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On Metre in the Rondo of Brahms's Op. 25

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Abstract:

The rondo from Brahms's Piano Quartet Op. 25 projects a number of different metres which may be organised into various metric spaces modelled on those of David Lewin and Richard Cohn. Although this organisation does not yield the multiple pitch-time analogical mappings proposed by Lewin and Cohn, it may be fruitfully applied to many works of Brahms and other composers. I argue that a movement's centrally located metre (the work's 'logical' metric tonic) tends also to be its primary metre (the work's 'rhetorical' metric tonic), and outline a new method for hearing contiguities in certain metric spaces. I conclude by designing a metric space tailored for the metres of the Op. 25 rondo, in which the refrain's 'tonic' metre is centrally located in three dimensions.

On Metre in the Rondo of Brahms's Op. 25

David Lewin's 1981 article, 'On Harmony and Meter in Brahms's Op. 76 No. 8', despite its modest five-page length, proposed a thought-provoking analogy between pitch and time that leaves many of its sympathetic readers hearing the first fifteen bars of Brahms's Capriccio in C Major with different ears.¹ Two decades later, Richard Cohn's 'Complex Hemiolas, Ski-Hill Graphs, and Metric Spaces', picked up this analogy, extended it through an incorporation of the author's previous work on metre, and demonstrated its applicability to other works of Brahms, notably the opening measures of the Violin Sonata in G Major, and the song *Von ewiger Liebe*.² In each study, the author measured the success of his analogy primarily by the number of different ways in which the domain of metre could be mapped via certain similarities to other domains.³ Indeed, each success is due in no small part to the choice of an analytical subject; restricted to the same kinds of analogical similarities, any randomly chosen work of Brahms would probably yield less lucrative results. Yet, for these three particular works, the analogy works as an insightful hermeneutic tool, in that the metrical thread outlines, and is itself outlined by, other patterns in the fabric of the music. However, this is not the only way to gauge the ultimate success of an analogy. Analogical thinking may also suggest novel ways to envision familiar objects and concepts. While such an analogy itself may not be replete with mappings, it can be a means to an end: success in this case comes in the form

of a theory that generalises the observations made through the analogical lens. Once such a theory emerges, the analogy's work is done.

These two sides of the coin of analogical success structure the ensuing discussion. On the one side, the present study seeks to apply the analogies of Lewin and Cohn to the final movement, the 'Rondo alla Zingarese', of Brahms's First Piano Quartet in G Minor, op. 25. Part I of this article inspects much of Brahms's rondo, particularly its themes and coda, from a hypermetric point of view. (Since it is not practical to reproduce all of the discussed musical passages, it is strongly recommended that the reader have nearby a score of the rondo, preferably one with bar numbers.) The tour of the rondo will be unhurried: the hypermetric readings require support from arguments that are as deliberate as necessary, as they form the backbone of my analysis in the second part. Part II then summarises the ideas from Lewin's and Cohn's articles and applies them to an analysis of the rondo's hypermetres, where I demonstrate how Lewin's analogy in particular may be extended and generalised in a manner that complements Cohn's research.

On the other side of the coin, the number of analogical mappings that engage Brahms's rondo fall short of the number achieved in the analogies of Lewin and Cohn. Therefore, Part III strives to redeem this apparent shortcoming by suggesting that one mapping that does remain, which is indirectly facilitated by a pitch/time analogy but does not directly involve an analogy with harmony at all, also holds true for a great majority of Brahms's works that engages the same metric content. I will conclude by proposing another kind of metric space particular to the rondo of op. 25.

I: Hypermetres in Brahms's Rondo

Peter Smith's formal analysis of the rondo is condensed in Table 1.⁴ Although this movement features three subordinate themes (Themes B, C, and D) in addition to the refrain (Theme A), the movement avoids the standard seven-part rondo design. Instead, Smith proposes a large tripartite structure for the movement (bracketed above the bar numbers), where, with regard to theme, key, and hypermetre, each of the three sections (numbered 1, 2, and 3) begins and ends similarly and exhibits contrast in the middle. This ternary principle emerges on a smaller scale in each of the four themes—each assumes a small ternary form (a-b-a') in its initial presentation—and on a larger scale in the tripartite structure of the movement, since the framing key and theme of the second section (the C theme in G major) contrasts with the G minor refrain that frames the opening and closing sections. Smith's analysis of the music's hypermetric organisation contributes less to this last point, as three-bar groups frame all three sections of the movement. However, as shown in the following discussion, not only are the rondo's hypermetric states as varied as the movement's themes and keys—thus supporting Smith's ternary-form analysis of the movement—but they, like keys, also may be situated within a framework such that each takes on a particular significance (beyond the generic label of 'contrasting') relative to the others.

The refrain (Theme A) clearly expresses triple hypermetre, in that much of the conspicuous repetition of motivic material groups the notated 2/4 bars into threes. In fact, few movements in the tonal repertoire best the sheer pervasiveness of triple hypermetre in this rondo: Beethoven's last bagatelle and David Smyth's comments regarding its

hypermetre come to mind.⁵ Although these repetitions create a notated hypermetre, the quick tempo readily suggests a moderate $3/4$ to those perceiving the music without the score. Employing William Caplin's distinction in Classic-era music between the length of 'real' bars (R) and the length of notated bars (N), I interpret their relationship in this case as $R = 3N$.⁶ Ex. 1 provides a 4:1 durational reduction of the metre and bass line in the seventy-eight bars that comprise the opening refrain, where a notated minim becomes a quaver.⁷ The dominance of a dotted-crotchet tactus in the reduction symbolises the fact that the grouping of $2/4$ bars in threes is pervasive. (In addition to displaying the hypermetre in condensed form, this reduction also illuminates a motivic parallelism between the structural bass notes of bars 1-18 (G-B \flat -A) and the first three notes of the melody in bars 1-2.)

If $R = 3N$, then the 'real' hypermetre resides at the next larger level of grouping, where three-bar groups are combined into larger units. Duple groupings of three-bar groups—in a 4:1 reduction, $6/8$ hypermeasures⁸—suit the refrain well except at bars 31-39 and bars 46-54, when arpeggiations through a G minor chord project triple groupings—in a 4:1 reduction, $9/8$ hypermeasures. However, instead of notating the refrain's hypermetre entirely in these two time signatures, Ex. 1 further groups bars 1-12, 19-30, and 67-78 into $12/8$ hypermeasures, given the strong motivic and harmonic unity of these bars. In fact, since the material heard in these three hypermeasures is the most formally and tonally marked as the 'rondo theme' in the G minor refrain, I will assert that $12/8$ hypermetre is its most representative hypermetre. (I will continue to make the distinction between the 12-bar 'rondo theme' and the longer small-ternary 'refrain' of

which it is a part.) This is shown in Ex. 2a, in which the score of bars 19-30 and the grouping structure of 12/8 are superimposed.

The formal labels a-b-a' in Ex. 1 convey Smith's ternary-form reading of the refrain. Certainly the change to a 'real' triple hypermetre of 9/8 in bars 31-39 helps to articulate the b section, or 'contrasting-middle' section, of this form.⁹ Smith postpones the return of the a' section until bar 67, despite the strong similarities between the second and eighth hypermeasures; hence, the question mark above hypermeasure 8 in Ex. 1. Smith's analysis, among other things, allows Brahms's restatement of hypermeasures 4-8 in bars 256-93 of the rondo to be described in its entirety as the recapitulation of the 'middle section of [a] small ternary'.¹⁰

After the refrain, the music continues without transition to the first subordinate theme in B \flat major (Theme B), which opens with a twelve-bar unit given in Ex. 2b that corresponds in length with the opening 12/8 hypermeasure of the refrain. The most immediate indicator of a hypermetric grouping is a perfect cadence in G minor on the downbeat of bar 88. This asserts an 8 + 4 partition of the twelve bars, which further implies a 4 + 4 + 4 partition, since 8, as a power of two, admits only one kind of metric interpretation; Carl Schachter would say that this metric span can only be 'composed out' in one way.¹¹ Using Ex. 1's exchange rate of a quaver for a notated minim, this 4 + 4 + 4 grouping converts to a hyper time signature of 3/2, as shown by the groupings above the music in Ex. 2b. In at least one way, the music cuts against the grain of a 3/2 interpretation: the arch-shaped gesture in the piano labeled 'x' in Ex. 2b ends the first hyperbeat but begins the next, rather than falling in the same place relative to the hyperbeats as the motives of the refrain typically do.¹² However, the implied hyperbeat in

bar 84 also calls the listener's attention to the succession from a dominant 5/3 chord to a tonic 5/3 chord in the secondary key of D minor. This harmonic motion, in turn, supports a tonal correlation with the metric grouping: hyperbeat 1 begins on an asserted tonic of B \flat major, hyperbeat 2 begins with a tonicised D minor, and hyperbeat 3 begins with a tonicised G minor. Furthermore, the sequential ascents within the twelve-bar contrasting-middle section in bars 92-103 (not shown) project an unmistakable 4 + 4 + 4 division, which, in spite of a brief *sostenuto* deceleration, can carry over into the return of the first twelve bars in bars 104-115.

The second subordinate theme in G major (Theme C), which follows the second statement of the rondo theme, calls for a *Meno Presto* tempo. Its opening six bars are provided in Ex. 2c. Although Brahms does not specify more accurately the ratio between this tempo and the opening *Presto*, as he occasionally does elsewhere in his compositions,¹³ many performances select a ratio that is close to one-half. This is demonstrated in Table 2, which relays the two tempi and their proportional relationship for a number of commercial recordings of either Brahms's rondo in its original instrumentation or Schoenberg's orchestration.¹⁴ The use of a simple tempo ratio like 1: .5 (i.e. 2:1) is also in line with David Epstein's view of simple proportions between tempi as a *desideratum*.¹⁵ In my analysis, I will interpret *Meno presto* as dividing the tempo in half. Therefore, from this perspective, all three themes listed in Ex. 2 occupy the same chronological span.

