles apply at higher levels. An intelligent interpretation may require that a longer or shorter hypermeasure be treated as equivalent to its neighbors when inferring the next higher level; nevertheless, such an expansion or contraction enters into the listener's total aesthetic awareness of the work.

Although a detailed theory of the listener's mental processes cannot be developed here, verisimilitude requires that metric analysis acknowledge two basic features of the listener's perspective. First, the listener must begin with the details of the musical surface, coming to understand hypermeter and other high-level structures only by a process of inference. For this reason metric levels will be derived from bottom to top in the analysis below. Second, the listener necessarily hears these details in a linear, diachronic fashion; his sense of meter and of other structure at any moment (at least, during a first hearing) can only reflect his experience up to that moment.[20]

As previously indicated, a complete formalized description of the musical cues by which one recognizes the boundaries of metric units is not feasible. In the first place, most of the individual factors involved are not subject to binary evaluation, but instead may be present in a continuum of possible degrees. Moreover, some of these factors are more significant at higher levels, and others at lower levels; also, they interact in complex ways. Therefore, the major determinants will be addressed here only in general terms.[21]

Most of these determinants seem to arise directly from epistemological requirements. For instance, the requirement of minimal cognitive complexity is best satisfied by a periodic pattern (compare rule MWFR4 in Lerdahl and Jackendoff); also, as previously noted, hierarchical recognition is further facilitated by duple or triple relationships at lower levels (MWFR3) and duple relationships at higher levels (MPR10). Furthermore, full integrated musical comprehension requires that musical events should be associated as much as possible with definite metric boundaries (MWFR1). For example, in the Chopin prelude (Op. 28, No. 24), in order to grasp mentally the left-hand figure which is repeated through almost the entire piece, we are obliged to recognize a stream of sixteenth-note time points as the lowest level in the metric hierarchy. (In some cases, however, precise temporal definition is suspended by compositional intent; for instance, the flurry of grace notes in bar 14 is doubtless intended as a single perceptual unit, so that the temporal positions of individual notes need not be measured.)

If superfluous complexity is to be avoided, then higher-level metric boundaries should coincide with inceptions of individual pitch-events as often as possible (MPR3), particularly with more cognitively significant pitch-events - such as those which introduce a new pitch level (MPR5e), have long duration (MPR5a), belong to the structurally important bass line (MPR6), or initiate new voice lines. Figure 2 shows three alternative listener interpretations for the next metric level in the opening bars of the prelude; all three patterns are periodic and stand in a duple or triple ratio to the sixteenth-note level. In Alternatives A and B, however, significant pitches, determined by relative duration or by the entrances of the accompaniment and melody, do not align with the assumed metric boundaries. The resulting complexity (which can be experienced by setting a metronome to indicate the beats under either of these alternatives and then attempting to tap the rhythm) is superfluous: that is, it arises from an arbitrarily chosen mental interpretation, and not from objective features of the music. Only Alternative C avoids these problems and satisfies the epistemological razor principle; hence, this metric level consists of eighth-note beats, as notated. (This interpretation, of course, will probably be further supported by the subtle durational and dynamic inflections added by a performer following Chopin's score.)

In order to minimize complexity, metric structure should optimally be aligned with parallel musical structures (MPR1) and other significant formal units, preferably in such a way that the beginning points of those units correspond closely to metric boundaries (MPR2). For instance, the recurring pattern (parallelism) in the left-hand part of the prelude clearly establishes the next metric level, measured by dotted quarter notes. If large-scale formal sections are of roughly equal length (as occurs in this prelude), then these sectional boundaries will also tend to align with metric boundaries. Cognitive complexity is further reduced if metric boundaries coincide with points of greater importance to the tonal structure (MPR9) or points of tonal stability.

At lower levels, articulations (MPR5d), relative dynamic stresses (MPR4), or textural emphases may impart cognitive significance to particular time points. For example, in the Urtext edition of the prelude,[22] a decrescendo is indicated between the first and second melody notes, thereby adding relative dynamic emphasis to the initial melody note and eliminating any doubt as to the placement of the bar line. In this case the measure units of Chopin's score are initially inferred from the dotted-quarter level on the basis of simple duple preference. The other possible duple interpretation, in which the piece might be assumed to begin with a half-bar upbeat, would offset the initial harmony, the accompaniment, and the melody from metric boundaries, thereby violating principles already discussed. Also notable is the emphasis conveyed by the decisive shape of the thematic entry, outlining a descending tonic triad. The easy recognizability of this head motive will render it an important determinant of metric boundaries wherever it recurs.

At higher levels, the beginning of a new harmony is of great structural significance and preferably should coincide with a new metric unit (MPR5f). If the harmony is complicated by a suspension, then that harmony can be more readily grasped if the suspension is resolved within that same metric unit - that is, on a metrically weaker beat (MPR8). A number of other considerations of form and texture, some of which will arise in the analysis below, also affect the determination of a cognitively optimal metric structure but are too complex to reduce to a few formal rules.

