Multiple Meters and Metrical Processes in the Music of Steve Reich

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Minimalist and repetitive music...reduces the elements of music to one, single component—periodicity.

Pierre Boulez, *New York Review of Books* 31/11 (June 28, 1984): 14

That Steve Reich's music challenges listeners' rhythmic and metric faculties is well known; the composer himself has written "If I compose music that is to use repeating patterns and is also to remain interesting I must build in rhythmic ambiguity to make it possible for the ear to hear a given pattern beginning and ending in different places depending on slight differences of accent and on how one listens."[1] Reich's statement draws our attention to two signal features of his metric language. First, a repeated motive may have more than one accentual interpretation; moreover, the contrasting interpretations differentiate the repeated motives, inviting the listener to engage in a process of comparison. Boulez's emphasis on periodicity is apt, for it is Reich's creative use of repetition within meter that gives the music its charge.

Consider, for example, the music shown as Example 1a, a portion of Reich's 1967 *Piano Phase*. This excerpt from the two-piano work results from the superimposition of an original melody (played on one piano, and shown in filled-in noteheads in the top line of the example) with a cyclical permutation beginning on its sixth note (played on the other piano, and shown in open noteheads on the top line); the resulting two-part counterpoint is repeated many times over. In Example 1b, I suggest two possible metrical interpretations of this pattern: in the first, the twelve pitches group into two larger groups of six sixteenths with subdivisions of 2 + 2 + 2, whereas in the second the twelve sixteenths are heard as part of three groups (4 + 4 + 4). The

[1] Reich, "Non-Western Music and the Western Composer," *Analyse musicale* 11 (1988): 49.

alternative readings arise from the oscillating E-F♯ bass line of the counterpoint; in the first, only E is heard as occurring on the beat, whereas in the second, F♯, in conjunction with triadic partners B and D, may occur on a beat. The many repetitions of this pattern allow a listener to rehearse both readings.[2]

As the music continues, a listener may initially prefer the first reading, for it preserves the 6/8 meter of the previous section, whose counterpoint is the result of the original melody with a cyclic permutation beginning on its fifth note (see Example 1c).[3] On the other hand, the music of Example 1a does not follow immediately from Example 1c, but is instead separated by a phasing process, described by Reich as follows (when phasing occurs for the first time): "After...getting into a comfortable and stable unison the second performer gradually increases his or her tempo very slightly and begins to move very slowly ahead of the first until, after about four to sixteen repeats, he or she is one sixteenth note ahead."[4] The phasing creates an intervening section of metrically ambiguous music between the two counterpoints. Whether one carries forward the meter from the first counterpoint, and how much one is willing to experiment with different countings in the second counterpoint, is probably a question of personal taste; however, Reich's multiple repetitions of the same material, and especially its canonic variation, provide opportunities for experimentation.[5]

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[2] In Example 1 I show each counterpoint on two staves; the top line shows the actual sounding pitches, while the lower line(s) suggest a metrical interpretation where less important pitches may have been omitted.

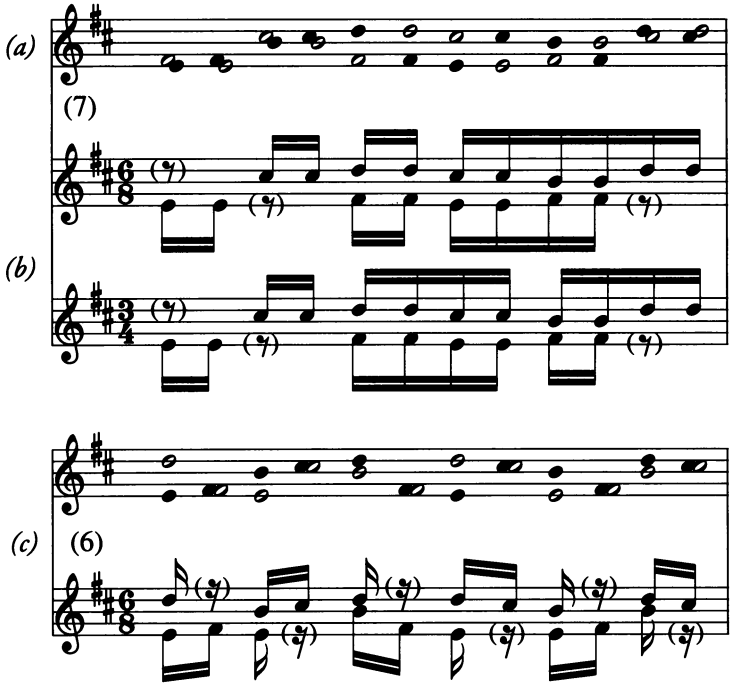
[3] In fact, each section but the first in this part of *Piano Phase*, where the two pianists play the original melody in unison, originates from cyclical permutation. In other words, *Piano Phase* is a canon at the unison where the *comes* (piano two) enters successively one sixteenth note later.

