Beat Hierarchy and Beat Patterns—From Aksak to Composite Meter

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In his study of Steve Reich's phase–shifting music, Richard Cohn points to a specific analytical challenge that transcends the repertoire at hand: "Given the relative poverty of our rhythmic terminology, the challenge for the theorist is to discover a means to characterize this material that is not only descriptively adequate, but also allows for exploration of its properties, its behavior under transformation, and its relations to other potential material" (1992, 149).[1] This essay responds to Cohn's call to action, singling out one of the many under–determined modes of rhythmic continuity in post–tonal music—(asymmetrical) composite meters. It rehearses a wide–ranging application of a new conceptual framework that can be used in accounting for the frequency and formal salience of composite meters in twentieth–century repertoire. Through analysis of select musical examples, I relate composite asymmetrical meters to compound and aksak meters, showing how certain types of "asymmetrical" meter exemplify non–isochronous duple and triple meters and, further, how composite meters combine two or more different metric units into a recurring whole (e.g., isochronous duple followed by non–isochronous triple meter). Along the way, I introduce a number of new concepts (meta–measures, duplication) and a new form of graphic representation (the time signature map).

Isochronicity refers to the durational equality of temporal units such as beats and beat groups. Isochronous beats cohere into symmetrical meters, such as symmetrical duple meter, or 2/4, whereas non–isochronous beats give rise to asymmetrical meters. The examples in this essay are chosen because they outline similar metric patterns, rather than for their exclusivity—a wealth of examples in the twentieth–century repertoire pursue similar metric patterns. An analytical approach to this repertory can take a perceptual or a formal stance but will likely suffer from a lack of a working methodology because approaches to rhythmic and metric analysis are not standardized and are often incompatible with one another. In lieu of following an established analytical methodology for this repertoire or a widely accepted theoretical framework for understanding beat hierarchy in asymmetrical meters, I consider various approaches and develop a performer–sensitive method of analysis.

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For example, in their approach to metric structure, Lerdahl and Jackendoff suggest that "the elements of metrical structure are essentially the same whether at the level of the smallest note value or at a hypermeasure level" (1983, 20) and that "the listener instinctively infers a regular pattern of strong and weak beats to which he relates the actual musical sounds" (1983, 12). The metric structure thus envisioned is distinct from the grouping structure, which reflects the listener's recursive division of the musical continuum into progressively larger formal units whose boundaries do not necessarily coincide with metrical accents. Grouping and metric structures are both hierarchical, but only the grouping structure is exhaustively hierarchical (metric structure ceases above a certain perceptual level). Furthermore, these two structures cooperate in determining the time–span segmentation of a piece.[2] Although the two structures are distinct, Lerdahl and Jackendoff apply similar formal and perceptual rules to both; these are called "well–formedness rules" and "preference rules," respectively. At least with respect to tonal music, these authors regard regularity and uniformity as normative for both grouping and metric structures.

In contrast to the concepts of hierarchical uniformity advanced by Lerdahl and Jackendoff, Christopher Hasty (1997) espouses the notion of qualitative meter and a dynamic, internal, relationship between beats.[3] Hasty's approach to rhythmic theory further asserts that meter need not be necessarily contiguous or continuous: any series of three or more events that frames a determinate duration, and hence spawns a process of projection, may be regarded as metric. For Hasty, rhythm and meter arise from a unified temporal experience and not as separate temporal phenomena.

Considering how intensely the experience of temporal phenomena relies on perception and memory, attending to the perceptual categories associated with distinct types of memory patterns is an important element of any metric theory. Candace Brower (1993) distinguishes among three types of memory—echoic, short–term, and long–term—each involving different types of auditory processing and representing different cognitive phenomena. Echoic memory pertains to immediate rhythmic activity, such as beat succession in the foreground, while short–term memory applies to phrase–level events. Long–term memory works associatively, relating events that are not part of an immediate sequence and are out of "serial" order (Brower 1993, 32). Lerdahl and Jackendoff's assertion that metric and grouping structures operate in comparable ways regardless of the level of metric hierarchy is, therefore, at odds with Brower's cognitive stratification of memory types. In an additional categorization of hierarchies of perception, Justin London posits that "[r]hythm may be a quality of musical figures and movement that is apprehended within the span of the

perceptual present, whereas form requires an understanding of structural relationships either wholly or partly outside the perceptual present" (2001, 278). London further distinguishes rhythm, which "involves the pattern of durations that is phenomenally present in the music," from meter, which "involves our perception and anticipation of such patterns" (2001, 278).

In this study, sound events will be considered in their formal roles, a stance that relies on retrospective hearing and memory more than on the "perceptual present." Attention will be directed more toward a conceptual, rather than a perceptual, approach to analysis. I presume that a compositional choice of rhythmic notation, such as a time signature, indicates some organizational aspect of a work's rhythmic structure unless it is overwhelmingly negated by the actual sound events. More importantly, the use of structural levels, as summarized below, allows for an integrated approach to the organizing parameters of rhythmic form regardless of how perceptually obvious (and to whom) the germane rhythmic events may be. I acknowledge that the field of music perception, which includes Brower's and London's studies, is increasingly important for the study of twentieth–century music—precisely because the customary modes of attending are often inadequate for an immersive interpretation of contemporary scores. However, "customary" modes of attending seem to vary greatly and improve upon repeated exposure to any repertoire; hence my reservation about bringing the perceptual parameters to the forefront of the current inquiry. Brower's cognitive models will thus loosely correlate with the three structural levels of rhythmic hierarchy detailed below, although, for the most part, the structural levels simply correspond to the units of formal segmentation.

The discord evident in analytical approaches to tonal works extends to the discussion of meter in post–tonal music, particularly when meter deviates from familiar common–practice models based on equally spaced (isochronous) beats. In twentieth–century scores we often encounter a mixture of duple and triple elements on one beat level generating a lack of uniformity on a higher level of beat. Such cases, as well as the purportedly pulse–based meters, are most often analyzed as bottom–up models. For example, a recent textbook on aural skills claims that, in asymmetrical meters, "beats become longer or shorter by adding or subtracting divisions [pulses] between them. Thus, asymmetric beat structures can be considered to use additive rhythms" (Cleland and Dobrea–Grindahl 2010, 467).[4] These two authors conflate asymmetrical and composite meter. As we shall see, the concept of asymmetrical meter describes those metrical patterns comprising beats in a 2:3 proportion, whereas composite meter exists only in the presence of at least two different types of meter (as with a concatena-

tion of duple and triple meter, or symmetrical and asymmetrical meter). In contrast to Cleland and Dobrea–Grindahl, Kvifte (2007) challenges the notion that an asymmetrical meter (such as 7/8) can be counted in (seven) pulse units in any musically satisfactory way. He disputes the universality of theories based on a "Common Fast Pulse" (e.g., those applying the concept of additive meter), particularly since musicians worldwide not only count non–isochronous triple meter "in three," rather than "in seven," but also because empirical studies show that the proportional equality and inequality of beats and beat subdivisions is measurably imprecise in performance and perception (Snyder et al. 2006).[5] In my experience, and supported by Kvifte, Snyder et al., and other studies, the sense of counting in three unequal beats develops over time and with greater exposure to non–isochronous meters.

The remainder of this essay is organized in three parts. The first section clarifies metric hierarchy and terminology pertinent to asymmetrical and composite meters. The second section illustrates multiple notational variants of a single asymmetrical meter—a four–beat aksak meter. The third and final section extends the discussion of composite meter from part two into a lengthier consideration of Ligeti's Capriccio No. 2, a work that features thematically conceived composite metric patterns that cohere into middleground entities, which I term *meta–measures*.

Beat Hierarchy and Beat Patterns

At the most fundamental level, meter is often viewed as hierarchical when it includes a progression of clearly defined beats that are organized into beat groups comprising two and/or three counting beats. After all, instructions for conducting, counting, and tapping of metric patterns customarily outline either duple or triple meter or some combination of the two. It often follows, however, that in many "pulse–driven" works, i.e., when all seven eighth notes in a 7/8 meter are continuously present and articulated, meters that cannot be evenly subdivided into groups of two or three counting beats are not seen as hierarchical, which then limits the theoretical recognition of their metric periodicity. As an extension of this limitation, asymmetric meters are not described by current rhythmic theories as coalescing into middleground structures akin to hyper–measures.[6]

This study recognizes three strata of rhythmic structure: (1) the foreground, defined by pulses, tactus beats, and beat groupings; (2) the middleground, consisting of measure groups and other salient groupings whose boundaries are structurally defined (e.g., meta–measures); and (3) the

5. Meta–Measure
4. Supra–Tactus
3. Tactus (main counting unit)
2. Pulse (chronos protos?)
1. Sub–Pulse (chronos protos)

Figure 1: Five levels of beat hierarchy in composite metric patterns.

background, which can be delineated by structural markers, such as phrase endings and pulse–stream convergences, which indicate pacing or formal segmentation. These hierarchical levels are broad categories in the domain of rhythmic form—none precisely specifies formal segmentation. Hence, it is possible to speak of "relatively background" phenomena depending on the type of temporal organization in an individual work. Heinrich Schenker similarly considered structural levels as flexible categories whose number would vary from one work to another. In this manner, a work could have one or several "shallow" and "deep" middleground levels (1979, 26).[7] Since the topic of this essay concerns metric patterns and phrase–level events, I will be focusing on the foreground and middleground, rather than the structural background.