Several of the determinants just listed are also features of either surface rhythm or phrase rhythm. It must be emphasized, however, that meter is distinct from such rhythmic structures. In fact, it is only by contrast with a clear metric structure that syncopations, cross-rhythms, and various kinds of out-of-phase rhythms can be recognized as such.[23] Both surface and phrase rhythms will be found to conflict with the metric hierarchy of Figure 3 at a number of points. For instance, strong syncopations occur, not only at levels below the measure, but also at metrically weak points on hypermetric levels - such as the expressive stresses at bars 66 and 70, which derive much of their eloquence from their contrast with the clear four-bar hypermeter. Likewise, both large and small rhythmic units can be found in this work which overlap metric boundaries in various and unpredictable ways. Furthermore, the "shape" of a rhythmic unit, as determined by dynamic stresses at certain points within the unit, frequently conflicts with the accentual pattern of the meter. Thus meter can be thought of as a kind of background against which rhythmic structures of various sizes, positions, and shapes can be clearly grasped by the listener.

Hypermetric Analysis of the Prelude

In Figure 3 hypermetric levels **a** through **f** (to be derived below) have been diagrammed; the lower metric levels, which (as shown above) agree with the written score, are omitted from the figure. At each level the strong beats (which initiate the metric units) have been indicated by vertical bars, a notational device adopted from Jonathan Kramer.[24] Beneath the hierarchy of levels, the bass line and underlying tonal structure have been indicated, reflecting the strong impact of these two factors on the hypermeter. Durations in the bass line have been reduced by a factor of six for easier representation. Two dividing dominants occur in the tonal structure; the second of these dominants (in bar 57) is introduced by an augmented-sixth chord and embellished by $^{6}_{4}$ suspensions. This analysis will attempt to establish the relative strength or weakness of the various time points or beats at each level. Wherever reference is made here to the metric strength of a particular "bar," such expression should be understood as an abbreviated reference to the initial time point of that bar.

Hypermetric level **a**, consisting of two-bar units, is immediately and clearly established by the positions of the beginning points of the harmony, accompaniment, and melody, together with the principle of duple preference. Moreover, this level is maintained in regular and unambiguous fashion throughout this composition. From Figure 3 it can be seen that almost all bass movements and key tonal movements occur on odd-numbered measures, and inspection of the score shows that formal boundaries and most harmonic changes occur at these points as well. Suspensions are regularly introduced on odd-numbered measures and resolved on even-numbered ones (as, for example, in bars 11-14 and 17-18). Recognition of this level is further reinforced by larger patterns, to be discussed in conjunction with higher levels.

For reasons too evident to require discussion here, the initial two bars are heard as an accompanimental introduction or "prefix" to the entrance of the melody at bar 3; hence, the latter is recognized as the first metric strong point in level **b**. This recognition is then confirmed by the melodic patterns of the following bars, which also establish four-bar hypermeasures for this level. The four-bar unit in bars 3-6, for instance, is quite clearly imitated in varied form by the next rhythmic unit, corresponding roughly to bars 7-10. Thus bars 3 and 7, which initiate these parallel passages, become clear metric strong points at level **b**. The first two movements of the bass, as well as significant harmonic changes, then lend metric strength to bars 11, 15, and 19. Bars 15 and 19 are further strengthened, not only by dynamic emphasis, but also by their melodic positions as culminations of runs. Harmonically, bars 15 and 19 are tonicized by their own dominants, rendering them points of greater tonal stability. Finally, bar 19 is an important dividing dominant in the high-level structure. Thus a four-bar hypermeter is strongly established in the first nineteen bars.

At bar 21, however, a metrical reinterpretation is required, for beginning at this point the basic "theme" of the prelude, previously stated in bars 3-19, re-enters a perfect fourth below. Thus all of the musical cues previously discussed appear anew; because of these cues, as well as the parallelism itself, the listener must interpret bar 21 as a metric downbeat in order readily to grasp the musical structure. In terms of phrase rhythm, bar 19 is understood retrospectively as a point of overlap: it is simultaneously the end-point of the preceding phrase and the beginning of the unit of bars 19-20; the latter is heard as a prefix to the following phrase similar to the two bars at the beginning of the piece. Bar 21 is thus a premature downbeat on level **b**; its most immediate aesthetic effect is to heighten the dramatic emphasis associated with the reprise of the basic thematic material.

A similar effect occurs in bars 37-38. The emphasis associated with the third entrance of the thematic material at bar 39 is increased, not only by the premature downbeat, but also by the preparatory bass movement in the two bars of the prefix: the rapid motion of the bass in bars 37-38, emphasized by Chopin's accents, clearly is directed toward the goal of bar 39. The pattern of four-bar hypermeasures then resumes, clarified by the harmonic changes at bars 43, 47, and 51, the parallel melodic material at these same three points, and the bass changes at 43 and 51.