[4] See the performance directions given by Reich in the score for *Piano Phase*.

[5] As this article went to press, John Roeder's elegant article "Beat-Class Modulation in Steve Reich's Music" appeared in *Music Theory Spectrum* 25 (2003): 275-304. Space prevents a full comparison of our views, but in general, while we both emphasize Reich's coordination of metrical and formal process, Roeder derives possible meters from the quantification of various sorts of accents, which in turn define beat-class tonics and modes. My conception of meter is inherently more fluid, and accordingly I focus on processes of metrical emergence, overdetermination ("multiple meter"), and dissolution.

Furthermore, his connection of each counterpoint with an intervening phase creates a cyclic counting process: as a fixed counterpoint emerges from the preceding phase, the listener iss drawn into locating pulse and downbeat, often finding more than one way to do so. The process continues as counting dissolves with the arrival of the next phase and so forth.

Example 1a-c. Superimpositions in Piano Phase.



The music remains engaging because of the ongoing cycle of metrical emergence and dissolution and because the central portions of the process—the fixed counterpoints—are themselves metrically complex. I have noted that a counterpoint may have more than one viable interpretation, a property I shall call

"multiple meter."[6] Except for special cases such as hemiola, competing metrical interpretations of entire passages are not typical of common-practice music; in fact, they violate customary construals, whose purpose is to extract from a score the existence of a [single] legitimate metrical interpretation. For example, Lerdahl and Jackendoff formulate as their Metrical Well-Formedness Rule Three that at a single level, metrical accents occur either two or three beats apart, a regulation that implies a single reading.[7] Even more striking is that the two readings given above contrast at a primary level of counting, giving alternative locations for beats and downbeats. Many theorists ascribe a special status to the metrical level known as the tactus, the one most commonly identified by the given time signature; Lerdahl and Jackendoff restrict the types of irregularity that may occur here, stating that "the tactus and immediately larger metrical levels must consist of beats equally spaced throughout the piece" (Metrical Well-Formedness Rule Number Four).[8] Harald Krebs calls this level the "primary metrical consonance" because of its continuing command even when challenged by substantial metrical dissonances.[9] A hemiola does not violate such conditions because in it one of the meters (usually triple) is fundamental or primary. In the *Piano Phase* example, however, both meters may be fundamental.

That the passage is "susceptible" to more than one reading is due in part to its division into twelve units (here, sixteenths). Because twelve may be factored by both two and three, the primary constituents of metrical grouping, it may give rise to different metrical patterns. Richard Cohn calls durations of such length

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[6] I have avoided the term "polymeter" in order not to suggest that there are two simultaneously sounding meters present; rather, I suggest that there are two valid readings of the passage.

[7] See Fred Lerdahl and Ray Jackendoff, *A Generative Theory of Tonal Music* (Cambridge: the MIT Press, 1983): 97.

[8] *Ibid.*: 97.

[9] Krebs, "Some Extensions of the Concepts of Metrical Consonance and Dissonance," *Journal of Music Theory* 31/1 (1987): 99-120. Krebs categorizes several types of accentual patterns that contrast with a given meter; while these patterns create significant moments of metrical tension, for the most part they do not actually interrupt the primary level of the given meter.