The rhythmic hierarchy of the foreground and middleground levels can be delineated via five levels of beat (see Figure 1). In Figure 1, the primary counting unit is the *tactus*, adopting an earlier term for the counting beat to clarify the more general and imprecisely used term "beat." I assume that tactus beats fall within the span of 50–190 beats per minute and need not be isochronous.[8] In this paper, all non–isochronous tactus beats are proportionally related, using only the simple and common proportion of 2:3. Other proportional relations are possible, but yield more complex metric relations that are not part of the current topic. *Supra–tactus* designates a grouping of tactus beats into a higher–level beat. A supra–tactus may, but does not have to, correspond with a notated measure. In the strictest sense, the supra–tactus level signifies either duple or triple meter. When the supra–tactus level is non–isochronous, indicating different–length measures, a composite meter emerges. Just as the possibility for shallow and deep middleground levels exists in Schenker's theory, a post–tonal work could feature more than one supra–tactus level. A shallow supra–tactus level represents a grouping of two, three, or four tactus beats, whereas deeper supra–tactus levels encompass phrase–length patterns comprising more than four tactus beats. *Pulse* denotes a subdivision of the tactus. Pulse is not used as a universal name for isochronous "beats" or as a part–time refer-

ence to the counting beat. *Sub–Pulse* is a subdivision of the pulse. Either the sub–pulse or the pulse can represent the *chronos protos*, defined as the level of beat that is the smallest common denominator between metric units.[9]

The *meta–measure* occupies the highest level of the beat hierarchy in Figure 1. A meta–measure is not a "beat" per se, but an organizing entity for tactus and supra–tactus beats in the middleground. This level applies to a range of composite metric patterns that may correspond to groups of notated measures or may be discerned from the musical foreground in the absence of any time–signature indications. Meta–measures can be defined as recurring grouping phenomena that contain at least two different metric groups. Like hyper–measures, meta–measures can be formed by combining (notated) measures or perceived metric units into a larger formal segment. In meta–measures, however, the constituent "measures" or bars are, by definition, not of equal length and their periodicity is not based on alternating strong and weak bars.[10]

I contend that asymmetrical metric patterns can actually possess greater inherent middleground periodicity than symmetrical patterns. Any "strength" or "weakness" attributed to a beat or measure in a symmetrical meter does not intrinsically derive from organization within the rhythmic domain alone: in tonal music, the voice leading is an important, if not a crucial, component of phrase structure, and cadences represent powerful structural markers such that it is difficult to discuss the structural significance of rhythm and meter in tonal music without taking its contrapuntal and harmonic structures into full account. In post–tonal music, the burden of phrase boundary delineation and structural closure often falls on other compositional parameters, most notably the temporal ones. For many twentieth–century composers, rhythm is more central to a work's functioning than pitch. The primacy of rhythmic design is already evident in the sketches of the early modernist composers (e.g., Schoenberg and Stravinsky) but becomes even more pronounced after World War II. When twentieth–century works rely on metric schemas, rather than ametric pulse–stream interaction, asymmetrical and composite meter feature prominently.

London (2004) and Arom (1991) each wrestle with the issue of metrical accents (or the lack thereof) in asymmetrical meters and conclude that no accent is necessary due to the intrinsic differentiation among beats in beat patterns comprising short and long beats. In essence, both London and Arom attribute a dynamic relation and a qualitative approach to beat groups in non–isochronous meters. I will add that, if there is an audible shift between two (or more) types of counting beat and that pattern undergoes repetition, we will also hear this process as cyclical. Elsewhere, I

have defined the middleground periodicity of composite metric patterns as arising from one of four factors: (1) change of speed at the level of the counting beat (consistent with London and Arom); (2) change in the number of beats in a metric unit (duple versus triple meter); (3) metric hiccup; and (4) metric palindrome (see Vojčić 2007). In this essay, which explores simple metric patterns, only the first two categories apply. If a series of beats features one or more differing tactus beats, such as a longer beat in combination with shorter beats, and this series repeats, we will hear a distinct and self–defined metrical pattern. In this manner, a beat progression comprising < short, short, short, long > beats would be heard as a group of four beats with the longer beat last. The boundary of the four–beat unit would be delineated by the change of tactus speed and would be easily aurally distinguishable.

Time signatures currently used to represent underlying metric structures are by no means intuitive. It is a matter of learning that a categorical distinction exists between the time signature for a simple meter like 2/4, which specifies a number of counting units in a measure (two beats, each expressed as a quarter note), and a time signature for a compound duple meter (6/8) that does not explicitly specify the tactus level.[11] The beat hierarchy for these two meters is summarized in Table 1, highlighting the three levels of beat essential to our understanding of metric hierarchy. Like asymmetrical meters, meters of 6/8 and 3/4 are sometimes equated from the bottom–up (additively) since each metric unit contains the same number of pulses, which represents a *quantitative* approach to beat patterns. However, the two meters are not metrically equivalent top–down, since 3/4 implies triple meter and 6/8 implies duple meter—these two meters are *qualitatively* different (see Table 2).[12]

Distinguishing between quantitative ("additive") and qualitative approaches to hierarchy is helpful when analyzing counting patterns in asymmetrical meters. Rather than "assembling" the musical middleground from numerous fast pulses, a qualitative approach locates the tactus level first. To understand the beat hierarchy in 7/8, for example, we look for a beat level higher than the one specified in the denominator. Unlike the pulse units (eighths), the tactus beats in 7/8 are customarily not isochronous because prime numbers cannot be divided evenly by two or three. Most often, a measure of 7/8 will contain three non–isochronous tactus beats—two short beats, equivalent to a quarter note, and one long beat, equivalent to a dotted quarter.

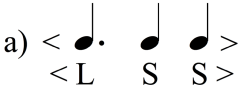
Meters that contain tactus beats of different lengths, comprising two and/or three isochronous pulses, are also known as *aksak* or Bulgarian meters.[13] The latter term originated with Bulgarian ethnomusicologists and

Time signature	2/4	6/8
Supra tactus		
Tactus		
Pulse		

Table 1: Beat hierarchy in duple meters 2/4 and 6/8.

Time signature	3/4	6/8
Supra tactus		
Tactus		
Pulse		

Table 2: Beat hierarchy in 3/4 (triple meter) and 6/8 (duple meter). An equal number of pulses does not imply an equal number of beats at the tactus level

a) 

b) 

c) 

Example 1: Three variants of authentic aksak triple meter (7/8). (L = long beat and S = short beat.)

was popularized by Bela Bartók's research at the beginning of the twentieth century. "When one of our famous musical researchers heard tunes with Bulgarian rhythm for the first time," Bartók recalled, "he shouted: Are all the Bulgarians lame, their songs having these limping lame rhythms?" (quoted in Fracile 2003, 198). With reference to Bartók's research on Bulgarian meters, the Romanian musicologist Constantin Brăiloiu later coined the term *aksak* meter.[14]

I adopt the term aksak meter in this essay and follow Simha Arom's (2005) recent classification of aksak meters. Arom defines three categories of aksak meter:

> a) in *authentic* aksak meters, the number of pulsations is a prime number, as in a three–beat 7/8 meter (7 is a prime number);
>
> b) in *quasi*–aksak meters, the number of pulsations is odd, but not prime, as in a four–beat meter notated with 9/8 (9 is odd but not prime);
>
> c) *pseudo*–aksak meters have an even number of pulsations, as in a three–beat 8/8 meter, as is the case in *tresillo* (*clave)* beat patterns.[15]

Aksak meters have non–isochronous tactus beats. They can accommodate multiple distinct types of beat pattern, bestowing the rhythmic foreground with a potential for additional variety. There are three variants of the authentic aksak triple meter (7/8), for example, since the long beat can occur first, last, or in the middle of the three beats (see Example 1). In quasi–aksak and pseudo–aksak meters, the sum of pulse units can also indicate three or four isochronous beats (as in 9/8 or 8/8, respectively).