Bars 51-56 contain two hypermeasures; however, there is some ambiguity as to their point of division. A "conservative" hearing of the passage (to use Andrew Imbrie's terminology)[25] maintains the four-bar pattern as long as possible, recognizing bars 55-56 as a separate shorter hypermeasure, set off by its vividly different texture and opposite melodic direction. A more "radical" hearing (as shown in Figure 3) recognizes a new four-bar hypermeasure beginning at bar 53, inferred from the bass motion as well as movement from tonic to pre-dominant harmony.

In either case bar 57 introduces a new bass and new harmony as well as a background dividing dominant; all of these factors endow it with strong metric accent. From here to the end of the piece, an unambiguous four-bar hypermeter is maintained. This pattern is emphasized by several factors: the partial resolution of the $^6_4$ harmony at bar 61, coinciding with a reversal of melodic direction; the arrival at bar 65 of the structural tonic, which is then maintained (except for harmonies created by neighbor-tones on metrically weak measures) to the end of the piece; and finally the thematic parallelism between the hypermeasures of bars 65-68 and 69-72.

At level **c** bars 3, 11, and 19 are metrically strong: as previously noted, bar 3 initiates an extended melodic unit, while sustained harmonies and bass tones begin at bars 11 and 19, the latter also marking a significant point in the piece's tonal structure. For similar reasons bars 21, 29, and 37 should be interpreted as strong. Bars 39-46 use melodic material parallel to bars 3-10 and also 21-28, as can be verified from certain surface details. (For example, the rhythmic and melodic pattern of bar 44 resembles that of bars 8 and 26 more closely than the pattern of 4, 22, or 40.) Bars 47-50, on the other hand, clearly develop out of the immediately preceding material, thus creating a four-bar extension; moreover, the bass remains constant at bar 47. Consequently, bars 39-50 are best interpreted as a three-beat hypermeasure. This longer hypermeasure, indicated by a fermata in Figure 3, is experienced by the listener as a kind of broadening, analogous to the slight pause which a sensitive performer might insert, for purposes of emphasis, just before a climactic moment. Chopin also places a piano just before the point of extension, enabling a crescendo to the important structural moment at bar 51 (which is indicated as fortissimo in some editions); thus the "upbeat" quality of bars 47-50 is clarified by means of dynamic contour.

Bar 51 not only initiates a fourth entrance of the familiar melodic motive, but also marks an important return to tonic harmony. The background dominant at bar 57 clearly identifies this point as the next strong downbeat, so that bars 51-56 constitute a single hypermeasure. One of its component time-spans, however, is shortened, conveying a sense of acceleration, reinforced by the plunging line of rapid triplets in bars 55-56.

From bar 57 to the end, level **c** is composed of regular eight-bar hypermeasures (except for the last, which, however, is extended by a fermata in the score). Bar 65 marks the final tonic arrival and the beginning of the coda; bar 73 is emphasized by a rolled chord, dynamic stress, and the sudden cessation of the rapid ostinato rhythm of the left hand.

At level **d** bars 3, 21, and 39 are all recognized as beginnings of major formal sections (if one disregards their upbeat prefixes). Bars 3 and 21 also correspond roughly with the decisive tonic and dominant points of bars 1 and 19, from which they are separated only by the two-bar prefixes. Hence they probably derive additional significance from these critical tonal points by a kind of "neighborhood" effect. The main effect of the prefixes, however, is to broaden the first two hypermeasures (as indicated by fermatas in Figure 3). Bar 51 acquires cognitive significance and metric strength both from its tonal position and from the fact that it coincides with the tonic return of the thematic section, while bar 65 coincides with the final tonic and the start of the coda.

Levels **e** and **f**, which may be highly attenuated for many listeners, are inferred by a duple-meter interpretation of levels **d** and **e** respectively. The downbeats on level **f** thus correspond to the initial and final tonics, which (if one admits hypermeter on this rarefied level at all) are clearly the strongest metric points in the composition.

Although the hypermetric extensions and contractions in this piece are subsumed into higher levels in such a way that levels **e** and **f** are regular, these alterations nevertheless affect the listener's overall sense of time flow. The cumulative effect of the _fermatas_ prior to bar 51 and of the following _accelerando_ is to convey a sense of continually increasing pace. This acceleration, combined with the faster motion in the high-level tonal structure from bars 51 to 65, the increasingly rapid surface rhythms, the gradually increasing dynamic level, and Chopin's _stretto_ indication at bar 61, creates a powerful sense of purposeful movement toward a goal, fulfilled at bar 65.