"mixed spans."[10] Reich often uses mixed spans because of this property, writing that "Very often, I'll find myself working in 12-beat phrases, which can divide up in very different ways; and that ambiguity as to whether you're in duple or triple time, is, in fact, the rhythmic life-blood of much of my music. In this way, one's listening mind can shift back and forth within the musical fabric, because the fabric *encourages* that."[11] "Shifting back and forth" becomes a formal process in *Piano Phase*, by drawing us through each counterpoint and by linking them: as the piece continues, previous interpretations provide models for subsequent music. Thus, counting itself creates continuity within the limited pitch materials of the piece.

Reich's metrical practice also extends typical tonal practice. Commentators on tonal music have also argued that metrical narratives participate in formal articulation, describing how metrical dissonance in the form of syncopations or contrasting interpretations may run through a piece.[12] Reich's practice is distinctive in two ways. First, the composer often engages the lowest levels of counting; in *Piano Phase*, for example, emerging multiple meters contrast at the levels of pulse and measure. Even more striking is Reich's practice of entraining these fundamental elements in a gradual way: instead of locating pulse and measure immediately from opening gestures, the listener instead infers tactus and time signature from the counterpoint that emerges out of the murky blur of the phase, a process that is repeated throughout the piece. While changes of meter in tonal music are typically understood as more or less immediate, occurring *at* formal

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[10] See Richard Cohn's "The Dramatization of Hypermetric Conflicts in the Scherzo of Beethoven's Ninth Symphony" in *Nineteenth-Century Music* 15/3 (1992): 188-206, esp. 194-195. This article is dedicated to multiple readings of spans of twelve.

[11] Liner notes for *The Desert Music*, Nonesuch CD 9 79101-2; emphasis his.

[12] See, for example, Cohn, "Metric and Hypermetric Dissonance," and Harald Kreb's *Fantasy Pieces: Metrical Dissonance in the Music of Robert Schumann* (New York: Oxford University Press, 1999). William Rothstein considers metrical transformations in the framework of phrase expansions in *Phrase Rhythm in Tonal Music* (New York: Schirmer, 1989) and Christopher Hasty's landmark *Meter as Rhythm* (New York: Oxford University Press, 1997) recasts meter as a process, one that is constantly evolving rather than existing as a background hierarchy.

boundaries and *between* sections of music, these processes take place over time, constituting part of the music's development.

Reich's interest in gradual processes is well documented. In his famous 1968 essay entitled "Music as a Gradual Process," the composer expresses his interest both in processes that can be heard "throughout the sounding music" and processes that happen "extremely gradually" because they "facilitate closely detailed listening,"[13] a perspective that was probably intensified by his study of West African drumming. Western listeners commonly describe the processive nature of listening to the superimposed repeating patterns characteristic of the idiom. For example, David Locke writes that

> Another kind of perceptual shift is what I like to call 'positive ambiguity of phrasing.' This term refers to the way in which a continually repeating phrase can be reordered mentally into various rhythmic modes: the durations of notes do not change but their sequence and musical function does. By itself the *gankogui* phrase does not suggest unequivocally one placement of bar lines or one phrasing configuration: only in combination with outer parts....does it acquire definite shape.[14]

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[13] Reich, *Writings About Music: 1965-2000*, Paul Hillier, ed. (Oxford: Oxford University Press, 2002): 34.

[14] See David Locke, *Drum Gahu: A Systematic Method for an African Percussion Piece* (Crown Point, IN: White Cliffs Media Co., 1987): 23. It is possible, however, to overstate this connection. Although the structural similarities between West African drumming and Reich's music seem obvious, it does not necessarily follow that the two idioms are directly linked. In fact, Reich has written about how Western composers respond to non-Western music, arguing that in the best of circumstances "one can create a music with one's own sound that is constructed in the light of one's knowledge of non-Western *structures*....One can study the rhythmic structure of non-Western music and let that study lead one where it will while continuing to use the instruments, scales, and any other sound one has grown up with. This brings up the interesting situation of the non-Western influence being there in the thinking, but not in the sound. This is a more genuine and interesting form of influence...the thinking of a Western composer is likely to produce something genuinely new" (from "Postscript to a Brief Study of Balinese and African Music (1973)," in Reich, *Writings about Music*: 71). Furthermore, musicians trained in Western traditions seem more likely to be concerned with identifying strong beats within metrical hierarchies. See Graeme Boone's useful discussion of this problem in "Marking Mensural Time" in *Music Theory Spectrum* 22/1 (2000): 5.