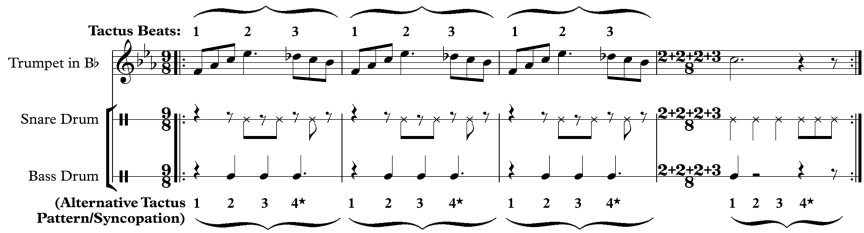
In *Hearing in Time*, Justin London (2004) devotes considerable attention to non–isochronous meters and establishes a theoretical underpinning for various beat cycles, allowing for proportionally related beats (2:3) in the presence of isochronous pulses (what he terms the "N–cycle"). Despite all the attention London afforded non–isochronous (aksak) meters in *Hearing in Time*, in his 2006 article, "How to Talk About Musical Metre," London still bemoans a general lack of analytical understanding for non–isochronous meters outside the cultural environments where they are common and popular: "To be sure, by definition the highest level of a repeating pattern is always isochronous, and most other levels of rhythmic structure tend to be isochronous. But Western music theory, from the 19th century through Lerdahl and Jackendoff (1983) has presumed meter to be inherently isochronous. Thus rhythms comprised of uneven beats and higher–order prime numbers of pulses (found in musical cultures ranging from Eastern Europe to Southern India) cannot be accommodated in Western music theory." The remainder of this essay aims to provide a means to accommodate these common metrical patterns in Western music theory. In

addition to clarifying the beat complement[16] and beat hierarchy of asymmetrical meters in the rhythmic foreground, I extend the consideration of asymmetrical and composite meters into the structural middleground by including phrase–level events such as meta–measures.[17] As a first step, I compare the beat patterns in a number of works featuring an asymmetrical four–beat meter and show how differing metric notation does not indicate diverse beat complement or beat hierarchy. I also introduce composite metric structures that include asymmetrical and symmetrical beat distribution within a recurring composite meter (e.g., the < 9/8, 8/8 > meta–measure). Finally, the analysis of Ligeti's Capriccio No. 2 synthesizes the discussion of beat hierarchy in asymmetrical meters with the elements of rhythmic form. The overall form of this work arises through the repetition and variation of a primary thematic unit in the structural middleground (a lengthy composite metric pattern of < 5/8, 5/8, 7/8, 8/8 >) and the core metric pattern of 5/8 in the foreground.

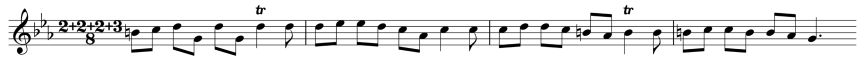
Four–Beat Aksak Meter

While London (2004) draws largely upon the tradition of beat–cycles in West African drumming or Indian talas for his examples, he opens his discussion with Dave Brubeck's "Blue Rondo a la Turk," which is in a quasi–aksak four–beat meter (the tactus is subdivided as 2+2+2+3 = 9 pulses). "Blue Rondo" is not an exception as there are numerous interesting examples of asymmetrical meter in various popular idioms. Sting's *I Hung My Head*, for example, seems to relish the ambiguity inherent in nine pulses, alternating and juxtaposing three–beat and four–beat 9/8 meter throughout the song and between the ensemble parts. Like *I Hung My Head*, many Balkan folk dances in quasi– and pseudo–aksak meters juxtapose isochronous and non–isochronous variants of a series of tactus beats. Beginning with these folk dances and with Sting's song, in this section, I go on to trace non–isochronous four–beat meters in select examples from works by Bartók and Crawford.

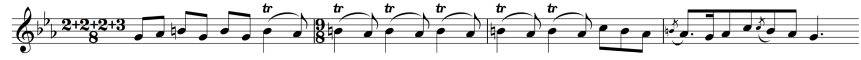
The metric interpretation of non–isochronous tactus beats in compound and aksak meters is a common feature of Balkan folk music. A Romani *Čoček* dance from Serbia juxtaposes isochronous and non–isochronous meters, alternating between duple (asymmetrical four–beat meter) and triple (symmetrical compound meter).[18] A simplified transcription of the *Čoček* introduction appears in Example 2a.[19] The trumpet line is in rhythmic unison with the entire brass section, while the bass drum sounds a locally syncopated beat pattern. The brass *tutti* is so predominant that



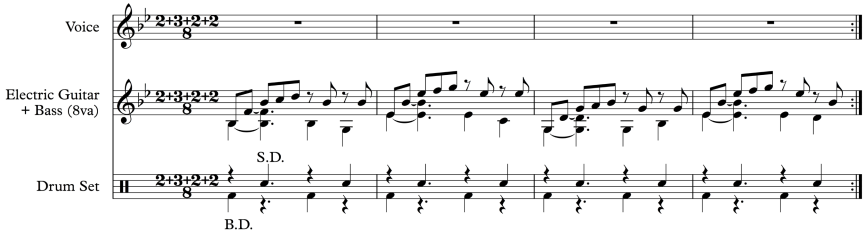
Example 2a: Three– and four–beat 9/8 meter in the introduction of a Serbian *Čoček* dance.



Example 2b: Competing four–beat–aksak–meter melody in *Čoček*.



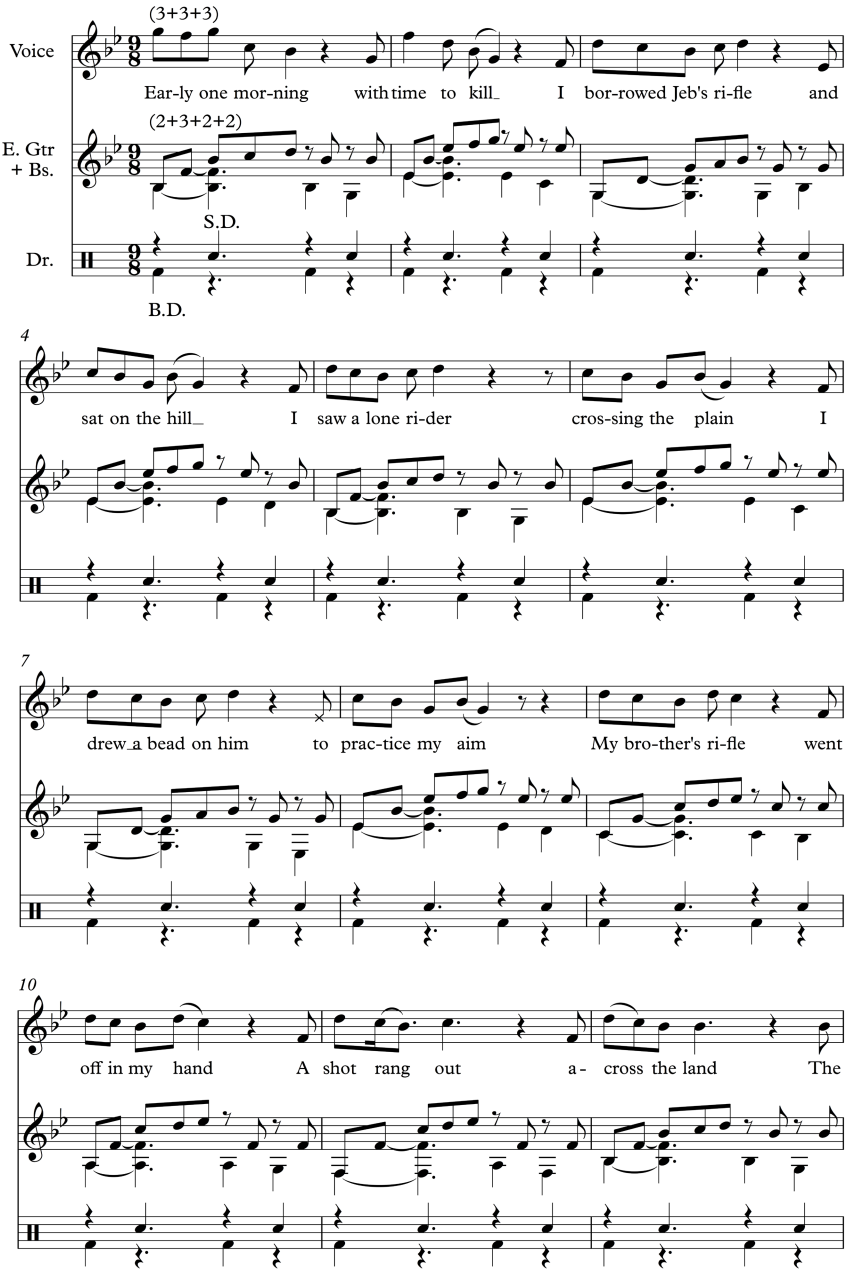
Example 2c: Beat pattern reversal in *Čoček*.



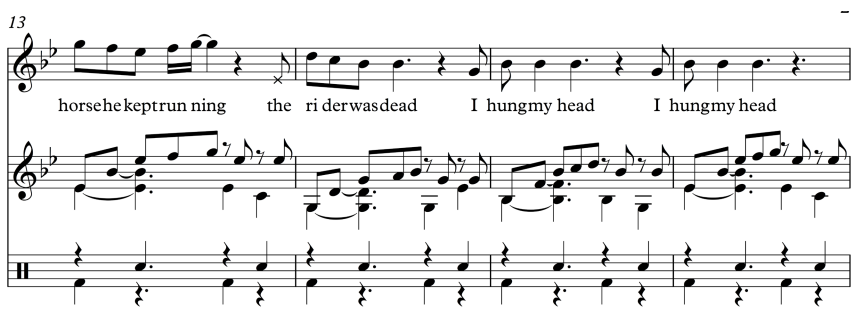
Example 3a: Sting, *I Hung My Head*, introduction (four–beat aksak meter).

the competing bass drum pattern is rather difficult to hear in the first three measures of the four–measure introduction. It is only in retrospect, with changes to the metric pattern later on in the dance, that the bass drum's four–beat pattern emerges as a competing tactus pattern when it is audibly taken up by the solo instrument(s) (see Example 2b).