Conclusions

Epistemology provides a unified theoretical framework which embraces many observed features of meter and which also clarifies the impact of metric structure on the total aesthetic experience of the listener. This framework enables one to comprehend the cognitive function of meter, which supports the listener's integration of all time-related aspects of a tonal work. Epistemology provides an understanding of metrical accent and of how and why such accent differs from stress and other forms of accentuation; moreover, it offers some insight into the specific musical features by which the listener recognizes metric boundaries. The necessity of establishing meter by means of musical cues, its tendency (once established) to perpetuate itself, and the differences in interpretation between a first hearing and subsequent hearings of a work are all best understood in terms of general requirements of cognition. Epistemological principles can explain why meter is hierarchical, why it tends toward simplicity and regularity (and also why it must sometimes assimilate irregularities), and why duple meter, and at lower levels triple meter, are preferred structures.[26] Finally, epistemology provides a basis for defining and pursuing <u>objectivity</u> in metrical analysis, even while recognizing individual differences in interpretation.

BASIC EPISTEMOLOGICAL CONCEPTS

Knowledge is the integrated mental awareness or grasp of reality.

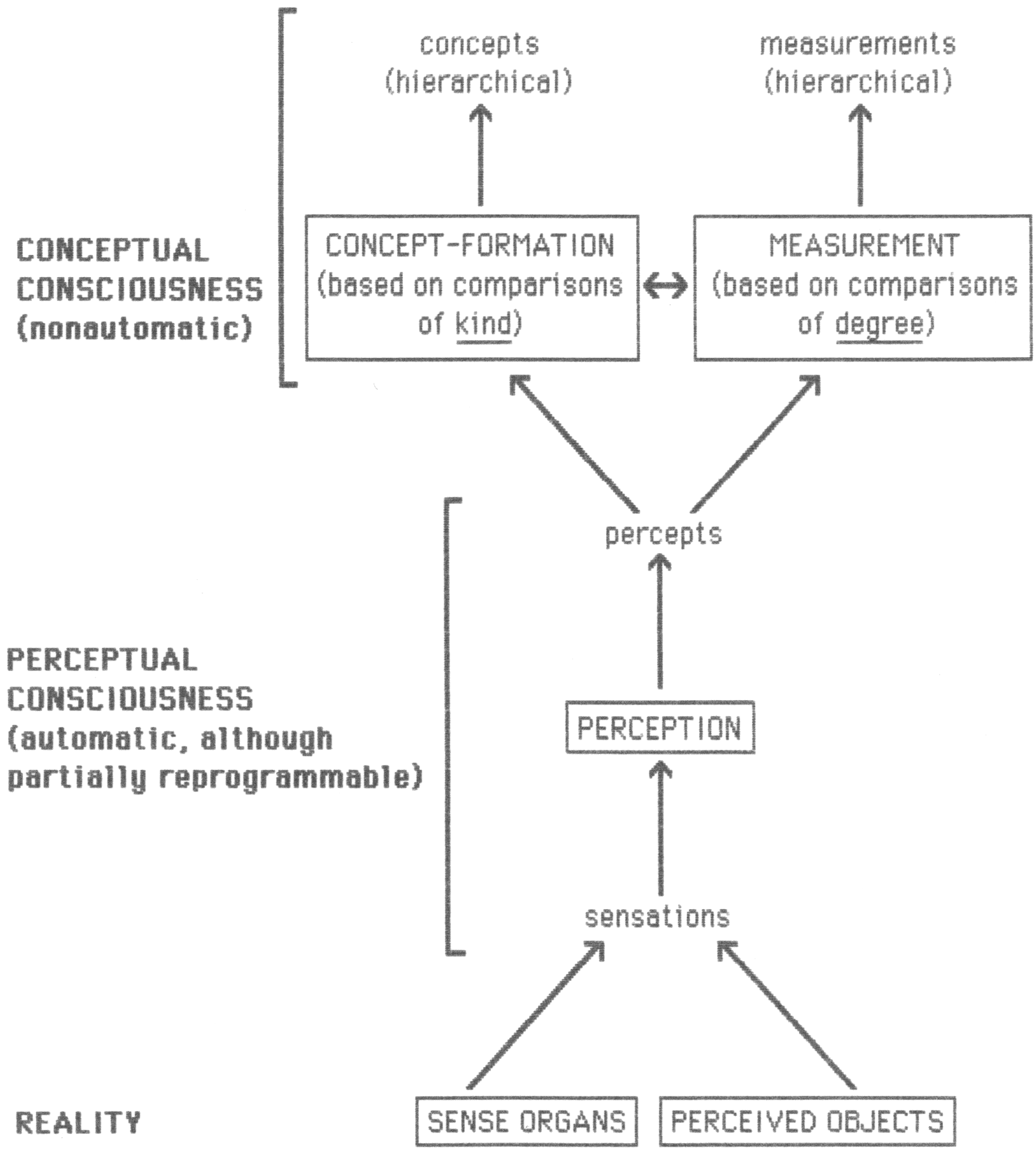
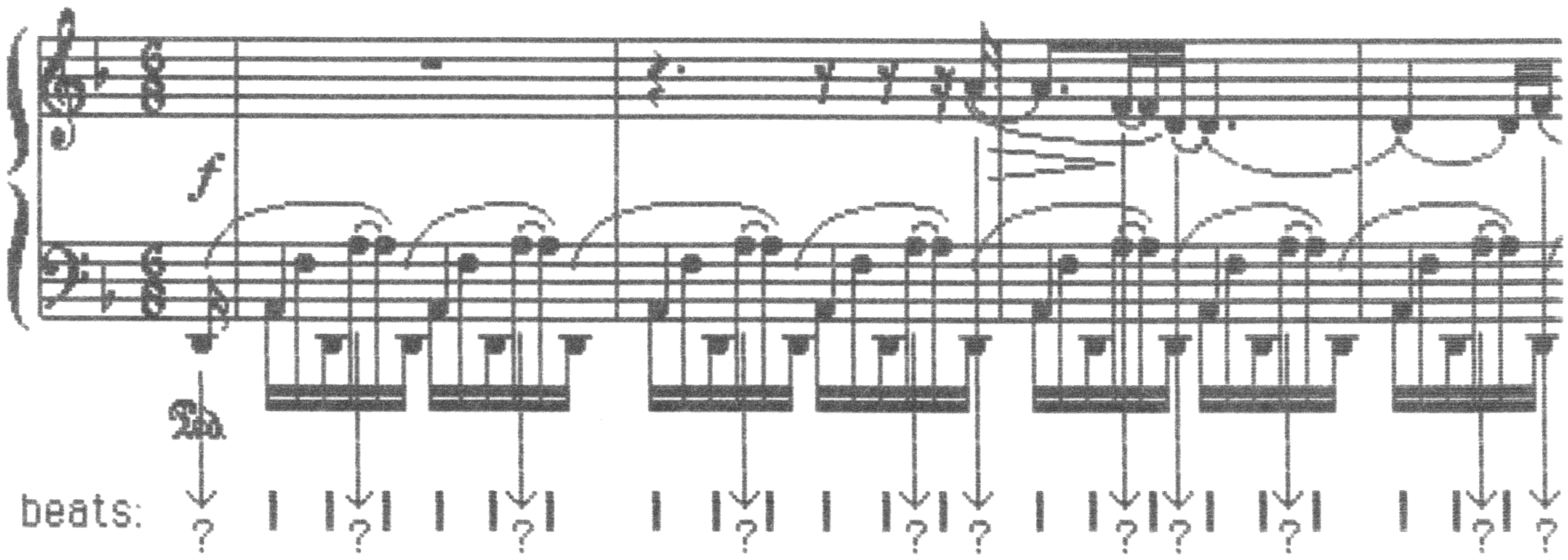
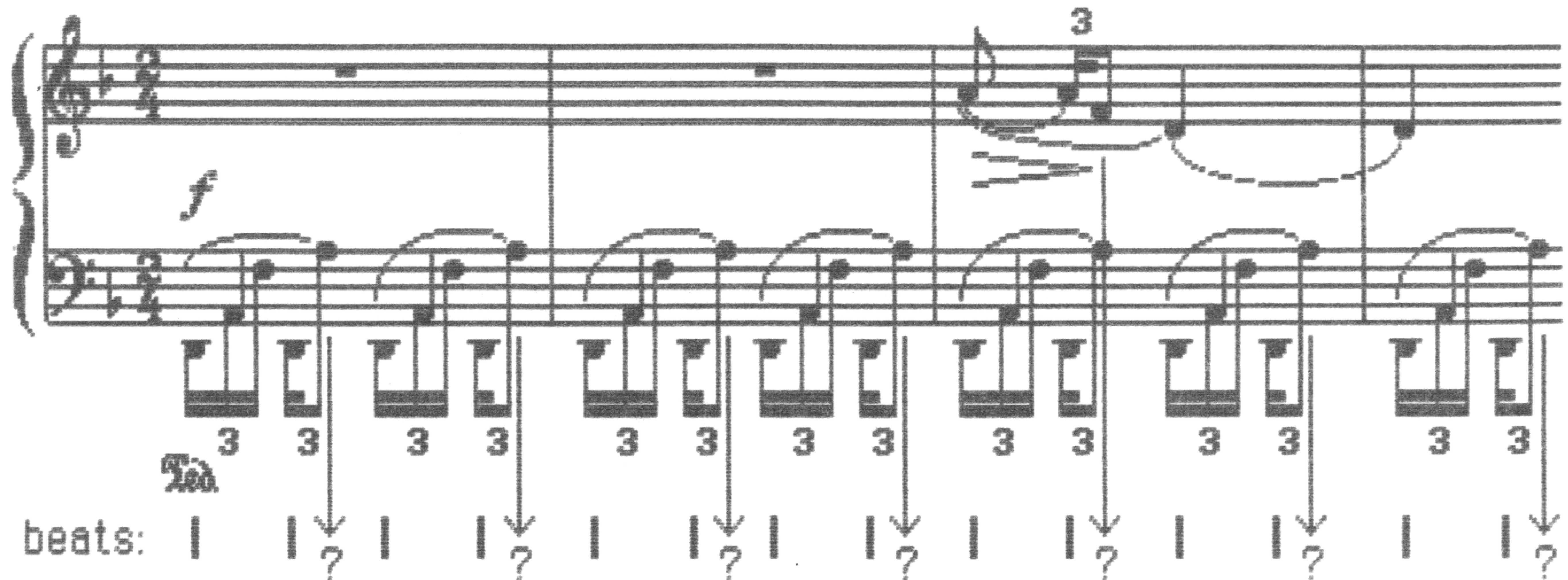