I shall demonstrate how the composer's gradual manipulation of meter shapes music that would otherwise be overly repetitious. I shall discuss how the emergence of levels of meter characterizes openings and conversely how the breakdown of meter characterizes closes; how multiple meter, as a representation of thoroughly complex metrical emergence, is associated with climactic, central sections of music. Because it takes place both over time and at various levels, meter easily marks processes of growth, climax, and dissolution that shape a piece. Metrical emergence results when a (most often mixed) span of time is initially accented in an irregular or sporadic way. In such a situation, metrical cues invite the listener to count, but their lack of consistency prohibits the confirmation of a meter at one or more levels. As the music continues, however, by appearing periodically the cues may eventually articulate the missing level(s), leading us to experience a process of growth as the metrical identity of a repeated motive is enriched. In a metrical dissolution the process is reversed: established levels of counting eventually dissolve when metrical cues disappear or contradict one another, often returning a motive to its original form. Reich's continuous repetition of motivic material is especially important in this process, for its ongoing presence in the midst of metrical irregularity encourages the listener to continue counting.[15]

While *Piano Phase* might be considered an experimental piece whose innovative feature (the phase) was used by Reich for only a

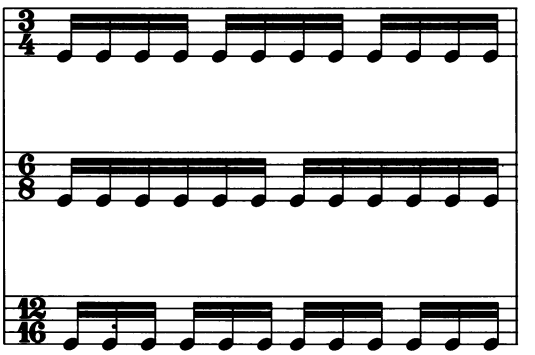
[15] How we perceive ambiguous metrical cues needs to be pursued further. Luke Windsor and Eric Clarke have investigated the categorical perception of meter as duple or triple (Eric F. Clarke and W. Luke Windsor, "Dynamic Information for Metre," Bourges: Fourth Workshop on Rhythm Perception and Production, 1992): 105-110; and W. Luke Windsor, "Dynamic Accents and the Categorical Perception of Metre," *Psychology of Music* 21 (1993): 127-140); in their experiments, dynamic (intensity) accents which originally clearly support 3/4 are gradually changed to support 6/8. Subjects are asked to identify 3/4 or 6/8 in sequences presented in random order. Although they report a neutral metrical "no-man's land" where neither duple nor triple is identified as ascendant, they also find strong metrical perception "which is resistant to a considerable degree of phenomenal counter-evidence" (Windsor, 138). Although the experiments tested only dynamic accent (not the effects of pitch or duration), they suggest to me our strong predilection for seeking metrical structure in a variety of accentual contexts. Thanks to Justin London for these references.

limited time,[16] I wish to argue that its metrical contributions reach well beyond that period. Although I will return briefly to that piece in the following section of this article, the bulk of my remarks will address metrical emergence and dissolution in the composer's 1984 work *The Desert Music.* Although this later piece is hardly "minimal," having five movements and lasting nearly an hour, its reliance on metrical process for formal definition follows the precedents of the earlier piece. I will trace metrical emergence through the first movement, also pairing it with the final dissolution in the piece's last movement. I will also discuss the central canon in the third movement as an example of multiple meter; its complexity serves as a suitable climax for the entire piece. I hope to demonstrate that the simpler sequence of phase to counterpoint and back in *Piano Phase* has been expanded to encompass the entirety of *The Desert Music.*

Piano Phase

Example 2a shows the three possible periodic divisions of a span of twelve sixteenth notes.

Example 2a. Metrical possibilities for twelve sixteenth notes.



[16] Reich wrote phase pieces only from 1965 through 1971; see "*Clapping Music* (1972)" in *Writings about Music*: 68.