The G major theme's three-bar grouping is clearly endorsed by the rhythmic repetition, the reuse of pitch material from bar 155 in bar 158, and even the transfer of a four-note scalar descent from the melody in bars 156-157 to the bass in bars 159-160.

However, for some initial hearings unbiased by the score, the metrical interpretation of this theme beyond the three-bar groups may be less definitive. Is the hypermetric downbeat on bar 156 instead of bar 155? Do these three-bar groups evenly divide in two instead of in three? However, the contrasting-middle music dismisses any ambiguity when choosing a single hypermetre for the entire 24-bar unit. The sudden shift to the parallel minor that begins the contrasting-middle in bar 161 makes the hypermetric downbeat unmistakable, and the minim harmonic rhythm in bars 161-162, coupled with the strings' melodic patterns that sequentially repeat with every minim pulse in bars 163-165, project a division of three-bar hypermeasures as the notation suggests: into threes. Thus the hypermetric interpretation of bars 155-160 that accounts for both its transparent three-bar grouping and the clarifications of bars 161-166 is the metric interpretation of Ex. 2c. Since the *Meno Presto* indication has, in a sense, already performed a 2:1 durational reduction, an additional 2:1 reduction from the notated 2/4 bar to a crotchet places the theme in 6/4 and squares the G major theme with the other two 4:1-reduced themes. As a postscript, the modifications to the G major theme when it is restated in bars 167-172 incorporate the hypermetric clarifications of the contrasting middle. First, the quaver rests on the hypermetric strong beats are filled in by exclamatory semiquavers in violin and viola; second, bars 170-171 feature motivic repetition at the notated metrical level of the minim.

The first sixteen bars (bars 173-188) of the *Meno presto* E minor theme (Theme D) present a clear-cut example of what Richard Cohn calls 'pure duple'.¹⁶ First, the harmonic rhythm gathers the crotchets into 2/4 bars, and the near-exact transposition (especially of the harmony) of the first four bars to generate the next four gathers the 2/4

bars into four-bar phrases.¹⁷ The layer in between—gathering 2/4 bars by twos—can be understood as ‘composed out’ in Schachter’s sense. Then, the symmetrical antecedent-consequent design gathers the four-bar phrases into eight-bar periods, of which there are also two. The seventeen bars that follow, which are composed of a nine-bar contrasting middle followed by a reprise of the eight-bar period, is clearly an extension of the sixteen-bar norm. Brahms’s literal ‘copy-and-paste’ of bar 194 as bar 195 stands as one of his more obvious examples of expansion (*Dehnung*). Thus, duple groupings connect five adjacent metric and hypermetric levels, or even up to six, if one accepts the expansion analysis.

What is curious about the E minor theme’s exclusive use of duple at the metrical and hypermetric levels—arguably the most common division at these levels in common-practice music and, according to Schenker, the most structural¹⁸—is that it offers a fresh contrast to the ‘mixed hypermetres’ of the three aforementioned themes. According to Cohn, a mixed metre incorporates both duple and triple groupings.¹⁹ To be more precise, each of the first three themes already discussed has exactly *one* triple grouping among its duple groupings, and each on a different level: the rondo theme groups single bars into threes, the B \flat theme groups four-bar units into threes, and the G major theme groups the equivalent of two *Presto* bars into threes. Actually, the E minor theme also uses a single triple grouping, but its location is submetrical: in the quaver triplets that were briefly introduced during the G major theme and become a distinguishing characteristic of the E minor theme’s melodic content.

At this point in the movement, all the themes have been introduced, as well as the keys and hypermetres most closely associated with them. According to Smith,

‘throughout the remainder of the movement, Brahms continues to hint at return without fully giving in to a solid arrival until the beginning of the coda’.²⁰ The arrival of the coda (bars 363-405) brings not only the long-expected and final statement of the rondo theme, but also another point of metric interest. Sixteen bars before the end of the movement, Brahms includes a striking gesture reproduced in Ex. 3: all four instruments iterate a three-quaver fragment that may be understood as an inversion of the opening three notes of the rondo theme. I call this gesture ‘striking’ for multiple reasons: it is the longest unison passage played *tutti* in the entire movement, and the pianist plays two single lines three octaves apart—an unusual texture, to be sure. Furthermore, unlike the ‘triples’ of the four aforementioned themes, which are consonantly embedded within each theme’s notated metric organisation, the triples of this unison gesture challenge the prevailing duple groupings at the submetric (quavers grouped into crotchets) and metric levels (crotchets grouped into bars). This generates the movement’s most pronounced ‘grouping dissonance’, as Harald Krebs calls it, with the bar line.²¹ (In his orchestration of Brahms’s op. 25, Schoenberg makes the metric dissonance of this gesture even more pronounced by placing an accent over the first quaver of each triple, and adding a new instrument with each successive triple.)

However, metric dissonance aside, this gesture is not without its own grouping structure: one is proposed above the music in Ex. 3, with each triple numbered consecutively. The implied 6/8 metre that results when triples 1 and 2 are gathered, and likewise triples 3 and 4, is the same metre that immediately undergirds the 12/8 of the rondo theme reduced by 4:1—compare the grouping of Ex. 3 to that of Ex. 2a. Moreover, these 6/8 metres are established through similar means. In both, the first and third triples,

and the second and fourth triples, are identical save for ascending octave transpositions in some of the parts. However, I am hesitant to group triples 1-4 of the unison gesture into a 12/8 bar: hence the dotted arch. Even though, as with bar 13 in the refrain, there is a change of pattern with the fifth triple—the line moves to (C–A–B \flat) instead of another (E \flat –C \sharp –D)—this change is not nearly as prominent as it is in the refrain. At best, 6/8 groupings in the unison gesture continue until the metrical dissonance gives way to metrical consonance, when the high Gs group quavers into twos instead of threes.

II: Harmony-Metre Analogies and Brahms's Rondo

In his article investigating Brahms's *Capriccio in C Major* op. 76/viii, Lewin uses a 2:1 durational reduction of the bass line in the first fifteen bars—resulting in seven hypermeasures plus change—to highlight the three principal tonalities in this opening section. This reduction is reproduced in Ex. 4. In hypermeasures 1 and 3, Lewin infers the tonality of C major largely through the presence of its dominant: a bald C major triad has been replaced with a dominant seventh of F, which precedes the F major tonality of hypermeasure 2. The tonality of E minor, ushered in by its dominant in hypermeasure 4, governs hypermeasures 5 and 6. He further employs his durational reduction to uncover three principal hypermetres, each of which is synchronous with one of the three principal tonalities: 6/4 with C major, 3/2 with F major, and 12/8 with E minor.

Lewin interprets these three tonalities of C major, F major, and E minor as tonic, subdominant, and dominant, respectively: he interprets E minor as a dominant substitute (D $_p$) instead of a tonic substitute (F), almost certainly because of its syntactical position

following tonic and subdominant. His interpretation of C major as tonic also arises from its relation to its surroundings: 'The C triad is notably absent; even the tonality of C is only suggested in the foreground. Nevertheless, C tonicity is implicit as a *Vermittlung* between the contending F [major] and E [minor] events'.²² Lewin then muses that the three hypermetres, in part through their concomitance with the three tonalities, might also acquire the attributes of tonic, subdominant, and dominant. For example, he states, 'as I hear the piece, a 'tonic' quality adheres to the 6/4 hypermetre of hypermeasures 1 and 3. These hypermeasures present the incipit of the principal thematic idea; they also contain the Cs of the bass line, along with the Bs that inflect them'.²³

Underlying Lewin's associations between harmonies and functional labels, and, by extension, between hypermetres and functional labels, is a distinction between what I will call *logical* and *rhetorical* definitions for the purposes of this study. Logical definitions are defined on musical objects in a work only through their extra-opus relations with other present musical objects. Rhetorical definitions are defined on musical objects in a work only through their particular intra-opus instantiation in that work.²⁴ For example, the tonic pitch and its accompanying triad as *Vermittlung* is a logical definition: among a group of major or minor diatonic triads, it is a triad whose root lies a perfect fifth both above and below the roots of either two other major or two other minor triads. However, a tonic pitch and its accompanying triad can also be defined rhetorically: the last, the first, the lowest, the most common, the most emphasised through a variety of means, and so on. In his analysis of the Brahms Capriccio, Lewin invokes a logical argument for C tonicity—the first quote above—because a rhetorical argument for the same would be much weaker. By contrast, the second quote above that interprets the 6/4

hypermetre as a tonic uses rhetorical definitions: besides this metre's association with the tonic C in this particular piece, it comes first and is associated with primary thematic material.²⁵

However, the core innovation of Lewin's article is the proposal that, like tonic harmonies, tonic metres may also be defined logically, and, furthermore, his definition is similar to the logical definition of tonic harmonies. He proposes that the 3:2 ratio between a 3/2 metre's triple division of a dotted-semibreve duration and a 6/4 metre's duple division of the same time span is comparable to the 3:2 ratio of a perfect fifth. The same comparison to pitch can be made for the 3:2 ratio between a 6/4 metre's triple division of a dotted-minim duration and a 12/8 metre's duple division of the same time span. Therefore, Lewin suggests that 6/4 can be understood as analogous to tonic, in that both are flanked by 3:2 ratios: 3/2 as dominant, and 12/8 as subdominant.

One way to hear Lewin's 3:2 relations between hypermetres, and ultimately to hear 6/4 as *Vermittlung*, is to attend to the tempo of the single triple grouping in each hypermetre, and to perceive its acceleration or deceleration by a factor of two into the single triple grouping of a different hypermetre. (All of the durations referred to in what follows are those of the reduction in Ex. 4, not the notated values.) In the opening 6/4 hypermeasure of the Capriccio, the counting of 1-2-3-1-2-3 follows the crotchet pulse. The following 3/2 hypermeasure cuts the tempo of this triple counting in half (or, alternatively, doubles the triple duration), such that 1-2-3 follows the minim pulse. Thus, the frequency of the 6/4's '1' beat relates by a factor of 3:2 to the frequency of the 3/2's '1-2-3' beats. I have modeled this 'triple counting' above the score in Ex. 4.