The initial juxtaposition of the symmetrical triple meter in the brass section with the asymmetrical four–beat meter in the drums becomes unbraided over the course of the dance, and the two meters are represented both one at a time (as in Example 2b) and in concatenation (see Example 2c, in which the presentational order of beats from Example 2a is reversed). In the dance proper, the asymmetrical four–beat meter is predominant (see Example 2b), but the dance occasionally switches into symmetrical triple



Example 3b: Vocals from Sting, *I Hung My Head*, bb. 1–16 of Verse 1.

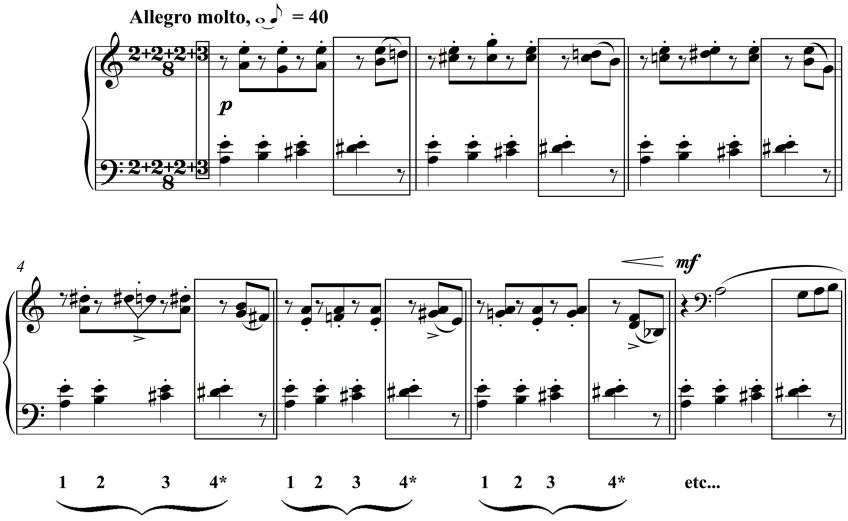


Example 3b: Continued.

meter (see Example 2c). This brass band example exemplifies quasi–aksak meter, a notated 9/8 with one longer beat (here, consistently the last in the group of four). The ensemble indicates in the album's liner notes that they consider this dance illustrative of asymmetrical 9/8 meter (see Zlatne Uste Balkan Brass Band 1993).

Another juxtaposition of three–beat and four–beat meters with nine pulses occurs in Sting's *I Hung My Head* (1996). The four–measure introduction, transcribed in Example 3a, is emblematic of the setting for guitars and drums throughout the song—they play in an asymmetrical four–beat meter, with a longer second beat.[20] A different grouping of pulses emerges with the entrance of the vocal line (see Example 3b). The vocal part signals a symmetrical triple meter, with a steady grouping of three syllables on each downbeat prefaced by a ubiquitous upbeat that rhythmically underscores an ascending leap into the first beat of each 9/8 measure. The second beat is habitually marked with a < short, long > rhythmic figure, further unsettling the rhythmic foreground. Consistent with the song's topic (an accidental shooting of a stranger), Sting's original rendition of *I Hung My Head* is arguably more unsettling than subsequent covers by Johnny Cash (2002) and Bruce Springsteen (2011) where, in both cases, the underlying metric complexity was smoothed over with performances in a symmetrical 4/4 meter. Unlike the later versions, Sting's song explores the grouping ambiguity afforded by the nine pulses and oscillates between the triple compound meter and the four–beat quasi–aksak meter.

Similar examples of asymmetrical four–beat meter are frequent in the music of Béla Bartók, who often draws on the folk traditions of the extended Balkan region. One of the Bulgarian Dances from *Microkosmos* (No. 152) is very similar to the Romani brass band example in its treatment of a four–beat meter with one longer beat (see Example 4. Boxes mark the consistently longer last beat in each measure). The time signature is expressed as a composite of < 2+2+2+3 > eighth notes, the same as Brubeck's "Blue

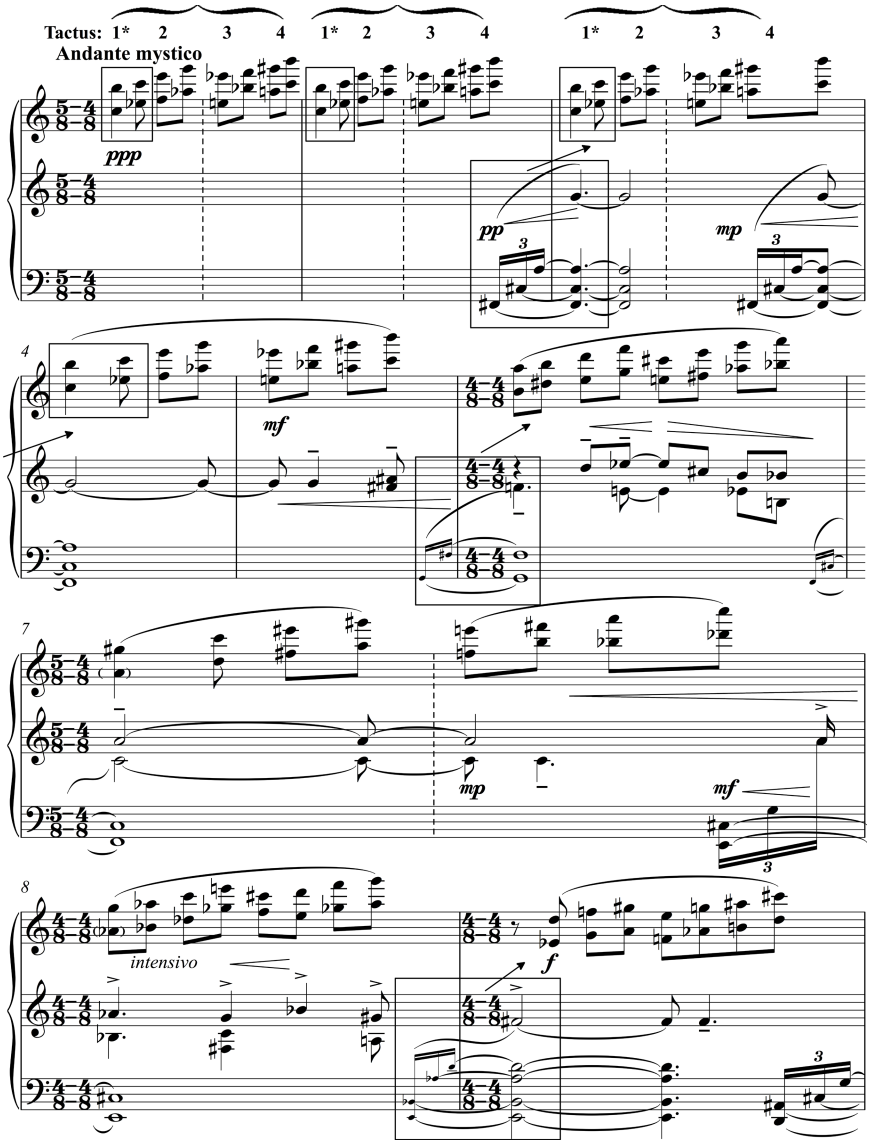


Example 4: A four–beat, quasi–aksak 9/8 meter in Bartók's *Microkosmos* No. 152, bb. 1–7.

Rondo." This notation differs from the time signature notation of Bartók's later concert works, even though they outline identical asymmetrical patterns (compare with the excerpt from *Music for Strings* in Example 6).

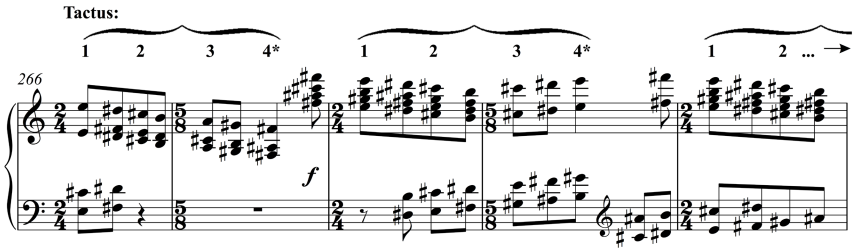
Another four–beat pattern with one longer beat, represented with a composite time signature of < 5/8, 4/8 >, can be found in Ruth Crawford's Prelude No. 6 from 1941 (see Example 5). The Prelude consists of three distinct textural layers: a) an ostinato in the uppermost part that contains mostly contiguous eighth notes; b) a sustained chordal bass that is always arpeggiated; and c) a mid–range line that gradually assumes a melodic character. The first beat of the composite metric pattern is also the long beat in the overall group of four (boxed in Example 5). The longer duration of the downbeat lends it greater metric weight, which is subsequently reinforced by the arpeggio that leads into it. The arpeggios that terminate on the downbeat, rather than just before it, are boxed in the example, and arrows point to the "strong" beats they precede. The composite metric pattern is always followed by a spin–off in < 4/8, 4/8 >, where the middle layer becomes more active than during the < 5/8, 4/8 > pattern. Otherwise, the < 5/8, 4/8 > and < 4/8, 4/8 > patterns are comparable, since both represent groups of four beats that follow the arpeggiated bass. Note that Crawford maintains the composite time signature indication for the contiguous measures of 4/8 (i.e., 4/8–4/8) rather than reverting to 8/8.