Each of these meters appears at least once during the course of the twelve counterpoints (the first eight of which are shown in Example 2b[17]). To the right of each pattern is one or more metrical interpretations (although I have identified the most obvious patterns, there may be additional ones); the arrow marks the perceived downbeat. Some superimpositions suggest more than one meter (for example, number 3 may be counted duply as a bar of 6/8 or quadruply as a bar of 12/8), while some instances of multiple meter result when we can perceive multiple locations for downbeats of the same meter (shown by a second arrow over the interpretation). For example, in number 4 either B or D may be counted as the first and second beats of a 6/8 bar.[18]

Although the example indicates a breadth of metrical experience during the repetitions, it does not display more subtle elements of the process. Certainly some of the readings are more strongly perceived than others, not only because of what immediately precedes them, but also by the reappearance of earlier motivic gestures with established metrical identities. Thus, with its repeating E-B-D pattern, the opening superimposition is more easily interpreted as a bar of 6/8 than of 12/16. However, when it returns at the end of the section, this unison melody inherits the legacy of the preceding number 13. Its alternating E-F♯ bass line (like that of number 3 on Example 2b) gives rise to a 12/16 meter and draws our attention to a similar bass line in the unison melody, permitting its more latent 12/16 meter to emerge more clearly.

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[17] The numbers of the superimpositions correspond to the score, where 1 and 2 are the original melody in unison first played by one pianist and then by both. I have not shown superimpositions 10-13 because they repeat earlier versions: number 9 repeats the counterpoint of number 7 (although it is cyclically permuted), number 10 repeats number 6, 11 is paired with 5, 12 with 4, and 13 with 3.

[18] The two kinds of multiple meter (the juxtaposition of two different periodic spans and the juxtaposition of the same periodic span with differing downbeats) correspond to Harald Krebs's grouping and displacement dissonances (Krebs adopted these terms from Peter Kaminsky's article "Robert Schumann's Metrical Revisions" in *Music Theory Spectrum* 19/1 (1997): 37). I have chosen to refer to Reich's usage as multiple meter rather than metrical dissonance because I wish to emphasize that no single reading is absolutely fundamental.

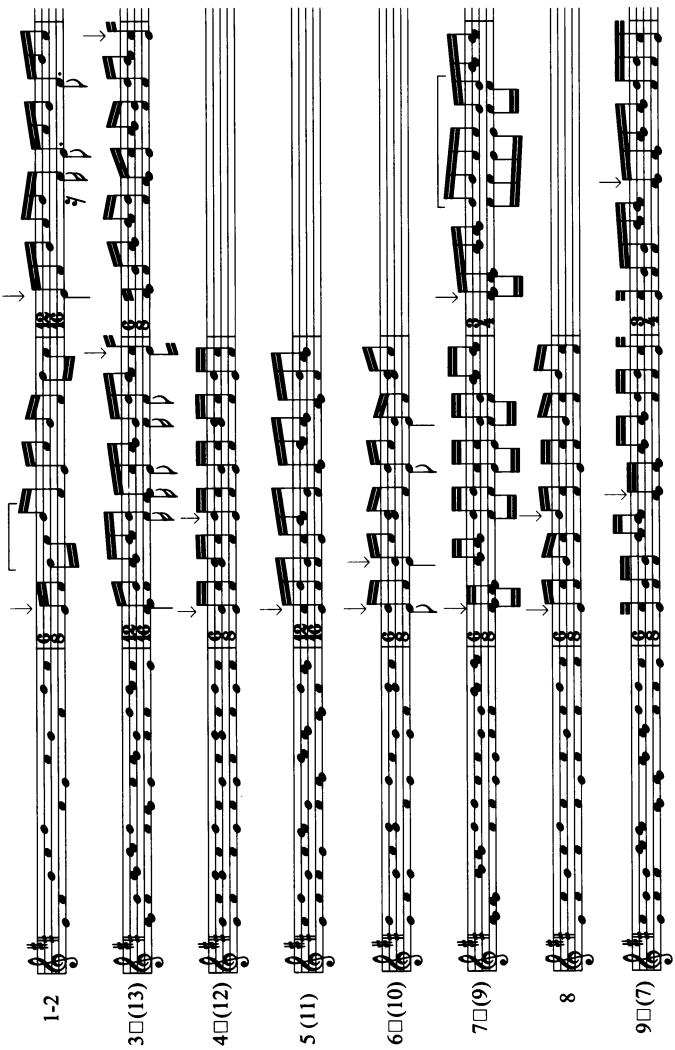
Although Reich's choice of twelve promises metrical complexity, the ordering and registral placement of the five pitches over twelve timepoints insures that varying durational and pitch patterns will arise in the superimposition. By choosing a scale segment (B, C♯, D, E, and F♯) set in ascending motion beginning on E, Reich assures that various parsings may be perceived as melodic, while his registral separation of E and F♯ from their scale partners (B, C♯, and D) creates a two-part counterpoint. The return of motivic fragments in various contrapuntal settings creates activity in what would otherwise be an overly repetitious environment. Some of the motivic connections between superimpositions are fairly complex. For example, the ascending third B-C♯-D of the unison melody offers a model for later music. This gesture is originally associated with the second and third eighths of a 6/8 measure; when that gesture recurs as a descending third in number 7 (D-C♯-B), we might interpret those pitches as spanning beats two to three (here of a 3/4 measure) as well (see brackets over the original melody and number 7 on Example 2b).