The third hypermeasure, also in 6/4, resumes the crotchet 1-2-3, and then the next consistent triple counting begins in the fifth hypermeasure of 12/8, but with the tempo doubled to a 1-2-3-1-2-3 that follows the quaver pulse. Thus, the frequency of the 6/4's '1-2-3' beats relates by a factor of 2:3 to the frequency of the 3/2's '1' beat. The triple-counting tempo of the first and third hypermeasures is therefore centrally positioned, since it is the only one that is both halved and doubled. Note how Brahms's repetition of the hypermetre from bars 1-2 in bars 4-5 allows the listener to hear each doubling and halving between *successive* hypermeasures: the listener steps from 6/4 to 3/2 and back in the first three hypermeasures, then steps from 6/4 to 12/8 and back starting in the third hypermeasure up through the repeat of the first hypermeasure.

Thus, in the Brahms Capriccio, 6/4 as a metric tonic is supported by both logical and rhetorical claims. However, this fortuitous correlation between logical and rhetorical tonics seems to be absent in the rondo of the G minor piano quartet. 12/8, the hypermetre consistently associated with the rondo theme, is unquestionably the rhetorical tonic metre for the work. However, when contextualised by 3/2 and 6/4, the hypermetres of the first two subordinate themes, the rondo theme's 12/8 is not the *logical* tonic metre according to Lewin's theory; rather, that honour goes to the 6/4 of the G major theme.

Again, one way to perceive 6/4 as *Vermittlung* in the rondo is to listen to the changes of triple-count tempo. (I recommend that the reader refer back to Ex. 2.) From the 12/8 rondo theme to the 3/2 B \flat subordinate theme, the 1-2-3 tempo that matches the notated bar slows by a factor of four. From the 12/8 rondo theme to the 6/4 G major subordinate theme, the 1-2-3 tempo slows by a factor of two. Thus, arranged by 2:1 ratios, the triple-count tempo of the 6/4 theme is in the middle. Admittedly, this may be

more difficult to cognise since the themes associated with the 3/2 and 6/4 hypermetres never occur in immediate succession.²⁶ However, I can offer two features that the triple groupings of all three themes share, features that can serve as heuristics for perceiving their triple-count interrelationships. First, in each theme, the triple grouping is confirmed through blatant repetition of at least the grouping's incipit: in the rondo theme, bars 4-5 repeat bars 1-2; in the B \flat theme, the entire twelve bars are repeated; in the G major theme, bar 158 repeats bar 155. Second, in each theme, at least the first triple grouping coincides with the span of a G-triad's arpeggiation, as highlighted in each of the themes of Ex. 2 with double boxes surrounding the notes of each arpeggiation.

So, to restate, although the rondo theme's 12/8 is the rhetorical metric tonic, the subordinate G major theme's 6/4 is the logical metric tonic, given the metric context of the other two comparable thematic hypermetres. In confronting this discrepancy, I could argue how the G major theme, and particularly its key, might nonetheless have some rhetorical tonic qualities, or how the rondo theme's 12/8 might nonetheless have some logical tonic qualities. I will first offer a few ideas regarding the former, but close with a more substantial discussion of the latter.

The logical metric tonicity of the G major theme is not without some corroboration. In addition to being in the tonic key if not the tonic mode, the G major material functions as the main framing section for one of the three large units of the rondo's largest level of tripartite organization, as shown in Table 1. Moreover, just as the G minor section of bars 1-154 creates contrast by presenting a middle section in the relative key a minor third above the G tonic, so too does the G major section of bars 155-255 present a contrasting section in the relative key a minor third below. This symmetry

can be shown with a neo-Riemannian arrangement of the movement's four most significant keys—G minor, B \flat major, G major, and E minor—as shown on the left side of Fig. 1. Here, two of the three parsimonious neo-Riemannian operators—P (parallel) and R (relative)—organise these four keys into a symmetrical one-dimensional series, not unlike the three-member series of harmonies and metres that Lewin explores and analogises, and the two G keys share the central spot in this series.²⁷ The rest of Fig. 1 displays a path marked by bar numbers and connected by thin lines indicating the order in which these keys are articulated during the first 293 bars of the movement. This path groups into three ternary structures, as shown with the solid lines: two that alternate a G harmony with its relative partner (shown in thin solid lines), and one on a more remote level that alternates G minor with its parallel partner (shown in thick solid lines). To be sure, these ternary structures restate in another way Smith's observation that the succession of keys in this rondo supports statement-contrast-return patterns on the two highest formal levels. What Fig. 1 adds to this observation is the fact that, from a neo-Riemannian perspective, these three ternary key oscillations are all 'stepwise', in that each involves a single neo-Riemannian transformation. The swing back to G minor in bar 256 subordinates G major, however; thus, the logical metric tonic of 6/4 is associated with the key that, from the perspective of Fig. 1, ultimately comes in a rhetorical second place.

Before demonstrating how the rondo theme's 12/8 may be logically defined as tonic, it will be advantageous to summarise Cohn's recent visualisations of metres and metric relationships, so that such graphs may assist in illustrating the argument. Given the hypermetres of 3/2, 6/4, and 12/8, there are multiple ways of conceptualizing 6/4 as

the *Vermittlung* centrally located between the other two metres, each a different variation of the same idea. Lewin used the reciprocal frequency ratios of 3:2 and 2:3, in order to make the analogy between pitch and time as precise as possible. Following Lewin, I suggested hearing the doubling and halving of triple-count tempi. Cohn's approach to metre facilitates yet a third way.²⁸ Each of the three metres 3/2, 6/4, and 12/8 (and many others) is a collection of pulses—each labeled by a duration—that are all either whole-number multiples or divisors of one another. To be sure the collection is complete, each pulse (save the shortest) is either twice or three times the duration of the next shortest. For example, 3/2 contains the pulses of dotted semibreve, minim, crotchet, and quaver; 6/4 contains the pulses of dotted semibreve, dotted minim, crotchet, and quaver; and 12/8 contains the pulses of dotted semibreve, dotted minim, dotted crotchet, and quaver. This set of three metres in particular all share the pulses of dotted semibreve—an example of what Cohn calls the *span pulse*—and quaver—an example of what Cohn calls the *unit pulse*—thus making them comparable. However, they differ according to the pulses in between span and unit pulses: what Cohn calls the *intermediate pulses*.

Using this theoretical apparatus, Cohn has more recently developed two closely related visual representations of metres and their relationships: *ski-hill graphs* and *metric spaces*.²⁹ A metric space is a graph of comparable metres in which the vertices are metres, and a unit distance (not to be confused with unit pulse) separates two metres when they share all pulses except one intermediate pulse. Since 3/2 and 6/4 differ by only one pulse (3/2 has a minim, whereas 6/4 has a dotted minim), these metres are a unit distance apart. The same is true for 6/4 and 12/8. However, 3/2 and 12/8 have two dissimilar pulses, thus two units of distance separate them. These distances arrange these three metres in a linear

fashion such that 6/4 is in the centre. (This use of minimal difference as a unit distance among sets under some kind of equivalence has also been one of the central characteristics of many recent pitch-class spaces.)

In a ski-hill graph of a set of comparable metres, the vertices are the set's collective metric pulses with the span pulse at the top and the unit pulse at the bottom. Edges that slope downwards to the left connect pulses in a duple ratio, and edges that slope downwards to the right connect pulses in a triple ratio. Fig. 2 shows one example of a ski-hill graph. Each distinct, descending path that begins with the span pulse and ends with the unit pulse maps one-to-one with one metre in the set of comparable metres. In the case of Fig. 2, the three possible paths correspond to the hypermetrical groupings of the three themes in Ex. 2, with the trappings of the 4:1 reduction removed. The leftmost path, which connects dotted long, dotted breve, dotted semibreve, and minim, is taken by the rondo theme (Ex. 2a). The rightmost path, which connects dotted long, breve, semibreve, and minim, is taken by the B^b subordinate theme (Ex. 2b). The slalom path down the middle of the slope, which connects dotted long, dotted breve, semibreve, and minim, is taken by the G major theme (Ex. 2c, but with the notated durations doubled to account for the *Meno Presto* tempo change).

My triple-counting strategy can also be reenacted on Cohn's ski-hill graph of Fig. 2. The edge connecting the minim with the dotted semibreve represents the 1-2-3-1-2-3 count of the rondo theme. The edge connecting the semibreve with the dotted breve represents the 1-2-3-1-2-3 count of the G major subordinate theme. Moving from the rondo's edge to the G major theme's edge requires a step up the slope to the right, which signifies a doubling of duration, or halving of the triple-count tempo, for the edge as

much as it does for the vertices. Likewise, the edge connecting the breve with the dotted long represents the 1-2-3-1-2-3 count of the $B\flat$ subordinate theme. Moving from the $B\flat$ theme's edge to the G major theme's edge requires a step down the slope to the right, which signifies a halving of duration, or doubling of the triple-count tempo. Thus, the G major's triple-count is centrally located, since it is flanked by reciprocal tempo changes.