The metric elongation of the first beat in Crawford's Prelude works well with the natural elongation that takes place in the presence of widely spaced broken chords in the bass line. When the chords are spaced par-



Example 5: 9/8 and 8/8 as four–beat composite meters in Crawford's Prelude No. 6, bb.1–9.

ticularly broadly in < 4/8, 4/8 > meter, as in measure 9, the ostinato line begins with a rest. While the reason for this may be primarily technical (the pianist's right hand is occupied by the arpeggio), the effect is also one of elongation and emphasis on the downbeat, now provided by the middle layer. In short, the notation of < 4/8, 4/8 > is clearly meant as a parallel to the < 5/8, 4/8 > notation, even though it is possible to sign the former



Example 6: < 2/4, 5/8 > four–beat groups in Bartók's *Music for Strings, Percussion, and Celesta*, II, bb. 266–70.

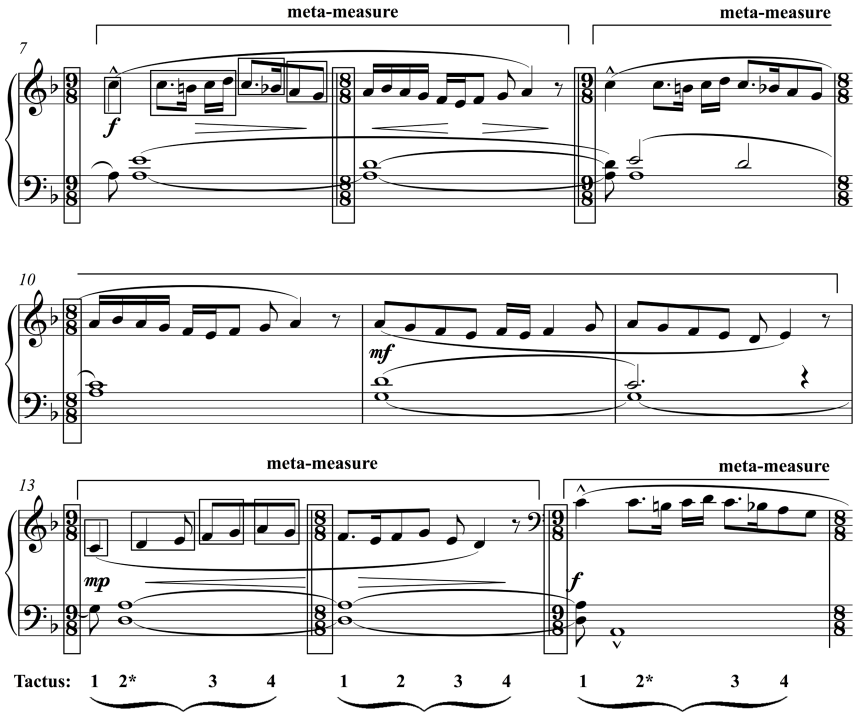
with either 8/8 or 4/4. Crawford is probably considering < 5/8, 4/8 > as a variant of 4/4 with an elongated first beat. The consistency in her notation emphasizes the kinship between duple meter with isochronous beats and duple meter with non–isochronous beats (that is, between 4/8 and 5/8).

A similar metric pattern occurs in the second movement of Bartók's *Music for Strings, Percussion, and Celesta* (see Example 6). It is notated as < 2/4, 5/8 > in a kind of a retrograde of Crawford's beat grouping. Crawford's Prelude is slower, more meditative, and lyrical than the furious dance music of this second movement of *Music for Strings, Percussion, and Celesta.* In Bartók's work, the long–beat–last pattern appears indicative of a faster tempo.[21]

Unlike the Bulgarian dance in *Microkosmos*, the passage from Bartók's *Music for Strings* is notated with two duple meters. The longer beat of the metric pattern appears in the second of each pair of measures. Unlike Crawford's notation in the Prelude, which equates 4/8 and 5/8 meters from the bottom up (from the level of the eighth–note pulse), Bartók's notation casts the composite metric pattern < 2/4, 5/8 > as fundamentally comprising two duple meters. In the absence of a notational equivalent that would allow for consistent notation, accounting for different–length tactus beats qualitatively (from the top down), Bartók's notation appears as a metric hybrid.[22]

The type of time–signature notation used by Bartók in *Music for Strings* appears frequently in early to mid–twentieth–century scores, whether applying to entire movements or only sections thereof. Revueltas's *Sensemayá* (1938), for instance, features a composite time signature of < 2/4, 3/8 >; Kirschner's Piano Concerto (1953) and Copland's *Short Symphony* (1933) have a < 3/4, 3/8 > time signature; and Tippett's Symphony No.2 (1957) contains a time signature of < 3/8, 2/4 >. In each instance, the maximum number of beats in the entire composite meter is four (3/8 stands for one longer beat equivalent to a dotted quarter).

While a recurring metrical scheme comprising two different metric units is a pre–requisite for meta–measures, the most interesting examples are those in which the number of tactus beats exceeds a four–beat aksak



Example 7: A four–beat 9/8 meter in the Serbian folk song *Dilber Tuta*, bb. 7–15.

meter, forming a larger unit of true composite meter. [*Bolna leži*] *Dilber Tuta*, a folk song from southern Serbia, arranged for the piano by renowned Yugoslav composer Josip Štolcer–Slavenski (1896–1955) and reproduced in Example 7, is based on a < 9/8, 8/8 > composite metric pattern. This pattern is bracketed above the score and the time signature changes are indicated with boxes. Unlike the recurring composite metric patterns previously surveyed, the < 9/8, 8/8 > meter in *Dilber Tuta* is much longer and is treated as a flexible cycle: The 8/8 metric unit is frequently duplicated, so that the order of metric units remains, but the number of measures within the meta–measure pattern varies. A single measure of 9/8 marks the onset of each meta–measure and is followed by a variable number of 8/8 measures.[23]

The notated time signature of 9/8 in *Dilber Tuta* does not signify a compound triple meter. The 9/8 measures feature four non–isochronous tactus beats with a longer second beat (marked in Example 7 with an asterisk), similar to Sting's *I Hung My Head*. Furthermore, the pitch structure highlights the progression of non–isochronous beats: the sixteenth notes in measures 7 and 9 decorate the primary melodic tone C5 as a double–neighbor figure, before descending to A4, for instance. Štolcer–Slavenski's beaming also appears deliberate: notes are beamed together when they

outline beats in duple subdivision, particularly stepwise descents such as C–Bb–A–G in measures 7 and 9 and A–G–F–E in measures 11 and 12. Syncopations, as well as the double–neighbor figure that elongates the second beat in the 9/8 measures, are not beamed together and are frequent only in 8/8 (see the second half of measures 11 and 12).

The kind of flexible–cycle variation found in *Dilber Tuta* occurs more readily in Balkan vocal music than in ensemble dances, in part due to a greater degree of improvisation by solo vocalists. A different type of metric variation is common in instrumental works. One of the popular dance–types related to the composite meter used in *Dilber Tuta* is the *Leventikos* dance from Greece, called *Pushteno* in Macedonia. The *Leventikos* may be transcribed or notated with 12 pulses such as a pseudo–aksak 12/16 (3+2+2+3+2), although a longer version with 16 pulses exists as well, often organized as 2+2+2+3+2+2+3. The 12–pulse version would appear to comprise five beats (< L, S, S, L, S >), whereas in the 16–pulse version, there would be seven tactus beats (again, both are prime numbers). In addition, transcribing this dance using either eighths or sixteenths would be common, since it is the tempo rather than its apparent notation that defines the tactus level.

The *Leventikos* dance could also carry a composite time signature: 12/16 could be transcribed as < 7/16, 5/16 >, and the expanded 16/16 version could be notated as < 9/16, 7/16 >. Understanding the previously cumbersome strings of time signature digits as < aksak triple, aksak duple > (in the case of < 7/16, 5/16 >) would be closer to envisioning the dance steps in a routine that combines short–beat steps and long–beat turns. Considering < 7/16, 5/16 > as an < aksak triple, aksak duple > conceptually focuses our attention on composite meters as comprising proportionally related tactus beats, rather than as a collection of fast pulses that add up to non–isochronous tactus beats. In essence, and regardless of how many pulses there are in the overall pattern, we would not view a composite aksak meter as an additive meter but would concentrate on the number of tactus beats and their distribution (i.e., the position of the long beat in relation to the short beats). Perceiving the periodic structure of a recurring composite aksak meter such as < 7/16, 5/16 > in terms of its constituent tactus beats would also be helpful in performance because the long series of twelve brief sound articulations would now be grouped into larger, more memorable, "chunks."[24]

Each of my previous examples is based on an asymmetrical (non–isochronous) four–beat meter. While Crawford's Prelude and Bartók's *Music for Strings* entail composite metric patterns that are equivalent to the notated 9/8 quasi–aksak meter from the Bulgarian dance in *Mikrokosmos*, the Serbian folk song *Dilber Tuta* contains a four–beat 9/8 meter as part

of a composite time signature pattern that exceeds four beats. There are two sets of four beats in the < 9/8, 8/8 > composite metric pattern and the overall sense of periodicity is varied by virtue of a flexible cycle variation, with a different number of recurring 8/8 units. Despite this variation, each phrase is characterized by a return to the non–isochronous beat complement in the notated 9/8 at the onset of each meta–measure.