The phases between each superimposition play a metrical role as well. During a phase process, two-point counterpoint gives way to heterophony, and with it our perceptions of measures and beats eventually disappear (only to be re-established as a new counterpoint comes into being.) Even within the phase itself there is a metrical process, described by Paul Epstein as follows:

> Although continuous, [the phasing process] is heard in several distinct stages. At first the impression is of increasing resonance, a change in acoustic quality only. At the next stage one begins to hear the voices separate: echo replaces resonance. At a certain point the irrational division of the beat caused by the echo presents a dizzying rhythmic complexity. When the voices are nearly 180 degrees, or one half beat, out of phase, a doubling of the tempo is perceived: one has a momentary sense of stability, of a simplification of the irrational rhythmic relationship heard previously. This stage is very brief and is one of those events that seem to occur suddenly. The out-of-phase quality quickly returns and lasts until the new phase locks in.[19]

[19] Paul Epstein, "Pattern Structure and Process in Steve Reich's Piano Phase," *Musical Quarterly* 72/4 (1986): 498-499. He also identifies the second half of the entire pattern of superimpositions as a retrograde of the first half, and describes formal connections based upon pitch groupings the superimpositions create (i.e., superimpositions that are consonant versus those that are dissonant.)

Example 2b. Superimpositions and metrical possibilities in Piano Phase.



The cycle of superimpositions and phases brings about a larger continuity in this portion of *Piano Phase*: with each new counterpoint we follow emerging metrical identity (or identities!) to their dissolutions as the phase process begins, and so forth. While the ongoing cycle gives rise to a series of emerging/dissolving gestures, whether a larger metrical path encompasses the entire set of superimpositions is debatable. On one hand, each succeeding counterpoint inherits previously established metrical identities, and cyclical permutation guarantees a return to the original unison setting. The centrally-located counterpoints may also be the most complex, for while 6/8 and 12/8 are common, only numbers 7 and 9 suggest triple meter. The juxtaposition of 3/4 and 6/8 in these superimpositions is more striking because the two meters do not share a midpoint (as do 6/8 and 12/8). And in succession, numbers 7, 8, and 9 spin out these two meters over an extended time. However, readings that engage a larger metrical development devalue dissolutions and emergences of counting provided by each intervening phase, processes that will take on much larger dimensions in *The Desert Music*.

The performers play a large role in conveying these gestures, choosing the length of each section,[20] how to emphasize motivic/metric connections between superimpositions, and whether to articulate various metrical interpretations or to play "neutrally." Their success relies on an ability to draw the listener through the stages of a counting process, a criterion mentioned by the composer. In his essay "Steve Reich and Musicians (1973)" Reich writes:

> The question often arises as to what contribution the performers make to the music. The answer is that they select the resulting patterns in all compositions that have resulting patterns, and that certain details of the music are worked out by members of the ensemble during rehearsals. Resulting patterns are melodic patterns that result from the combination of two or more identical instruments playing the same repeating melodic pattern one or more beats out of phase with each other. During the selection of resulting patterns [for *Drumming*]...[the