Therefore, in the case of Fig. 2, centralizing 6/4 via my triple-count strategy works equally well as Cohn's common-duration approach. This is precisely because, as aforementioned, each of the three metres 3/2, 6/4 and 12/8 has exactly *one* triple grouping along with two duple groupings. In other words, each path down the slope of Fig. 2 has exactly one leg that aims to the right; therefore, there is a one-to-one mapping between distinct paths and triple ratios. This would be the case for any ski-hill graph in which the span pulse is 2^m3 as long as the unit pulse, where m is a positive integer: in the case of Fig. 2, since the span pulse is 12 quavers long, $m = 2$. A greater value of m simply lengthens the slope along the duple axis, while keeping the width of the slope to a single triple-ratio edge.³⁰

However, one of the primary innovations of Cohn's ski-hill graphs is their potential expansion along both duple *and* triple axes. His analyses of music by Dvorák and Brahms use ski-hill graphs in which, if the span pulse is 2^m3^n as long as the unit pulse, the values of m and n *both* exceed 1. For example, Fig. 3 presents a ski-hill graph where both m and n are 2, a graph that Cohn uses to examine Brahms's *Von ewiger Liebe*. For these cases, Cohn remarks that Lewin's line-of-fifths analogy 'runs out of steam', since a metre may contain more than one pulse that can be modified by a 3:2 or 2:3 factor to create another metre. In Fig. 3, the 'left slalom' path that follows the pulses

dotted semibreve, dotted minim, crotchet, quaver, and triplet semiquaver contains exactly one pulse that may be augmented by 3:2 (crotchet to dotted crotchet) to create another path. However, this same path contains two pulses that may be diminished by 2:3 (dotted minim to minim, and quaver to triplet quaver), either (or both) of which may be diminished to create another path. The result is a metric space that transcends a single dimension, since it contains metres 'a step away' from more than two other metres.

Yet whereas this particular expansion of Lewin's theory permits a larger metric network, it also comes with a notable restriction. Cohn remarks that his theory 'has, at present, no means for accounting for the insertion of a hypermeasure of irregular length'.³¹ I interpret this to mean, among other things, that all comparable metres must use the same span and unit pulses. But Lewin's original idea was not so restricted. What if, after the fourth hypermeasure in Brahms's *Capriccio*, Lewin had inferred from the music an 18/8 hypermeasure instead of two 12/8 hypermeasures?³² Would this have changed his analysis? Technically, no: the 3:2 relationship holds just as well between a 6/4's triple division of a dotted minim span and an 18/8's duple division of the same span. The same is true for 6/8. However, he chose 12/8, thus resulting in a set of three metres that are comparable and thus organisable due to two independent factors: they symmetrically partition the same time span, and the 3:2 frequency proportion is a well-defined relation among them. If one imagines Lewin's article at the top of a ski-hill graph, Cohn has forged one path down that engages the first factor apart from the second, while I hope to chart another distinct path down that engages the second factor apart from the first. This requires revisiting the coda of Brahms's rondo.

Ex. 3 showed that the unison gesture in the coda groups quavers into threes, briefly resulting in, at the least, a virtual $3/8$ time signature. Although the coda's tempo quickens to *Molto presto*, many performances do not accelerate so much as to place the ratio between the two tempi closer to a simple non-trivial proportion, such as 3:2 or even 4:3, than to 1:1. Furthermore, even if such an acceleration did take place, the coda's repeat of the rondo theme at the *Molto presto* tempo helps to concretise the proportional relationships between this theme and the other metrical events of the *Molto presto* coda. Therefore, to facilitate comparison among these metres, I will consider the coda's unison gesture at the *Presto* tempo, just as I considered the G major theme to be at half the *Presto* tempo.

Including the unison gesture's $3/8$ on the ski-hill graph of Fig. 2, which includes all the metric pulses of the first three themes, requires a downward extension of the graph so that the unit pulse is a quaver, as provided in Fig. 4. It is reasonable to assume that the three paths that correspond to the three themes in Ex. 2 extend down to this new unit pulse, since all primarily use duple submetrical divisions. Yet the unison gesture's path certainly does not extend up to the dotted-long span pulse—to do so, Brahms would have had to articulate an unwieldy succession of *sixteen* three-quaver groups. Therefore, within Cohn's framework, the grouping structure of the coda gesture is not comparable to the grouping structures of the three themes in Ex. 2. However, a comparison can be made using triple counting, because, as with the other metres, the grouping structure of the coda gesture projects exactly *one* triple tempo. This triple count is represented on the ski-hill graph of Fig. 4 by the edge on the bottom of the hill that slopes down to the right. This triple count of the unison gesture is four times as fast as the triple count of the rondo

theme; this is visually represented on the ski-hill graph by the fact that the two triple edges that represent these two metres are separated by a distance of two units along the duple axis (2×2). I have already demonstrated that the triple count of the B^b subordinate theme is four times as slow as the triple count of the rondo theme; again, this is represented on the ski-hill graph in the same fashion. Therefore, contextualised by the subordinate themes *plus* the unison gesture as shown by the labels in Fig. 4, the triple count of the rondo theme is moved into the middle, depicted by its central position on the ski-hill slope. In an eleventh-hour reorientation, the coda's unison gesture helps to confirm on a logical level what has already been well established on a rhetorical level—that the rondo theme's metre is the tonic metre of the movement.

Of course, the quadruple proportion between the rondo theme's triple grouping and the B^b subordinate theme's triple grouping is bridged by the triple grouping of the metre of the G major theme: the quadruple leap is split into two duple steps. The corresponding bridge between the triple groupings of the rondo theme and those of the coda gesture is the triple grouping of crotchets into a dotted minim. This triple grouping has a rhetorical presence in the coda as well. With the exception of the *Molto presto* acceleration, the restatement of the rondo theme is exact until it arrives at bar 378, as shown in Ex. 5. For the first time in the movement, Brahms clearly uses a triple grouping of crotchets through sequential repetition: in bars 378-380, both pitch and rhythm collaborate to project a dotted-minim pulse. Thus, one comes closer to hearing a 'stepwise' motion from the rondo theme to the unison gesture: the triple-count tempo of the rondo theme in bars 363-374 doubles into the triple-count tempo of bars 378-380, which, after a brief return to the slower triple count in bars 381-390, doubles again into

the triple-count tempo of bars 392-396. On the ski-hill graph of Fig. 4, the metre of bars 378-380 traces the path connecting dotted semibreve, dotted minim, crotchet, and quaver. Although it does not reach the span pulse, it does not need to for a comparison with the other metres to be made: it too projects a single representative triple grouping, and this triple grouping falls in between the triple count of the rondo theme and the triple count of the unison gesture along the duple axis.

To summarise, the two quicker triple counts in the rondo's coda stretch the metric continuum and thus reposition the rondo theme's metre, which is undoubtedly the rhetorical metric tonic of the movement, as the logical metric tonic.

III: Beyond Analogies

Lewin and Cohn achieve a significant number of analogical mappings between harmony and metre in their analyses. Lewin identifies three harmonic states and three metric states in the Brahms Capriccio, and each trio can be organised into a single dimension by 3:2 frequency ratios. Although the subdominant and dominant harmonies do not coincide with their respective metric correlates—rather, the Capriccio pairs subdominant harmony with dominant metre, and dominant harmony with subdominant metre—tonic harmony and tonic metre concur. Cohn substitutes minimal pulse difference for Lewin's 3:2 ratio as the unit distance, thus losing the perfect-fifth component of Lewin's analogy. However, in *Von ewiger Liebe*, he achieves, along with an analogy to the semantic content of the *Lied*'s text, two additional harmony-metre analogies: 1) the succession of metres corresponds to a common large-scale succession of keys in tonal

music, and 2) each metre occurs in conjunction with its corresponding harmony to an appreciable degree. Cohn also discovers instances of the latter in the opening to Brahms's First Violin Sonata.

In the rondo of op. 25, there are no such justifiable instances of this second type of mapping. If one accepts that the rondo theme's metre is the logical metric tonic, then, by extending the harmonic analogy, the G major and B \flat subordinate themes logically correspond to dominant and double dominant, respectively, and the metres from the coda logically correspond to subdominant and double subdominant. However, these harmonies do not accompany the themes or passages that project the metres to which they correspond.³³ An exception could be made for tonic: as previously argued, the rondo theme projects both the metric and harmonic tonics of the movement. Yet undermining this correlation is the fact that the G major theme projects tonic harmony but dominant metre.

The first kind of mapping—that the succession of metric states matches large-scale harmonic syntax—is more promising in the rondo. In tonal music, phrases that establish tonic harmony customarily do so on both rhetorical *and* logical levels: tonic harmony usually ends and frequently begins such phrases (among other rhetorical emphases), and dominant and subdominant functional harmonies (or their substitutes) are both usually in attendance, often equally so. Yet tonic is rarely so doubly defined when considering an exclusive set of global harmonies for an entire common-practice movement, such as the harmonies associated with certain themes or large formal sections, or the harmonies of Schenker's *Ursätzen*. That is, whereas tonic may be rhetorically singled out on such global levels, subdominant harmonic function typically does not

logically counterbalance dominant function on the same global levels.³⁴ Rather, if there is any logical harmonic middle for such global harmonic levels, it lies somewhere between tonic and dominant. The most customary place for subdominant to provide any logical counterbalance in such works, if it does so at all, is in the work's closing section or coda. Therefore, to put this in terms used earlier: in an eleventh-hour reorientation, the coda's subdominant helps to confirm on a logical level what has already been well established on a rhetorical level—that tonic is tonic.

In his application of the pitch-time analogy to his analysis of *Von ewiger Liebe*, Cohn cites this practice of subdominant peroration, since the subdominant metre presides over the *Lied*'s third and final stanza, and contends with the tonic metre during the song's postlude. However, I believe that the Brahms rondo comes even closer to striking this particular analogy with subdominant peroration. Compared to the metric tonic established rhetorically by the music of the rondo theme, the contrasting and comparable metres associated with the two subordinate themes are both on the dominant side of this tonic. (In fact, with the metre of the G major theme now analogous to dominant, the large-scale ternary form marked by the thick solid lines in Fig. 1 corresponds to a tonic-dominant-tonic metric progression.) The final statement of the rondo theme in the coda returns the harmony and metre to tonic, but just as importantly, caps off the form. It is only in these final moments when all tonal and formal obligations have already been met that the metres on the subdominant side assert themselves. So, even though these two metres do not coincide with literal subdominant-side harmonies in Brahms's rondo—in fact, the coda takes an unusual turn towards a tonicised minor dominant—their formal position


and rhetorical disposition mirror those characteristics of last-minute subdominant harmony in many full-movement tonal forms.