Figure 1

Alternative A:



Alternative B:



Alternative C (as notated in original score):

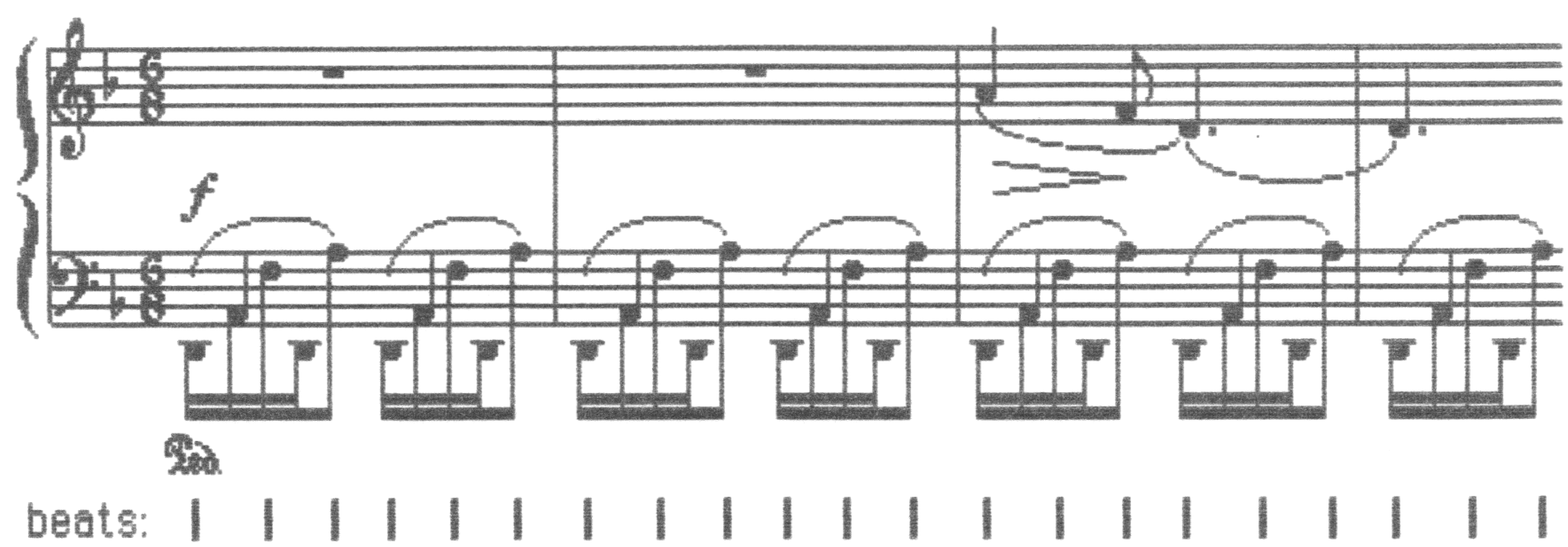
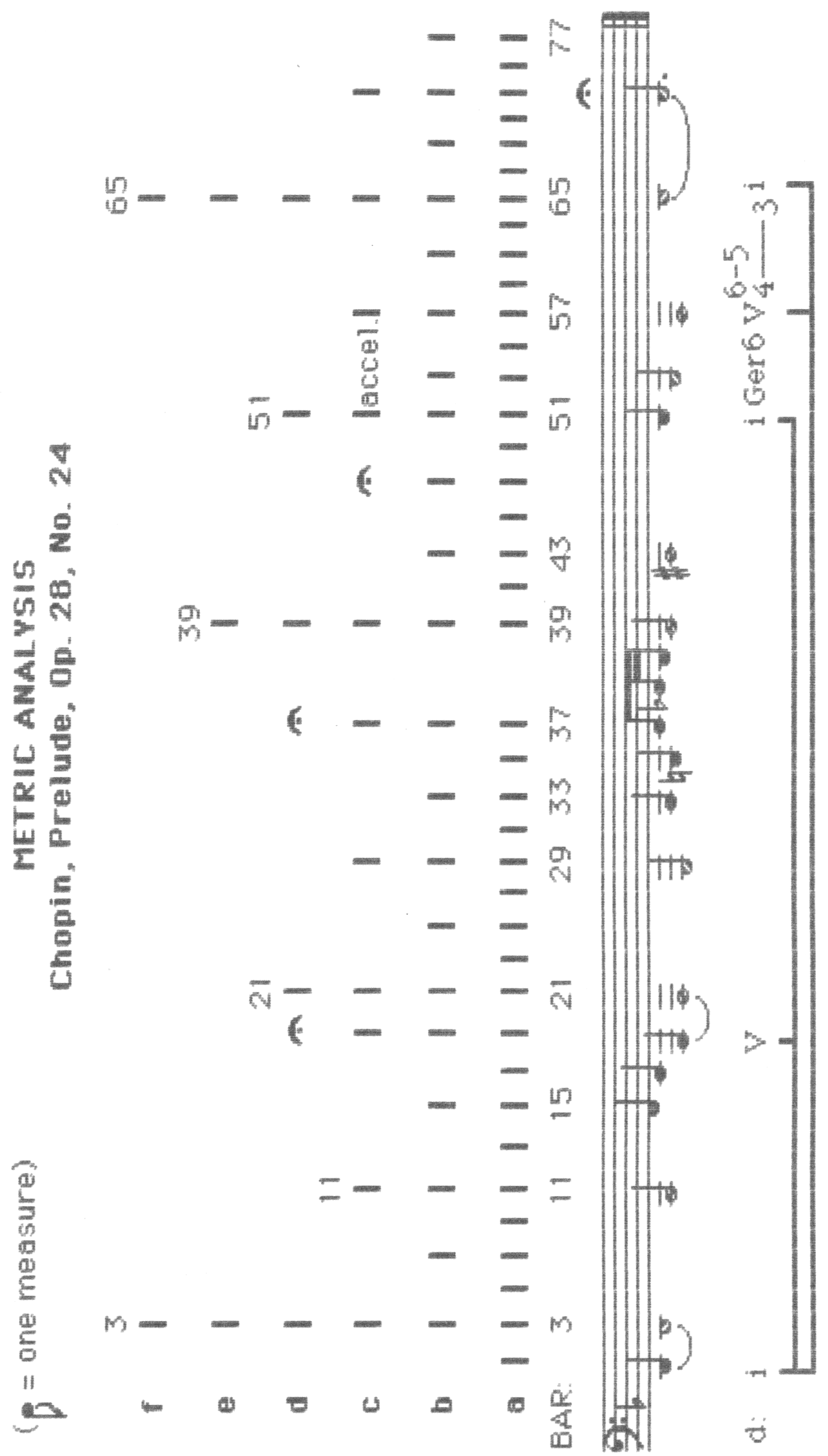