Composite Meter and Phrase Structure in Ligeti's Capriccio No.2

Ligeti's Capriccio No.2 (1947) illustrates the types of periodic entities that composite meters, such as the one from *Dilber Tuta*, can engender. Metric organization in Capriccio includes three asymmetrical meters combined into a recurring middleground unit, which correlates with a phrase. The composite metric structure is not static, but corresponds to formal groupings and is summarized in the Figure 2 time signature map. From the standpoint of the structural background, the graphic representation of a work's metric organization via a time signature map illustrates a novel approach to form summary. In short, a time signature map is a visual account of form from the standpoint of the underlying metric structure. The map provides an overview of a work's temporal shaping in the formal middleground and highlights structurally important or form–generating elements. Since the time–signature map summarizes indications *notated* by a composer, it represents a starting point in the process of formulating an analytical description. A time signature map addresses metric and grouping frameworks only and does not account for foreground rhythmic activity. While the rhythmic foreground and the metric structure may exhibit different degrees of congruence with one another, the time signature map points only to those changes affecting the notated meter. In tonal music, the presence or the persistence of 3/2 in a time signature map would not specify any foreground rhythmic patterns, but it might betray a composer's fondness for such metric designations or for a particular musical genre (e.g., a Courante). However, unlike a potential time signature map of a work in 3/2—a map that could, and probably should, include further elaboration of the hypermetric structure—a time signature map depicting meta–measures illustrates metric paradigms embodied by changing and composite meters in far more detail.

The time signature map of Capriccio No. 2 summarizes the sequence of measure lengths in all the **a** sections, omitting the contrasting **b** section of the rounded binary form.[25] In this map, repeated time signatures are indicated successively within the overall metric pattern and are separated

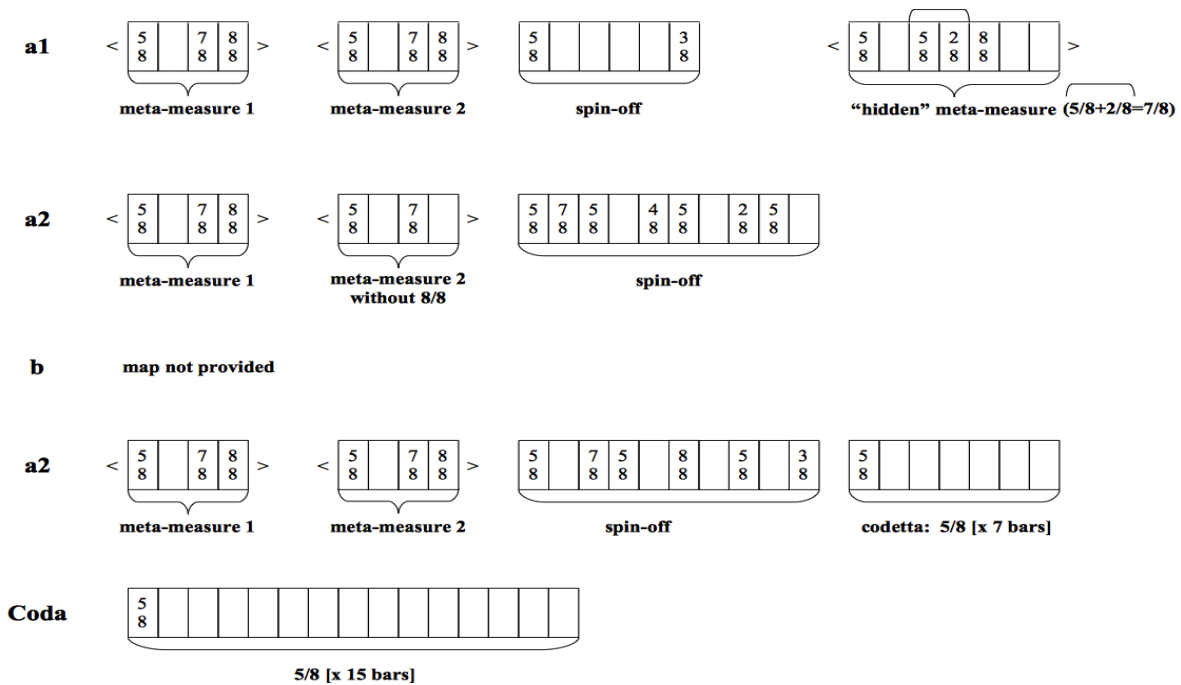
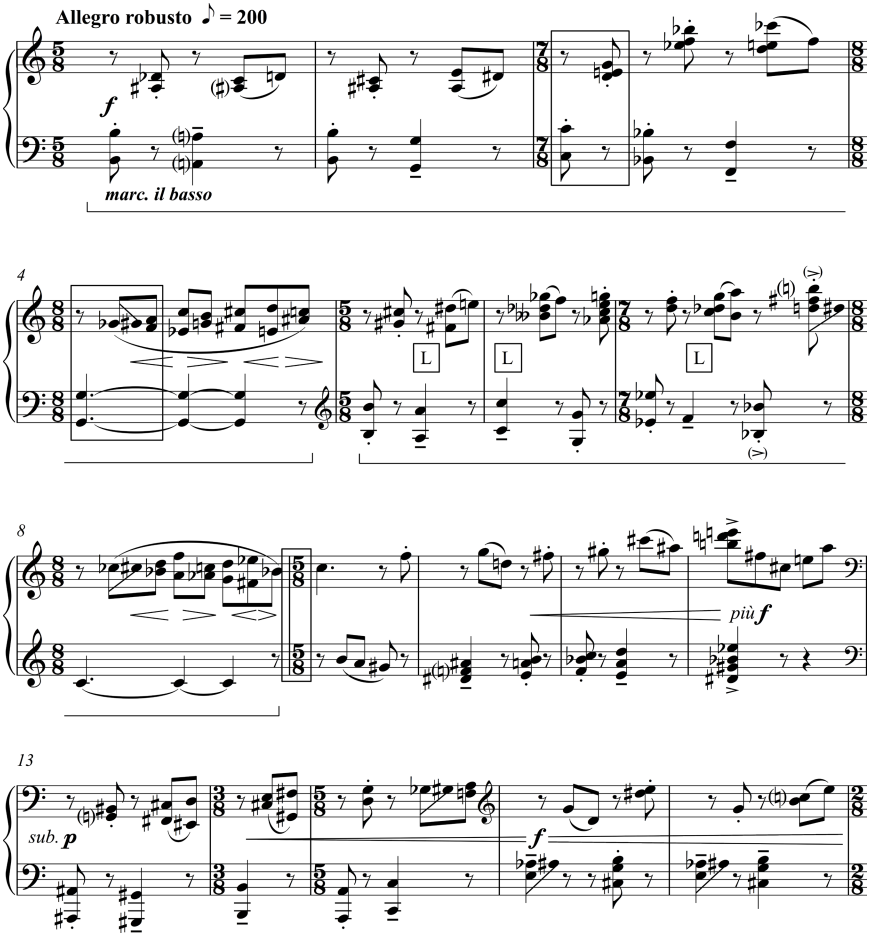


Figure 2: An annotated time signature map of Ligeti's Capriccio No. 2.



Example 8: Composite meter in the opening meta–measures (bb. 1–17) of Ligeti's Capriccio No. 2.

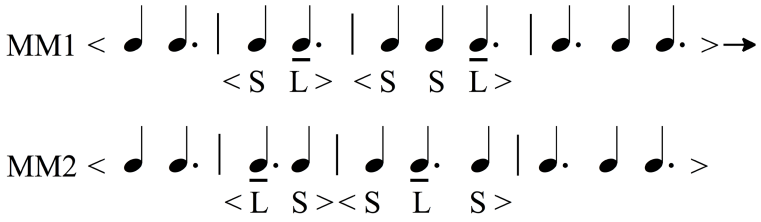
by barlines.[26] If the number of repetitions is excessive enough to cause clutter on the graph, the number of repetitions accompanies the time signature in parentheses. The Capriccio map shows a repeating < 5/8, 5/8, 7/8, 8/8 > pattern, which exemplifies a formally salient composite metric grouping—a meta–measure. Just like the < 9/8, 8/8 > pattern in Example 7, this composite metric pattern is also indicated with brackets in the score (see Example 8). Thematic variation of meta–measure patterns is optional and not a firm pre–requisite; akin to an ostinato, meta–measure patterns can persist unchanged as an ordered succession of metric units over the course of an entire work or a section. If treated as flexible cycles, meta–measures can also outline rotational form.[27]

In this instance, the time signature map illustrates how an aksak–like metric pattern can represent a recurring thematic element. The composite metric pattern < 5/8, 5/8, 7/8, 8/8 > correlates with a short phrase, which repeats numerous times, but is also varied, expanded, and truncated. Again, this type of compositional variance is emblematic of the *thematic* meta–measure patterns and distinct from periodic metric schemas where meta–measure patterns recur unaltered. Periodic meta–measure patterns can include significant rhythmic disturbances, such as syncopations, that conflict with the beat patterns and beat hierarchy suggested by the time signatures.