Moreover, if one were to hear the coda in isolation, the only three comparable triple tempi heard would be the rondo theme's dotted-semibreve pulse, the dotted-minim pulse of bars 378-380, and the unison gesture's dotted-crotchet pulse. In the context of the entire movement, I have argued that these metres correspond to tonic, subdominant and double subdominant metres. However, within the confines of the coda, the subdominant metre becomes the logical middle term. In other words, the coda tonicises the subdominant metre. One may even opt to hear double subdominant metre—that is, the metre analogous to the lowered seventh scale degree—discharge into subdominant metre.³⁵ Consider the unison gesture once more in Ex. 3. I observed earlier that the metrical dissonance of the triple groupings gives way to metrical consonance, in that the repeated high Gs in bars 396-397 group quavers into twos instead of threes. But one may infer another kind of 'resolution' as well. Provided the downbeat of bar 398 is heard as a hypermetric downbeat, the three two-quaver groups that precede it combine into a single hypermeasure of 3/4. Triple counting animates this discharge from double subdominant to dominant. Starting in bar 392, count 1-2-3 six times at the quaver pulse, then 1-2-3 once at the crotchet pulse with the high Gs, then a single 1 on the downbeat of bar 398. The reduction of the triple-count tempo in half is analogous to the lowered seventh scale degree discharging into the subdominant.

Such analogies can provide fresh ways of hearing metrical relationships in a particular musical work, but, as Justin London has recently cautioned, they do not necessarily prove a deep connection between pitch and time.³⁶ And this is to be expected:

an analogical argument is at best an inductive one. Yet an analogy may also facilitate a new way of labeling and organizing familiar entities. Such is the case with Lewin's and Cohn's metric spaces: they arrange metres into a framework whereby each metre acquires a certain meaning when compared either to the whole (e.g. 'in the middle', 'on the periphery') or to another specific metre (e.g. 'one step away', 'maximally distant'). Regardless of the space's analogical origins, such a framework provides a certain theoretical orientation that may (or may not) reveal a common metrical practice shared by many musical works. In the case of the metric spaces surveyed in this study, one such relationship does emerge. Despite their differences, the analyses of Lewin, Cohn, and this present study all have one mapping in common: the close correspondence between the logical metric tonic and the rhetorical metric tonic. Note that, with the exception of the word 'tonic', there is no analogy between pitch and time here: the logical metric tonic is the metre centrally positioned in some metric space among other metres in the piece, and the rhetorical metric tonic is the metre occurring last, first, most often, with primary thematic material, etc., and is often reflected, at least in part, by the notated time signature.

However, without the benefit of multiple analogical mappings such as those in Lewin's and Cohn's analyses, there is essentially nothing more in the music—for example, stemming from harmonic relationships or formal hierarchies—that equates the rhetorical metric tonic with the logical metric tonic beyond the abstract and undifferentiated relationships among a set of metres each present somewhere in the piece. And perhaps this abstraction is too great, or the means for hearing metrical distance and relationships presented herein too unwieldy to stand on their own without the analogical

crutch. But there is at least one reason to pursue this line of enquiry: the equivalence of a work's logical and rhetorical metric tonics is a phenomenon not isolated to a few pieces of Brahms. Table 3 lists twenty-eight pieces, movements, and songs (or clearly delineated sections thereof) by Brahms that each projects at least three metres that may be arranged in a single continuum using duple ratios among the metres' triple-count pulses. In all of these cases, the triple-count pulse located "in the middle" is the only triple-count pulse of the three contained with the rhetorical tonic metre. The bar numbers provided in parentheses for each slower and faster triple-count pulse point the reader towards particular passages that prominently, although not necessarily exclusively, provide the flanking triple-count pulses. In three cases from relatively late in Brahms's career—the third movement of the op. 88 String Quintet, the first movement of the op. 120/i Clarinet Sonata, and the tenth organ chorale prelude "Herzlich tut mich verlangen"—the faster triple-count pulse is four times as quick as that of the rhetorical tonic metre. Nonetheless, the rhetorical tonic metre is centrally positioned, albeit not symmetrically. The length of the list in Table 3 ultimately depends upon how liberally one identifies contrasting metres in Brahms's music. For example, my list excludes triple-count pulses that are 1) established *only* by onset rhythm (e.g. ) and 2) concurrent with a conflicting metre, such as in the second movement of Brahms's Violin Sonata No. 3. However, even if one admits such metres, the convergence of logical and rhetorical tonic metres is unabated. More importantly, I have found only one counterexample in Brahms's *oeuvre*—"Ade!", the fourth song of op. 85.³⁷

This is perhaps also a phenomenon not isolated to the music of Brahms. In his article on complex hemiolas and metric spaces, Cohn cites several works of Beethoven—

the opening of *Für Elise*; the finales to the 'Tempest' Sonata, the 'Emporer' Concerto and the Triple Concerto; the first movements of the E minor 'Rasumovsky' Quartet, the 'Ghost' Trio, the Eighth Symphony and the 'Appassionata' Sonata—and two of Schumann—the Finale of the op. 11 Piano Sonata and the first movement of the Third Symphony—in which all three possible metrical divisions of a span of twelve units are used. In all of these examples, the logical metric tonic is the rhetorical metric tonic. I suspect that tonal music abounds with many more examples, and contains a relatively much smaller number of counterexamples.³⁸ If this suspicion is correct, it suggests that tonality's use of a particular musical entity as both a logical 'middle point' and as a rhetorical 'home base' is not necessarily restricted to harmony. Instead, there may be a more general perceptual and/or aesthetic concept at work here that encompasses harmony, metre, and perhaps other quantifiable musical dimensions. It is to this broader 'nexus' idea that I intend the use of the more pitch-centered term 'tonic' in my concluding thoughts to refer.

In equating its logical and rhetorical metric tonics, I have shown that the rondo of Brahms's op. 25 is in good company. Yet this would seem to imply that the rondo is undistinguished among the pieces cited in Table 3. I would like to close with an observation that suggests otherwise.

To return once more to Lewin's analogy, a (simple or single) hemiola relationship is analogous to a dominant relationship because the 3:2 frequency ratio characterises

both. However, the 3:1 ratio is just as much of a dominant relationship as the 3:2 ratio is, since both ratios are congruent to a pitch-class perfect fifth modulo the octave. The same can be said for 3:4, and so forth. Lewin's analogy mixes the general with the particular here: harmonies and their representative tertian roots are usually designated by pitch-classes and related by pitch-class intervals, but the ratio 3:2 describes the interval between the precise frequencies of two registral pitches. This ambiguity would seem to dilute the potency of Lewin's analogy. Yet one can take advantage of this by teasing apart pitch-class equivalent intervals such as 3:2, 3:4, and 3:1, and treating each as a unique relation capable of creating its own series of metres. Each series would be arranged by a $3:2^n$ interval with three terms would be analogous to dominant, tonic, and subdominant, but particularly to dominant, tonic, and subdominant pitches a certain registral distance apart. When used in analysis, multiple 'pitch' intervals can potentially lead to multiple three-term series, which can potentially lead to multiple tonic metres (or dominant metres, or subdominant metres) that are each equally defined. This could complicate analytical matters considerably: a metre logically defined as tonic on one series might be logically defined as dominant on another series, and so forth. This potential for multiple ambiguities is partly what makes the Brahms rondo remarkable when examining it from this point of view.

Recall how Fig. 4 shows how the rondo theme is the *Vermittlung*, since its triple edge is in the middle of five triple edges arranged along the 2:1 axis. Fig. 5 presents an embellished version of Fig. 4, in which two edges have been added. The edge added on the lower right represents the notated quaver triplets of the *Meno presto* E minor theme, which, if a listener were unaware of the notated *Meno presto*, would sound like crotchet

triplets. Its triple-count tempo is three times faster than the rondo theme's triple-count tempo. The edge added on the upper left represents the triple grouping of dotted-semibreves that begin the contrasting-middle section of the refrain; using a 4:1 reduction, Ex. 1 displays this grouping as a 9/8 hypermeasure. The new triple-count tempo it contributes is three times slower than the triple tempo of the rondo theme. Indeed, the triple-count tempo that has been associated throughout this analysis specifically with the rondo theme permeates, and thus tonicises, the entire refrain. Thus the pulses that make up the 9/8 hypermeasure reflect its dual formal function: while it is a part of the refrain and its triple grouping of minims, it provides contrast by offering a distinctive triple grouping of dotted-semibreves. It bears mentioning at this point that, of all the pulses shown in Fig. 5, only the one contributed by the refrain's contrasting middle (the nine-minim duration on the upper left) is not periodic. By some accounts, this fact disqualifies Ex. 1's 9/8 as a *bona fide* hypermetre. However, I believe someone familiar with Brahms's movement still hears a triple count in these bars, because this informed listener anticipates the next hypermetric downbeat.

With the reciprocal relationships afforded by the E minor theme and the refrain's contrasting middle, the triple count of the rondo theme—and the entire refrain—is the *Vermittlung* yet again, but this time along the 3:1 axis. Ex. 6 examines this 3:1 continuum even closer, and further indicates that, as with the G major and B \flat themes, the first triple grouping of each passage also embeds a triadic arpeggiation. Furthermore, the 3:4 ratio defines the refrain's triple count as *Vermittlung* a third way. Whereas the refrain projects a dotted-semibreve pulse, the B \flat subordinate theme projects a breve pulse, which is 3/4 as fast as a dotted-semibreve pulse. Thus, a harmony-metre analogy using the 3:4 ratio

stipulates that, if the refrain's metre is tonic, the B \flat theme's metre is dominant, not double dominant. The parallel situation arises when considering the coda's unison gesture: it is subdominant, instead of double subdominant, when compared to the refrain along the 3:4 axis. As suggested before, the dual 3:4 and 4:3 relationships can be experienced through triple counting: count 1-2-3-1-2-3 at the minim pulse with the refrain, decrease the tempo by a factor of four and hear the B \flat theme, or increase the tempo by a factor of four and hear the coda's unison gesture.