[20] Each superimposition in the *Piano Phase* score is marked with a suggested range of repetitions; in the performance directions Reich adds that "the point throughout...is not to count repeats, but to listen to the two-voice relationship and as you hear it clearly and have absorbed it, move on to the next bar."

performers] all contributed various patterns we heard resulting from the combination of the three marimbas. These patterns were selected, and an order for singing them [with the marimbas] worked out..."[21]

Describing the listener's active role in his phase pieces, Reich stresses continuity within repetition; about *Violin Phase* (which he calls an "expansion and refinement of *Piano Phase*") he writes:

As one listens to the repetition of the several violins one may hear first the lower tones forming one or several patterns, then the higher notes are noticed forming another, then the notes in the middle may attach themselves to the lower tones to form still another...Since it is the attention of the listener which will largely determine which particular resulting pattern he or she will hear at any one moment, these patterns can be understood as psycho-acoustic by-products of the repetition and phase-shifting. When I say there is more in my music than what I put there, I primarily mean these resulting patterns. Some...are more noticeable than others, or become more noticeable once they are pointed out.[22]

The resulting patterns, a product of Reich's manipulation of meter, transform repetition into shape.

The Desert Music

"In the beginning there was the pulse."[23]

Steve Reich has described the distinctive opening of *The Desert Music* as "a kind of chorale, only instead of individual chords sounding for a given length of held notes, they're pulsed; instead of a steady tone you get rapid eighth notes repeating over and over again..."[24] These repeated pulsing chords appear in all five

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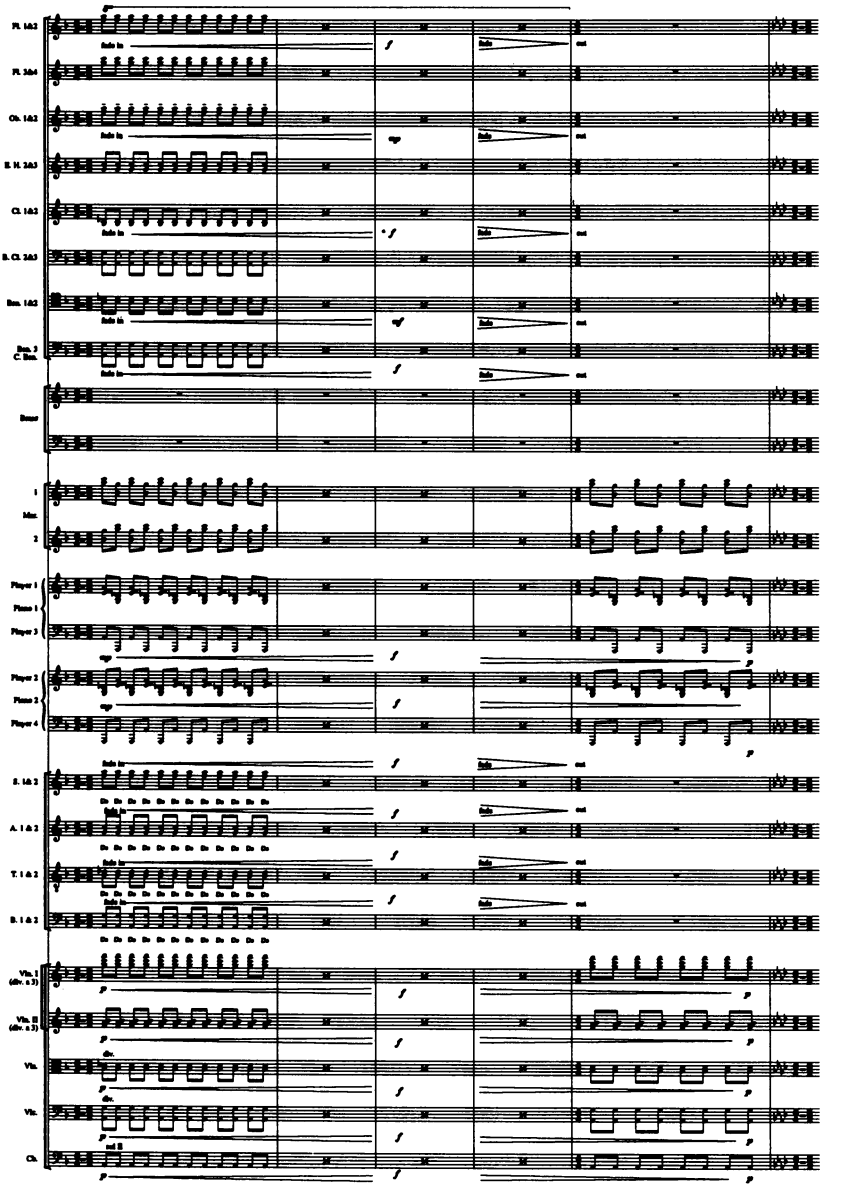
[21] Reich, *Writings about Music*: 79-80.