This time signature map also highlights the preponderance of 5/8 meter in the "spin–off" sections, as well as in the Coda. At the level of the rhythmic foreground, aksak duple (5/8 with one short and one long beat) represents the *core* metrical pattern, which is expanded to generate the three– and four–beat meters of 7/8 and 8/8 but is also truncated into short and long beats (e.g., a "lone" bar of 3/8). Pitches falling on tactus beats help to unify the four bars of this meta–measure into one composite pattern (see Example 8). Note how the left hand descends starting from the downbeat of each 5/8 bar: the initial melodic dyad B3–A3 is followed by B3–G3 and further expanded to C4–Bb3–F3 in the 7/8 bar (all pitches in bars 1–4 are doubled by an octave below). The arrival at the pitch G3/G2 at the end of the first phrase is reminiscent of a fourth–descent in tonal music (from tonic to dominant); furthermore, the last bass note of the second phrase (a sole C4) evokes a connection between the two phrase endings. There are sufficient tactus beats and beat groups in the opening two phrases (bars 1–8) to form five bars of 5/8 in each meta–measure, but the resulting syncopation would greatly obscure the overall descent in pitch space in the left hand and would undermine the metrically strong position of the final notes in each phrase (G and C).[28]

The underlying emphasis on 5/8 meter here points to another rhythmic process unfolding in Capriccio No. 2—*duplication*. The term *duplication* refers to a process of pattern–variation in which the repetition of one or more metric units (a tactus or a supra–tactus beat) from a basic group (*core pattern*) forms the basis for subsequent groups of any type.[29] In this instance, duplicated *tactus* beats have the effect of a rhythmic prefix. The core pattern of the entire meta–measure and all its subsequent variations in Capriccio No. 2 is the 5/8 aksak meter. The 7/8 bar of the meta–measure pattern duplicates the first (short) tactus beat from the 5/8 bar, and the 8/8 bar duplicates the second (long) beat of the 5/8 bar. In most instances of duplication, the core pattern appears unadorned and unaltered at some point in the music; in Capriccio No. 2, the core pattern appears particularly

Example 9: Beat duplication in the opening meta-measures of Capriccio No. 2 (bb. 1–4).

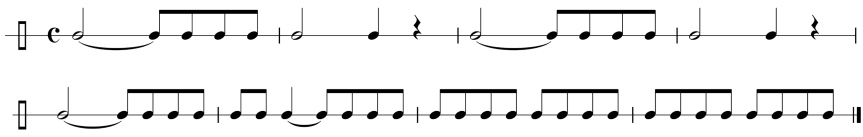


Example 10: Internal arrangement of the beat pattern in two meta-measures of Capriccio No. 2 (bb. 1–4 and 5–8).

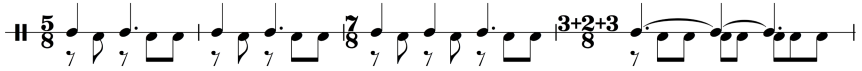
unadorned and unaltered in the Coda and the Codetta. Example 9 summarizes the beat pattern in the opening meta–measure; duplicated tactus beats are underlined.[30]

The meta–measure pattern appears twice in Capriccio No. 2 before any further development of the core pattern takes place. Granted, the second of the two 5/8 bars in the second meta–measure reverses the position of short and long beats from < short, long > to < long, short >; this type of variation in beat placement continues in the various spin–off sections, evoking the change of long–beat placement that marks the distinction between the two thematic meta–measures. Example 10 summarizes this difference between the two meta–measure variants (MM1 stands for meta–measure 1; MM2 stands for meta–measure 2). While the main meta–measure pattern clearly repeats at the opening of each **a** section, that repetition does undergo a slight internal rearrangement. The long beat is no longer the last in each unit; rather, it becomes the first beat in the second 5/8 bar and the middle beat in the 7/8 bar (marked "L" in the Example 10 reduction as well as in Example 8. The longer beats subject to this rearrangement or shift forward in the sequence of beats are also underlined). This type of internal variation between the two opening meta–measures allows for some flexibility and playfulness within a rather unyielding adherence to the meta–measure pattern in all the **a** sections. However, regardless of this internal variation, the number of beats in each meta–measure and the sequence of complete metric units remain unchanged.

The main meta–measure pattern in Capriccio No. 2 closely resembles a dance in *aksak* meter—tactus beats are underscored by the left hand, while the right hand elaborates the off–beats. The last measure in the pattern



Example 11a: Rhythmic reduction of meta–measure 1 (Capriccio No. 2, bb. 1–4).



Example 11b: Rhythmic reduction of the first phrase of Mozart's String Quartet K.465, I (bb. 23–30).

(8/8) has only one articulation in the bass, revealing its concluding role as a gesture of rhythmic cadence. The difference between the metric structure in Capriccio No. 2 and the aksak meters previously surveyed lies in the length and formal function of the composite metric pattern. In Capriccio No. 2, the composite meter comprises three distinct aksak meters: an authentic aksak duple meter (5/8), an authentic aksak triple meter (7/8), and a pseudo–aksak triple meter (8/8). Additionally, the meta–measure pattern thus formed correlates with one complete phrase, rather than only a motive or one bar of a phrase.[31]

The **a2** section begins as a restatement of **a1**, but pitches are repeated only in the first measure. Subsequent repetition is rhythmic and not melodic, and it affirms our hearing of the composite metric pattern as the primary vehicle of structural coherence. In support of the thematic character of the meta–measure, the 8/8 cadential measure is omitted in the second phrase of **a2** as the process of liquidation and fragmentation intensifies in preparation for further development in the middle section.[32]

Another notable feature of rhythmic design in Capriccio No. 2 is the effect generated by following two identical 5/8 measures, forming one half of the phrase, with contiguous eighth notes in 7/8 and 8/8, suggesting increasing continuity. The rhythmic reduction in Example 11a accounts for all the articulated pulse units and illustrates this increased continuity in the second half of the phrase. This motivic arrangement, comprising the repeated motive and subsequent continuation, is reminiscent of a classical sentence structure; see the reduction of the first theme of Mozart's String Quartet K.465, I, in Example 11b, as a means of comparison.[33] Just like the opening reiteration of the main motive in Capriccio No. 2 compares with the motivic and rhythmic repetition in the presentation phase of K.465, the "greater continuity" in the continuation part of the phrase in Ligeti's work recalls the drive towards the cadence in the second part of the phrase in

Mozart's string quartet movement. Similarly, the tempo in Capriccio No. 2 remains constant even though the large–scale metric pattern undergoes a tightening and loosening typical of the hypermetric structures of the earlier style.

The musical examples in this essay, as a collection and in sequence, demonstrate one possible manner of relating music that is variously notated but is to some degree emblematic of a similar metric (or even rhythmic) profile. Aside from Capriccio No. 2, these works feature variations of an asymmetrical or aksak–like meter comprising four beats, with one beat longer than the other three. When the tactus beat is defined as the primary counting unit in a reasonable tempo range, many differing time–signature combinations share similar beat patterns. Once the number of beats in an asymmetrical meter reaches or exceeds five, the resulting metric patterns are frequently notated and understood as composite meters. When such composite meter becomes recurrent or thematically repeated and varied, meta–measures emerge as the primary grouping force in the structural middleground.

Following the discussion of beat hierarchy and beat complement in aksak meters, *Dilber Tuta*, based on a composite meter < 9/8, 8/8 >, provided a transition into the analysis of beat groups in Ligeti's Capriccio No. 2, itself based on a composite metric pattern of < 5/8, 5/8, 7/8, 8/8 >. The analysis of Ligeti's Capriccio No. 2 also completed the discussion of beat hierarchy on five levels, as it introduced the concept of meta–measures.[34] In addition to the middleground stability provided by meta–measure patterns (comprising four notated measures), rhythmic motives in Capriccio No. 2 are generated through a process of beat duplication in the foreground, where the core metric pattern (an aksak duple, 5/8) spawns additional metric groups of 7/8 and 8/8. The combined effect of the two main rhythmic processes taking place in Capriccio No. 2 projects a sense of continuity in the domain of rhythm that includes elements of both structuring and variation.

Various types of composite meter appear in post–tonal music. In many instances, such as the examples included in this essay, rhythmic patterns implied by composite meter are largely realized in the foreground, and the transparency of beat hierarchy poses a modest analytical challenge. However, the concept of meta–measures is far broader than the context in which it was introduced here, and a more complete theoretical discourse concerning meta–measures would include the interaction of meta–measures with significant temporal phenomena such as rhythmic polyphony and tempo modulation. In addition, composite meters cohering into meta–measures could be subject to multiple forms of flexible–cycle varia-

tion. In more complex temporal environments, meta–measures may have little correspondence with conventionally notated metrical groupings but may still represent a structured approach to rhythmic continuity. With attention specifically focused on asymmetrical and composite meters, this study promotes a more inclusive understanding of meter in post–tonal music. The concepts I introduce and elucidate here can be and should be further explored in terms of their possible transformations as well as their interaction with other temporal phenomena.