Fig. 6 summarises this triple mediation.³⁹ Each node represents one of the seven hypermetres discussed in the Brahms rondo; and each hypermetre is signified by its representative triple grouping, using the rhythmic values from Brahms's score with the exception of the G major and E minor themes, whose durations are doubled due to the *Meno presto*. These seven hypermetres have been arranged into three series, each of which is analogous to a subdominant, tonic, and dominant series arranged by a particular registral interval: perfect fourth (3:4 and 4:3), perfect fifth (3:2 and 2:3), and perfect twelfth (3:1 and 1:3). The metric pulse of the refrain's triple grouping that is transformed by the frequency ratios is either the dotted-semibreve pulse (3:4 and 3:2) or the minim pulse (1:3, 2:3, 4:3, and 3:1). As demonstrated earlier, all of these reciprocal relationships can be perceived through triple counting: take the 1-2-3 tempo of the refrain, increase or decrease the tempo by factors of two, three, and four, and enjoy the whirlwind tour of the movement's different metres. Note that the three dominant metres are each associated with the three subordinate themes, whereas the subdominant metres accompany fragments more closely allied with the refrain. And at the core of this three-dimensional

space rests the metre of the refrain, whose representative triple count is triply defined as the logical tonic.

Again, there is nothing else in the music that would demonstrate, for example, how the refrain's contrasting middle section and the E minor theme form an inversional balance around the refrain: these two passages are on different formal levels and in different keys. It may seem a drawback to treat the metric content of a work as an undifferentiated collection of meters in order to construct the analysis of Fig. 6, but it is exactly such a perspective that has already facilitated the generalizations of Table 3. Ultimately, these kinds of analysis offer the most potential for further understanding if one moves 'beyond the analogy'. Although these metric spaces have their origins in pitch/time analogies, and perhaps best succeed when they bolster such analogies, they also can succeed when they reveal new patterns within the metric content of a work or collection of works, patterns not necessarily dependent upon, or concomitant with, more familiar terrains of form or harmony. Cohn asks that pitch/time analogies simply 'aid in the construction of models that help us to clarify our insights into compositions and to communicate them to each other.'⁴⁰ This study seeks to do no more or no less.

Ex. 2. Hypermetres of three themes in Brahms, Piano Quartet op. 25, IV such that one notated bar equals a quaver.

a. G minor rondo theme (A theme) (bars 19-30; bars 1-12 and 67-78 exhibit the same metrical grouping)

12
8

b. B \flat major subordinate theme (B theme) (bars 80-91)

3
2

c. G major subordinate theme (C theme) (bars 155-160); *Meno presto* is interpreted as $\text{♩} = \text{♩}$

6
4

Table 3. Rondo tempi for a number of commercial recordings of Brahms op. 25.

Artists	Label	Catalogue Number	<i>Presto</i> tempo (bar 1)	<i>Meno presto</i> tempo (bar 155)	<i>Presto: Meno presto</i> ratio
London SO, Neeme Järvi	Chandos	CHAN 8825	$\text{♩} = 77$	$\text{♩} = 31$	1: .40
Isaac Stern, Jamie Laredo, Yo-Yo Ma, Emmanuel Ax	Sony Classical	SM3K 64 520	$\text{♩} = 99$	$\text{♩} = 42$	1: .42
City of Birmingham SO, Simon Rattle	EMI	CDS 7 47301 8	$\text{♩} = 79$	$\text{♩} = 36$	1: .46
Houston SO, Christoph Eschenbach	RCA Victor BMG Classical	09026-68658	$\text{♩} = 78$	$\text{♩} = 37$	1: .47
Martha Argerich, Gidon Kremer, Yuri Bashmet, Mischa Maisky	Deutsche Grammophon	4637002	$\text{♩} = 90$	$\text{♩} = 44$	1: .49
Murray Perahia, Amadeus Quartet	CBS Masterworks	MK 42361	$\text{♩} = 86$	$\text{♩} = 44$	1: .51
Beaux Arts Trio, Walter Trampler	Philips Classics	454 017-2	$\text{♩} = 84$	$\text{♩} = 45$	1: .53
Arthur Rubenstein, Guarneri String Quartet	RCA Victor BMG Classical	09026 63065-2	$\text{♩} = 89$	$\text{♩} = 52$	1: .58

Ex. 3. Brahms, Piano Quartet op. 25, IV, bars 390-398 and one projected grouping structure.

Ex. 4. Reprint of analysis from David Lewin, 'On Harmony and Meter in Brahms's Op. 76, No. 8', with 'triple counting' added.

Fig. 1. Path through neo-Riemannian space outlined by four significant keys.

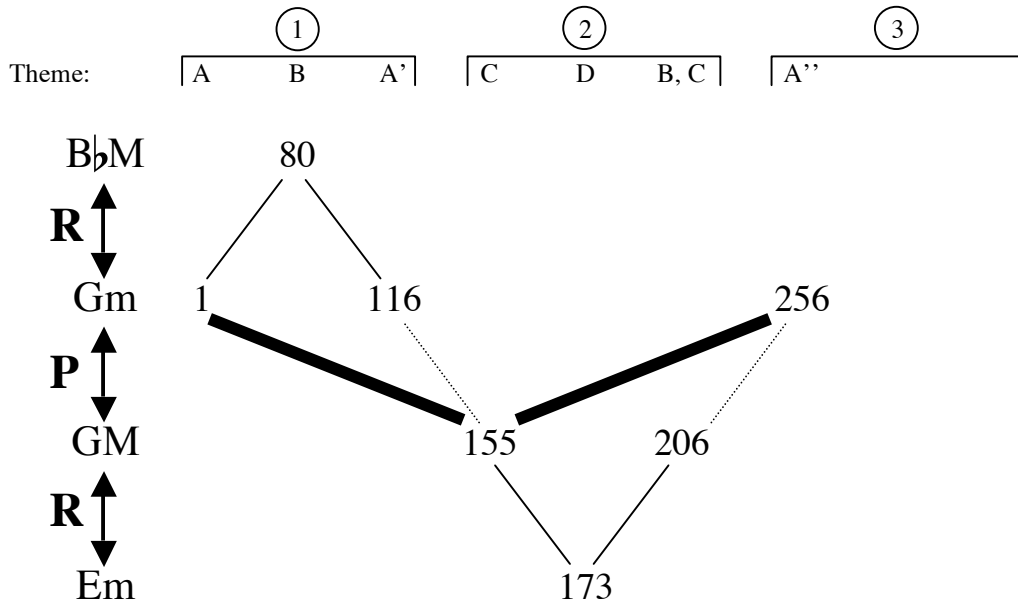


Fig. 2. A ski-hill graph.

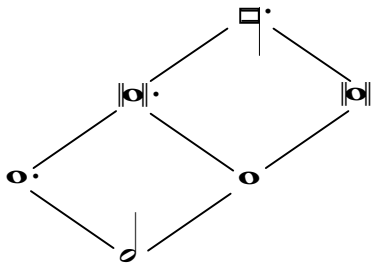


Fig. 3. Another ski-hill graph.

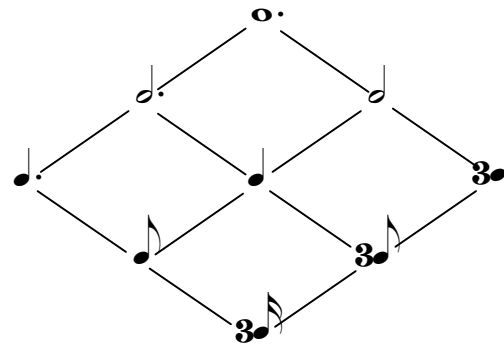
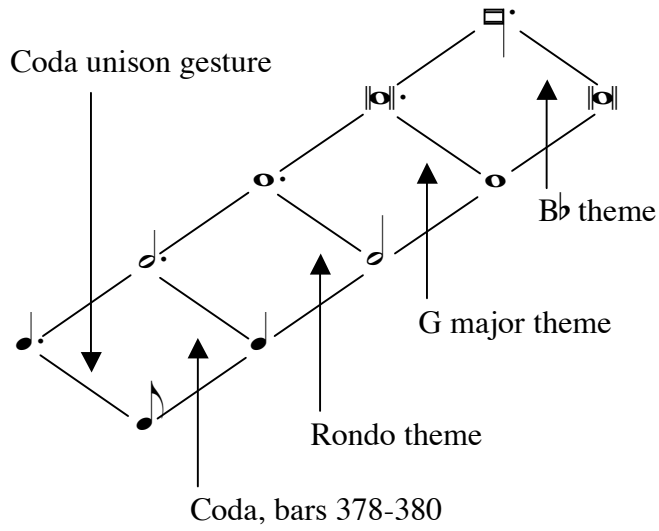


Fig. 4. An extended ski-hill graph to accommodate metres from the coda; each arrow points from a theme or passage in the coda to its metre's representative triple grouping.

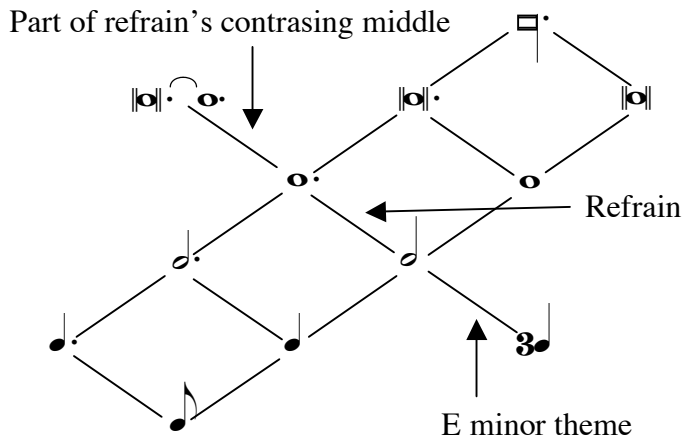


Ex. 5. Brahms rondo, bars 375-380.

Table 3. Works or sections of works by Brahms in which the logical tonic metre and the rhetorical tonic metre are equivalent.