Figure 2



METRIC ANALYSIS
Chopin, Prelude, Op. 28, No. 24
= one measure
f
e
d
c
b
a
BAR:
3
11
15
21
29
33
37
39
43
51
57
65
77
accel.
d:

Figure 3

NOTES

1. William Rothstein, <u>Phrase Rhythm in Tonal Music</u> (New York: Schirmer Books, 1989), 99.

2. Jonathan Kramer's viewpoint is representative: "although we experience beats, measures, and hypermeasures, doing so is a psychological process abstracted and interpreted from perception." See Jonathan D. Kramer, <u>The Time of Music</u> (New York: Schirmer Books, 1988), 98.

3. Rothstein, 100.

4. Fred Lerdahl and Ray Jackendoff, <u>A Generative Theory of Tonal Music</u> (Cambridge, MA: MIT Press, 1983), 68-104.

5. Thus the epistemological viewpoint focuses, neither on consciousness construed as pure abstraction, nor on reality construed in merely concrete terms, but on the determination of a valid <u>relationship</u> between consciousness and reality. It should not be concluded, however, that this approach represents some kind of Hegelian synthesis of Idealism and Materialism; on the contrary, epistemology requires that one reject the underlying notion of both camps that there must exist an ultimate gap between mind and reality.

6. For a sophisticated modern presentation of the view that the senses provide such contact, see David Kelley, <u>The Evidence of the Senses: A Realist Theory of Perception</u> (Baton Rouge, LA: Louisiana State Univ. Press, 1986), 1-262.

7. The explanation of conceptual consciousness offered here is similar to the view elaborated in Ayn Rand, <u>Introduction to Objectivist Epistemology</u> (New York: New American Library, 1979), 1-116.

8. Even the kind of knowledge that is embodied in propositions is intimately rooted in concept-formation, since the meaning of a proposition is strongly dependent on the meanings of its constituent concepts.