Notes

1. While the "material" Cohn singles out in Reich's phasing works represents a repeated pattern of eight or twelve pulses (hence the beat–class set), the material I refer to is more generally derived from the organization of the rhythmic parameter and is not restricted to twelve–pulse cycles.

2. Time–span segmentation refers to our processive understanding of event boundaries and the resulting formal delineation of a piece of music. It is largely based on grouping and metrical structures. Time–span segmentation divides a musical work into nested time spans.

3. Hasty (1997) employs the concepts of quantitative and qualitative meter to distinguish between analytical approaches that emphasize the durational quantity of beats as the agent of periodicity and those models in which metrical accent arises from the sense of motion and internal relations between beats. In this essay, Hasty's terminology is used even more broadly to denote the qualitative distinction between duple and triple meter (symmetrical or asymmetrical), in contrast with the quantitative, bottom–up, approach that reflects a type of accrual of pulse units into longer tactus beats.

4. Howard Smither qualifies metric organization in twentieth–century music as falling into six distinct types, all possibly identified with single or multiple time signatures and based on regular or irregular grouping of short "counting" units (1974, 818–22). His approach to the types of meter discussed here can also be viewed as "additive." (The term "additive" meter originates with Sachs 1953.)

5. With the caveat that expressive variations in performance represent a related, but not identical, category to that of the notated or culturally established manner in which beat durations are seen to vary, we can extrapolate that asymmetrical meters with beats in a 2:3 ratio represent a category of duple or triple meter that is not entirely dependent upon the constant iteration of the (fast) pulse units, which they theoretically comprise.

6. The issue of hypermeter (or hypermeasures) in asymmetrical meters in not as much one of simple dismissal or disqualification, but more a problem of omission. Examples of asymmetrical hypermeasures in published analyses and theoretical discussions are really hard to find. Among the few commendable efforts, Kirilov 2012 offers a detailed analysis of asymmetrical beat structures in Bulgarian wedding music, but identifies a <7/8, 7/8, 11/8> meta–measure simply as a "combined metric group."

7. The concept of structural levels originates with Schenker, for whom they represent hierarchical organization of tonal events and the elaboration of the fundamental structure. In Schenker's theory, the lower levels of the hierarchy are intrinsically connected with the structural background, and each lower level represents further "composing out" or pro-

longing of the background events. My use of the terminology pertains to rhythmic events without the implication of their interconnectedness. Furthermore, no component of pitch–structure theory is implied by my use of this terminology.

8. French psychologist Paul Fraisse (1982) confines the perception of pulse sensations to 50–200 beats per minute, while Justin London (2006) prefers a more conservative range of 60–120 beats per minute. In contrast to London, I adopt a more generous window for tactus speeds since certain musical genres, like bebop, habitually rely on faster tactus speeds, such as MM=190.

9. The term chronos protos was first used by Aristoxenus in Elements of Rhythm, 4th cent. B. C., to stand for a unit of time. See Pearson 1990.

10. Rothstein (1989) defines hypermeter (and consequently hyper–measures) as a concatenation of measures according to a unified metrical scheme, which includes the recurrence of equal–sized measure groups and a definite pattern of alternation between strong and week measures. The term hypermeter originates with Cone 1968.

11. The time signature of 6/8 does not usually indicate a six–beat measure; rather it expresses a type of subdivision of the main beat (i.e., two beats are each divided into three pulses, rather than two).

12. One way of understanding beat hierarchy is in relation to the medieval concept of tempus and prolation—a top–down approach. With either tempus or prolation, a higher beat level is divided by duple or triple subdivisions (although not both duple and triple on the same level). The alternative, the bottom–up approach, organizes chronos protos (sub–pulse or pulse) units into duple and triple groupings.

13. Aksak is a Medieval Turkish word for limping, lopsided, or even lame. The earliest discussion of aksak meters is attributed to Brăiloiu 1951.

14. Nice Fracile points to Bartók's sources in Hristov 1913 and Stoin 1927—neither work has been translated into English. Another Romanian musicologist, Radulescu (1972, 186), identifies Aristoxenus as the first person to discuss elements of this beat pattern as choreios alogos (illogical trochee).

15. Latin clave patterns are based on two metric groups, sometimes equivalent to two notated measures. One of these metric units is a non–isochronous tresillo pattern, which entails a series of pulses equivalent to a pseudo–aksak pattern of 3+3+2 eighth notes.

16. Beat complement simply refers to the number and the duration of tactus beats within recurring metric groups (or Supra–Tactus units), such as can appear between the barlines when they are notated in musical scores. Tactus beats may be isochronous or non–isochronous.

17. Beat complement represents all (potentially non–isochronous) beats in a single measure or metric scheme. This is generally not issue in simple meters (e.g., all beats are notated as quarter notes), although can be an issue for uninitiated with respect to compound meters (i.e., there are two rather than six beats in 6/8). In asymmetrical and compound meters, the progression of proportionally related beats can be rather variegated.

18. Čoček is an early nineteenth–century dance form popular and widespread in Serbia and Macedonia. The name derives from "little camel," a term used as a reference to male courtesans and "dancing boys" of the Ottoman occupation. This dance has largely been disseminated and preserved by the Romani tribes of the southern Balkan region.

19. The transcription approximates durations to the nearest eighth note and is based on a performance by an American "Balkan" Brass Band, Zlatne Uste.

20. Transcriptions circulating online appear notated as < 4/8, 5/8 >, which disregards the beat patterns in the bass guitar and the drums.

21. The Balkan folk music I am familiar with frequently features longer–beat–first when the music is sung, slow, or lyrical and longer–beat–last in faster dance music. In this manner, the longer beat represents a dance turn and the shorter beats correlate with dance steps. With this in mind, a composite meter of < 5/8, 7/8 > can be danced as a < step, turn, step, step, turn > sequence corresponding to the progression of tactus beats < short, long, short, short, long >.

22. While Carl Orff suggested time signature notation that would simply indicate a written note value in place of a denominator, this notation has not been embraced outside of music education textbooks (although the engraving capability exists through notational software programs).

23. As means of brief summary, I note here that flexible–cycle variation represents a principle of pattern–variation applied to a core pattern and is exemplified by a generalized ordered series of two or more values. A pitch pattern might thus be generalized as < high, low >, whereas a rhythmic pattern might outline < short, long > durations. With respect to metrical patterns, three types of variation emerge: (1) expansion of the core metrical pattern; (2) duplication of metric units; or (3) internal rearrangement of metric units within the core pattern.

24. The definition and the complexity of a perceivable "chunk" can vary based on experience and training. See Brower 1993 and Kvifte 2007.

25. The b section freely develops 5/8 material from the opening with expanding and contracting groupings that result in time signatures as short as 2/8 and as long as 13/8. In this instance, the time signature summary would not provide further insight into the formal structure of the section.

26. Metric units can either be summarized with time signatures or tactus patterns, the primary criterion for this choice being the eventual clarity of the representation.

27. Hepokoski and Darcy (2006) define the rhetorical property of rotational forms as arising from an ordered presentation of musical elements or ideas. This ordered sequence of musical elements can be subject to reordering in later rotations, and certain ideas might even be omitted. Rodgers elaborates that point: "That a piece's themes do not continuously and rigorously follow a strict rotational pattern does not mean we cannot look at the piece through a rotational lens and thereby learn something important about its logic of repetition and elaboration" (2009, 17). Flexible–cycle variation of ordered meta–measure patterns resonates with these definitions of rotational form.

28. Tracing the 5/8 meter in this manner, beyond the two opening measures, evokes Pieter van den Toorn's (1987) concept of background periodicity, which he had applied to diverging metrical schemes in Stravinsky's music (e.g., the 2/8 "background" meter [background periodicity] in Danse sacrale).

29. For more information, see Vojčić 2007, 209–42.

30. The reduction in Example 9 marks the tactus at the level of quarter and dotted quarter notes, since the tempo marking indicates a very fast eighth–note pulse (MM = 200).

31. This essay does not include examples of meta–measures correlating with a motive (although bars 7–8 of Dilber tuta in ex.7 would qualify) or a "measure" (bar). In fact, if the condition for meta–measures having five or more tactus beats is observed, it is difficult to find true meta– measure patterns that can be satisfyingly notated between two barlines.

32. Liquidation and fragmentation are used in Arnold Schoenberg's (1943, 11) sense of the term. Liquidation is a developmental procedure. It entails a gradual reduction of thematic material and its characteristic and essential features. Fragmentation simply refers to the process of dividing larger musical ideas into smaller constituent segments.

33. Sentence structure has been adopted from Arnold Schoenberg's terminology and is extensively covered in Caplin 1998. In contrast to an eight–bar period comprising two phrases, a sentence is a single eight–bar phrase. In a sentence, a two–bar motive is repeated or sequenced in the first half of the phrase, followed by a four–bar continuation phase that brings about a cadence and the conclusion of the phrase.

34. The composite metric pattern in Dilber Tuta (< 9/8, 8/8 >) also represents a meta–measure, although it exemplifies a flexible–cycle type of variation of the core metric pattern. In this connection, see Vojčić 2007. For the sake of space and clarity, this type of meta–measure construction is not fully addressed here.

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