Opus No.	Work	Triple-Count Pulse of Rhetorical Tonic Metre	Slower Triple-Count Pulse by Factor of 2 (Bar numbers)	Faster Triple-Count Pulse by Factor of 2 or 4 (Bar numbers)
8	Piano Trio No. 1, IV (rev. version)	♩	♩ (153-158)	♩ (141-144)
18	String Sextet No. 1, III, Scherzo	♩	♩ (9-10)	♩ (9-10)
18	String Sextet No. 1, III, Trio	♩	♩ (55-56)	♩ (53-54)
33/ix	"Ruhe, Süßliebchen"	♩	♩ (49-66)	♩ (96)
43/i	"Von ewiger Liebe"	♩	♩ (73-76)	♩ (79-116)
51/2	String Quartet No. 2, IV	♩	♩ (1-2)	♩ (9-12)
56	<i>Haydn Variations</i> , VIII	♩	♩ (21-24)	♩ (2-3)
65	<i>Neue Liebeslieder Walzer</i> , conclusion	♩	♩ (23-24)	♩ (1-9)
68	Symphony No. 1, I	♩	♩ (159-160)	♩ (327-334)
73	Symphony No. 2, I	♩	♩ (23-27)	♩ (64-65)
76/i	Capriccio in F# Minor	♩	♩ (10)	♩ (60-63)
76/viii	Capriccio in C Major, 1-15	♩	♩ (3-4)	♩ (9-13)
78	Violin Sonata No. 1, I	♩	♩ (16-17)	♩ (11-20)
84/v	"Spannung"	♩	♩ (39-40)	♩ (71-76)
86/v	"Versunken"	♩	♩ (58)	♩ (43-46)
86/vi	"Todesehnen", 31-85	♩	♩ (75-76)	♩ (31-32, 77-82)
87	Piano Trio No. 2, I	♩	♩ (9-12)	♩ (136-138)
87	Piano Trio No. 2, II, 109-170	♩	♩ (134)	♩ (136-155)
87	Piano Trio No. 2, III, 1-61	♩	♩ (51)	♩ (44-46)
88	String Quintet No. 1, III	♩	♩ (93-94)	♩ (44-45)
90	Symphony No. 3, I	♩	♩ (3-6)	♩ (165-167)
98	Symphony No. 4, II	♩	♩ (87)	♩ (20-21)
106/ii	"Auf dem See"	♩	♩ (4)	♩ (27-29)
114	Clarinet Trio, III	♩	♩ (23-24)	♩ (13-14)
119/i	Intermezzo in B Minor	♩	♩ (21-24)	♩ (43-44)
120/i	Clarinet Sonata No. 1, I	♩	♩ (21-22)	♩ (184-186)
122/iv (posth.)	Chorale Prelude No. 4 "Herzlich tut mich erfreuen"	♩	♩ (30)	♩ (18-19)
122/x (posth.)	Chorale Prelude No. 10 "Herzlich tut mich verlangen"	♩	♩ (11)	♩ (2)

Fig. 5. The extended ski-hill graph of Fig. 4 plus two more triple edges.



Ex. 6. Comparison of three triple counts. Dotted boxes indicate a triadic arpeggiation.

bar 173, 'cello (*Meno presto* is interpreted as $\text{♩} = \text{♩}$)

Bar 173 of the cello part, marked *poco f espr.* The notation shows a triple count with a triadic arpeggiation indicated by a dotted box and a '3' above the notes. A large arrow on the right points from this section towards the piano section.

Reduced
by 3:1

bars 1-3

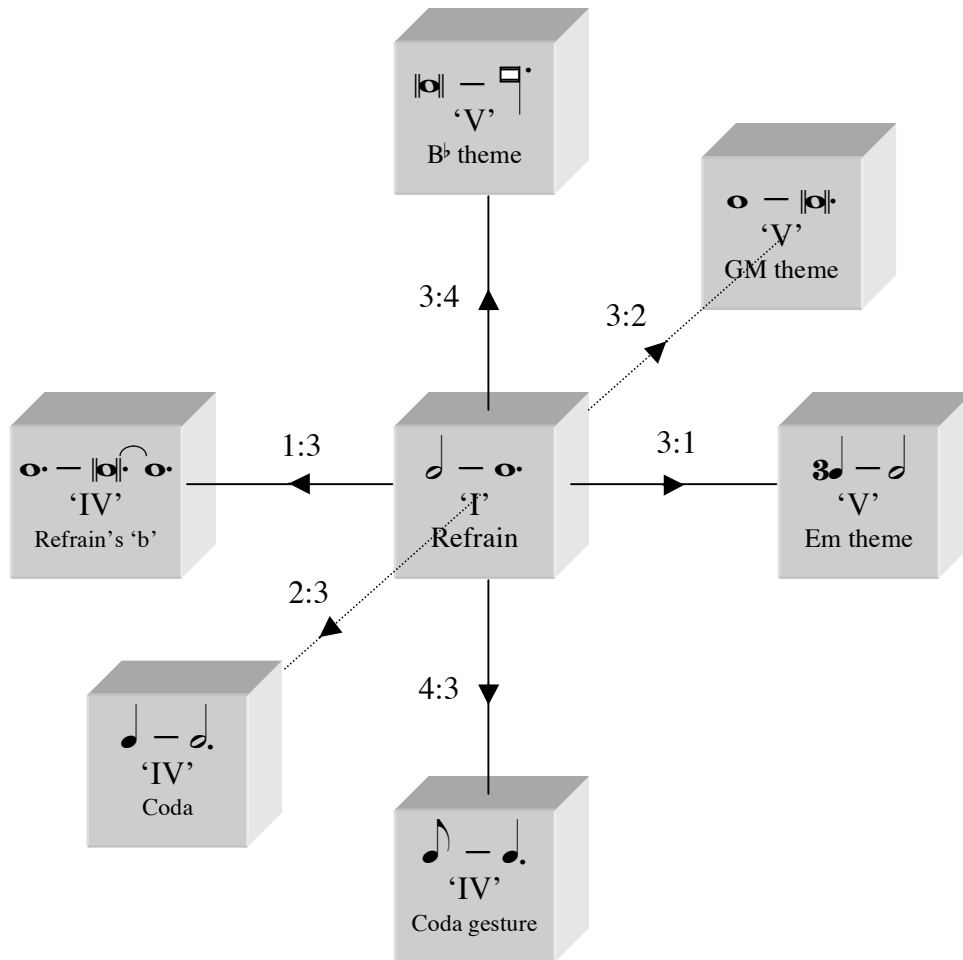
Bars 1-3 of the piano part, showing a triple count with a triadic arpeggiation indicated by a dotted box and a '3' above the notes. A large arrow on the right points from this section towards the piano section.

Augmented
by 3:1

bars 31-39

Bars 31-39 of the piano part, showing a triple count with a triadic arpeggiation indicated by a dotted box and a '3' above the notes. A large arrow on the right points from this section towards the piano section.

Fig. 6. A metric space that arranges seven of the rondo's metres along three axes of dominant, tonic, and subdominant.



NOTES

Earlier versions of this paper were presented in 2004 at annual meetings of Music Theory Midwest in Kansas City, Missouri and the Society for Music Theory in Seattle, Washington. I am grateful to Richard Cohn, Peter Smith, and two anonymous readers for providing comments on an earlier draft.

- ¹ David Lewin, 'On Harmony and Meter in Brahms's Op. 76, No. 8', *19th-Century Music*, 4/iii (1981), pp. 261-265.
- ² Richard Cohn, 'Complex Hemiolas, Ski-Hill Graphs, and Metric Spaces', *Music Analysis*, 20/iii (2001), pp. 295-326.
- ³ My conception of analogy throughout this study is strongly informed by Keith J. Holyoak and Paul Thagard, *Mental Leaps: Analogy in Creative Thought* (Cambridge, Massachusetts and London: MIT Press, 1995).
- ⁴ Peter Smith, 'Brahms and Subject/Answer Rhetoric', *Music Analysis*, 20/ii (2001), p. 221.
- ⁵ '[Beethoven's last] bagatelle may well be the most thorough example of triple hypermeter in the tonal repertory.' David Smyth, 'Beethoven's Last Bagatelle', *Intégral*, 13 (1999), p. 132.
- ⁶ William Caplin, *Classical Form: a Theory of Formal Functions for the Instrumental Music of Haydn, Mozart, and Beethoven* (Oxford: Oxford University Press, 1998), p. 35. As Caplin explains, an analytical argument for the relationship between R and N depends not only on the tempo of the music, but its tight-knit qualities. Although Brahms's music does not fall within the Classic era, many aspects of Caplin's tight-knit paradigms still apply to Brahms's music. Using $R = 3N$, the first six bars group into a basic idea, since basic ideas are typically two real bars long. The exact repetition of this basic idea in bars 7-12 creates a normative four-real-bar presentation phrase, the first half of an eight-real-bar sentence. The modified repetition of bars 13-15 as bars 16-18 diminishes the length of the repeated unit to one real bar—an example of Caplin's fragmentation—and is thus characteristic of a continuation phrase, the second half of a sentence. The only departure (at least proportionally) from the sentence model is the insertion of bars 19-24, repeating bars 1-6, as after which the two real bars that express cadential function in bars 25-30 then follow. (As Caplin explains, cadential function typically uses more conventional material, rather than repeating the characteristic basic ideas from the presentation phrase as Brahms does.) However, I also interpret this insertion as exacting a proportionally-balanced miniature ternary form in these opening thirty bars (bars 1-12, 13-18, 19-30), which precedes and foreshadows the many ternary forms to follow.
- ⁷ My durational reduction is modeled after Carl Schachter's analyses in 'Rhythm and Linear Analysis: Durational Reduction', *The Music Forum*, 5 (1980), pp. 197-232.