9. Such appearances on more abstract levels of quantitative differences which explain lower-level qualitative differences are not unprecedented; perception of different qualities of color, for example, is explained on a more abstract level of knowledge by quantitative differences between electromagnetic wave frequencies. The analogy between color recognition and pitch recognition should not be overdrawn, however, for the latter also involves quantitative relationships: the ear readily distinguishes "higher" from "lower" pitches and with training can detect and compare intervallic sizes.

10. As Walther Dürr and Walter Gerstenberg observe, the longest time span "which can be distinctly perceived as a single unit" seems to be approximately twelve seconds; listeners generally can grasp longer spans only through "rational abstraction." See Walther Dürr and Walter Gerstenberg, "Rhythm," in Stanley Sadie, ed., The New Grove Dictionary of Music and Musicians (London: Macmillan Publishers Limited, 1980), XV, 805. The direct aural perception of temporal proportions also resembles our visual perception of numerical relationships as represented in geometry.

11. Joel Lester characterizes meter as a "grid" by which events are located in time, much as tonality serves as a grid by which they are located in pitch. See Joel Lester, The Rhythms of Tonal Music (Carbondale, IL: Southern Illinois Univ. Press, 1986), 52.

12. Carl Schachter, "Rhythm and Linear Analysis: Aspects of Meter," in The Music Forum, ed. Felix Salzer and Carl Schachter, vol. 6 (New York: Columbia Univ. Press, 1987), 17. Kramer also discusses the cognitive advantages of hierarchical organization in meter. See Kramer, 98-102.

13. Rothstein, 100.

14. Ockham's razor was regarded by early writers as an indication of metaphysical parsimony (i. e., a frugality inherent in nature itself). The

epistemological approach, however, recognizes that any mixture of the arbitrary (the objectively unsupported) is incompatible with an integrated awareness of reality (that is, knowledge). Because any admission of the arbitrary or superfluous is precluded on epistemological grounds alone, the assumption of metaphysical parsimony is unnecessary - and is thus (ironically) itself a violation of the razor principle.

15. Lester, 168.

16. Schachter, 5-6.

17. Schachter, 5.

18. In their words, "phenomenal accent functions as a perceptual input to metrical accent." See Lerdahl and Jackendoff, 17.

19. As Lester says, "beats mark off functionally equivalent spans of time" (Lester, 46). Confronted with unequal metric time spans, says Schachter, "the listener must arrive at the idea of equal spans - and consequently of an underlying metrical structure - through a process of inference" (Schachter, 38). William Benjamin also describes the listener who continues "to think metrically" even as he assimilates irregularities: "he will go on monitoring where he is . . . in reference to a time-cycle of specific length" (William E. Benjamin, "A Theory of Musical Meter," Music Perception 1:4 (1984): 391-392). Similarly, Kramer defines a given metric level as regular if the "number of intervening beats on the next-shallowest level" agrees with contextual expectation, regardless of variations in the "absolute time" occupied by those beats (Kramer, 99).

20. Kramer observes that this linear-processing restriction is circumvented in metric recognition insofar as "we retain and possibly revise perceptions in short-term memory before entering them into long-term memory" (Kramer, 117). Such memory buffering capacity is not unlimited, however; moreover, it still does not enable us directly to perceive non-linear structures, since the latter are abstractions and hence have no existence independent of mind (although they may be subject to objective validation).

21. Each of the metric determinants listed here, of course, must be evaluated in a total context which includes all of the others as well.

22. Frédéric Chopin, Préludes, ed. (from the autograph and first edition) by Ewald Zimmermann (Munich: G. Henle Verlag, 1968), 48.

23. As Lester notes, "it is because of the metric hierarchy that we can say that a given note or harmony is an anticipation, a delay, a syncopation, an upbeat, an afterbeat, and so forth" (Lester, 167-168).

24. See, for example, Kramer, 102, 107, 116, 119.

25. See Andrew Imbrie, "Extra Measures and Metrical Ambiguity in Beethoven," chapter in Beethoven Studies, ed. Alan Tyson (New York: W. W. Norton, 1973), 65. The conservative metrical interpretation here would be more likely to occur on a first hearing, whereas the radical interpretation might be inferred by a listener already familiar with the piece; this difference illustrates an important epistemological principle, namely, that valid, objective inferences are in part a function of one's context of knowledge.

26. These features have been widely recognized but generally interpreted in subjective psychological terms. Thus Imbrie writes: "Our desire for security prompts us to accept the simplest, more nearly regular interpretation of events, unless and until they force us to seek the next simplest. And our desire for order leads us to seek as many levels of metrical organization as our powers of attention and synthesis will allow." (See Imbrie, 54.) The tendencies described by Imbrie are real and significant, but this author views them, not merely as subjective impulses, but as inherent requirements of objective understanding.

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