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- 8 This paper will use the term 'hypermeasure' instead of 'hyperbar' to indicate a grouping of bars.
- 9 William Caplin dubs the B section of a ABA' small ternary-form a 'contrasting middle'. (Caplin 1998, p. 13)
- 10 Smith 2001, p. 221.
- 11 'As part of what one might call the composing-out of meter, one can observe a definite tendency to realize explicitly those intermediate levels that had been missing or present only inferentially'. Carl Schachter, 'Rhythm and Linear Analysis: Aspects of Meter', *The Music Forum*, 6 (1987), p. 15.
- 12 I am grateful to Jay Hook for pointing this out.
- 13 For a detailed account of both explicit and implicit indications of proportional tempi in Brahms's music, consult Bernard Sherman, 'Metronome Marks, Timings, and Other Period Evidence Regarding Tempo in Brahms', in Michael Musgrave and Bernard D. Sherman (eds.), *Performing Brahms* (Cambridge: Cambridge University Press, 2003), pp. 99-130.
- 14 When the B \flat theme (Smith's B theme) returns in G major in bar 206, the accompanying 'in tempo' indication is customarily interpreted by most performances to be 'in' the tempo of the movement (*Presto*), not the tempo of the G major section (*Meno Presto*). Therefore, these performances invoke a 'Meno Presto' at the return of the G major theme in bar 238 even though such a direction is not provided! Reinforcing this practice is the *Tempo I* indication at bar 256 for the return of the refrain material, implying that the preceding theme uses a contrasting tempo.
- 15 Expressed most recently and thoroughly in David Epstein, *Shaping Time: Music, the Brain, and Performance* (Schirmer: New York, 1995).
- 16 Richard Cohn, 'Dramatization of Hypermetric Conflicts in the Scherzo of Beethoven's Ninth Symphony', *19th-Century Music*, 15/iii (1992), p. 194.
- 17 For Smith in 'Brahms and Subject/Answer Rhetoric', these eight bars combine 'characteristics of both real and tonal answers: on the one hand, the consequent transposes the melodic idea into the minor dominant; on the other hand, the B-F \sharp stepwise descent in the antecedent is answered by an F \sharp -B fifth.' (p. 220) I also interpret this 'near-exact transposition' as a consequence of fitting an unequal division of the melodic octave *Koppelung* (the perfect fourth B4-F \sharp 4 plus the perfect fifth F \sharp 4-B3) with a symmetrical hypermetre (two four-bar phrases).
- 18 'Since the principle of systole and diastole is inherent in our very being, metric ordering based on two and its multiples is the most natural to us ... Measure numbers in odd numbers (such as 3 or 5) have their roots in a duple ordering in the background and middleground...' Heinrich Schenker, *Free Composition*, trans. Ernst Oster (New York: Longman, 1979), p. 119.
- 19 Cohn, 'Dramatization of Hypermetric Conflicts', p. 194.

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- 20 Smith, 'Brahms and Subject/Answer Rhetoric', p. 222.
- 21 Harald Krebs, *Fantasy Pieces: Metrical Dissonance in the Music of Robert Schumann* (Oxford: Oxford University Press, 1999), p. 31.
- 22 Lewin, 'On Harmony and Meter', p. 263.
- 23 *Ibid.*, pp. 263-264.
- 24 Daniel Harrison's 'position finding' and 'position asserting', two means of localizing tonic in a composition, is an example of a logical/rhetorical pair. See *Harmonic Function in Chromatic Music: a Renewed Dualist Theory and an Account of its Precedents* (Chicago: University of Chicago Press, 1994), pp. 73-90.
- 25 Harald Krebs's 'primary metrical layer', which he defines as 'the most prominent metrical layer in a work, generally (but not always) the layer designated by the upper integer of the time signature and rendered visually apparent by the bar lines' (Krebs 1999, pp. 254-255) is closely related to my 'rhetorical metric tonic'.
- 26 The closest the B \flat and G major subordinate themes come to being back to back is when the B \flat theme returns in bars 206-217, transposed to G major. The G major theme then returns in bars 238-255.
- 27 The P (parallel) operation on a 3-11 triad leaves two notes separated by a perfect fifth unchanged, and moves the remaining note up or down by one semitone to form another 3-11 triad. The R (relative) operation on a 3-11 triad leaves two notes separated by a major third unchanged, and moves the remaining note up or down by one tone to form another 3-11 triad. See Richard Cohn, 'Introduction to Neo-Riemannian Theory: a Survey and a Historical Perspective', *Journal of Music Theory*, 42/ii (1998): pp. 167-180, for an account of the development of neo-Riemannian theory and these operations.
- 28 This approach is first formulated in Cohn, 'Dramatization of Hypermetric Conflicts', and Richard Cohn, 'Metric and Hypermetric Dissonance in the Menuetto of Mozart's Symphony in G Minor, K.550.' *Intégral* 6 (1992), pp. 1-33.
- 29 Cohn, 'Complex Hemiolas'.
- 30 The inverse case of this is when all of the comparable metres have exactly *one* duple grouping among the remaining triple groupings. In this case, the ski hill would generally slope towards the right, and the span pulse would last $3^m 2$ unit durations. In the case where $m = 2$ (that is, when there are three comparable metres), and the unit pulse is a quaver, three bars of 6/8 would serve as tonic when contextualised by two bars of 9/8 (subdominant) and three bars of 3/4 (dominant). This trio of metres is discussed in Cohn, 'Menuetto of Mozart's Symphony in G Minor', pp. 11-13.
- 31 Cohn, 'Complex Hemiolas', p. 207.
- 32 Actually, the reading of a single 18/8 hypermeasure has some merits: the right hand's sequential ascent that begins in bar 9 continues into bar 11, then changes

to another, quicker sequential pattern starting with bar 12. Also, the first of the two cadential 6/4 chords would fall on a hypermetric downbeat.

³³ To complicate things further, Brahms's rondo uses thematic key relationships that are not by dominant, subdominant, and other relationships generated by them (double dominant and the like), but rather by mediant and submediant: one is left wondering how to analogise such situations. Lewin's solution in the case of the Brahms Capriccio is to treat such relationships as substituting for a dominant or subdominant relationship. Another option, in cases of keys third-related to tonic, is to treat them as a blend of tonic and dominant or subdominant; the analogous metrical situation would be a direct 3:2 metrical dissonance. While this approach to the analogy does not yield any results with the subject of this paper, other pieces do provide some degree of correlation: the reader is directed to the Scherzo of Schubert's D major Piano Sonata, D. 850, and 'Aufschwung', the second piece in Schumann's *Fantasiestücke*.

³⁴ An irony with regard to this particular analysis is that the one form where subdominant often balances dominant on a global scale is the rondo.

³⁵ The term 'discharge', and its metaphorical signification of a resolution to a tonic representative, comes from Harrison 1994.

³⁶ Justin London, 'Some Non-Isomorphisms Between Pitch and Time', *Journal of Music Theory* 46/i-ii (2002), pp. 127-151.

³⁷ "Ade!" is notated in 2/4, but most of the piano accompaniment divides the bar into twelve triplet semiquavers. Brahms metrically groups this span in all three possible ways—with triplet crotchet, triplet quaver, and triplet semiquaver pulses, respectively—thus, the metre projecting a triplet quaver pulse is the logical tonic metre. However, the accompaniment largely uses the two metres supporting triplet crotchet and triplet semiquaver pulses respectively. Moreover, crotchet and quaver pulses dominate the vocal line and conclude each verse in the accompaniment, suggesting that the best choice for a rhetorical tonic metre is the logical "subdominant" metre.

Another apparent counterexample, the finale of the Piano Sonata No. 3 (op. 5), is only so if one makes an atypical performance decision. This movement is notated in 6/8, often asserts 3/4 within its main theme, and the *Più mosso-Presto* coda begins with a 3/2 pattern. This would make 3/4 the logical metric tonic, and 6/8 the rhetorical metric tonic. However, most performances immediately increase the tempo of the coda to a point that eliminates any reasonable duple relationship between the *Più mosso*'s minim pulse and the *Tempo primo*'s crotchet pulse.

³⁸ The celebrated first movement of Beethoven's "Eroica" Symphony offers one more example. For most of this 691-measure movement, the rhetorical tonic metre of 3/4 is relieved only by several instances of the logical 'dominant' of 3/2, but sure enough, triple groupings of quavers strongly arrive in 'cellos and basses right before the end (bars 665-671).

³⁹ The differences between Cohn's metric spaces and spaces like those of Fig. 6 highlight subtle but noteworthy distinctions in what constitutes 'metrical distance'. In his analysis of the *Lied*, Cohn's double dominant is a 3/2 metre using triplet quavers, represented as the right slalom path on Fig. 3, which is the inverse of the tonic 3/4 metre with straight quavers, represented as the left slalom path on Fig. 3. According to Cohn, these two metres are two unit distances apart—hence the double dominant—since they differ by two intermediate pulses. But do two differences necessarily signify two degrees of separation? These two pulse differences, $\mathfrak{3}\text{♩} - \text{♩}$ and $\text{♩} - \text{♩}$, correspond to two hemiolas that reside on different metrical levels. When the second stanza adds triplet quavers to the straight quavers from the first stanza, I think I could learn to visualise a change from ♩ to $\mathfrak{3}\text{♩}$ as a unit distance as Cohn's graphs suggest. When the 3/2 replaces 3/4, I think I could also learn to visualise a change from ♩ to ♩ as a unit distance. However, when these changes occur simultaneously, as they do at the end of the second stanza, I do not think I could learn to visualise these two unit distances as concatenated. Rather, I visualise these two changes as unfolding along two *different* axes as in Fig. 6. The move from ♩ to ♩ can be analyzed as a move from tonic to dominant along the 3:2 axis (recall that the ratio compares frequencies, not durations). The move from $\text{♩} - \mathfrak{3}\text{♩}$ can be analyzed as a move from tonic to dominant along the 3:1 axis (the triple-tempo of the 3/4 accelerates by a factor of three). Thus my approach treats the right slalom path of Fig. 3 not as analogous to the more familiar double dominant—two notches away from tonic on *the* line of fifths—but to the less familiar doubly-defined dominant—one notch away from tonic on two different lines of registral fifths.

⁴⁰ Cohn, 'Menuetto of Mozart's Symphony in G Minor', 32.