[22] "Early Works (1965-68)" in Reich, *Writings about Music*: 26.

[23] Jonathan Cott, "Steve Reich in Conversation with Jonathan Cott," liner notes for *The Desert Music* (Nonesuch CD 9 79101-2: 1985).

[24] Liner notes for Nonesuch CD 9 79101-2: 1. Reich has long been interested in manipulating pulsing chords. In his essay "The Phase Shifting Pulse Gate-Four Organs-Phase Patterns—An End to Electronics (1968-70)," he writes "On Lincoln's birthday in 1968 I had the idea that if a number of single tones were all pulsing at the same tempo, but with gradually shifting phase relations, a great number of musical patterns would result. If the tones were all in phase (struck at the same instant), a pulsing chord would be heard." See *Writings About Music*: 38.

Example 3. Pulsing chords that open The Desert Music.



movements, both in their original setting of steadily repeated eighths (as in Example 3, the opening of the first movement), and in syncopated reiterations; the instrumental reiterations are often augmented by voices chanting "de de." That the chords are repeated rather than held chorale-style is crucial, for their reiterations establish the lowest levels of meter, and provide ample opportunities for subsequent metric interpretation and reinterpretation at higher levels.

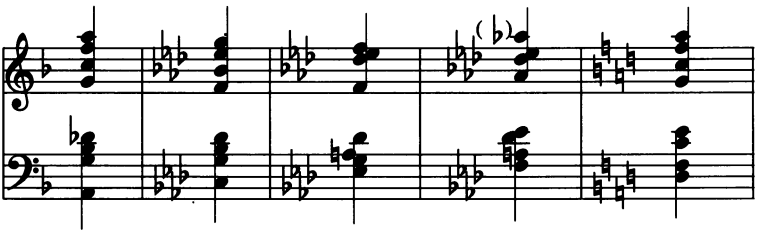
I will examine Reich's treatment of the chords in the outer movements, tracing how meters emerge and dissolve around this fundamental material. Occurring at the opening and closing of *The Desert Music* (as well as throughout the piece,) the chords are both formal and metrical frames, for their metrically "neutral" pulsing provides a point of departure and return for the many types of metrically complex music within the piece.[25] The emerging and dissolving meters lead away from the opening and back to the piece's close; like the earlier phases, they mark formal development, but in a much longer and sequential manner. The text mirrors this shape as well: syllables lead to fully formed words and sentences as pulse leads to measure and hypermeasure.

I begin with the emerging meter in the first movement, which itself divides into three parts: an introduction lasting until R21, the texted portion of the movement from R21 through R50, and a closing section which recapitulates much of the introduction. It is in the introduction that several levels of meter emerge, and at the opening Reich establishes only its very lowest levels: broken chords in the marimba and piano parts group them and the chorus's chanting into a quarter-note pulse (refer to Example 3).[26] Although the pulses cycle through five harmonies (shown in Example 4a), the change from one harmony to the next does not group the quarter pulse at a higher level because the duration of the chords varies. This section, does, however, establish some partial regularities from which to build higher metric levels in subsequent music: on Example 4b, where each chord's duration is shown in

[25] I will discuss the metrically complex central canon in the third movement later on in the paper.

[26] Some (including myself) may hear a half-note pulse here; I will address sources for this next metric level shortly.

Example 4a. Five-chord cycle.



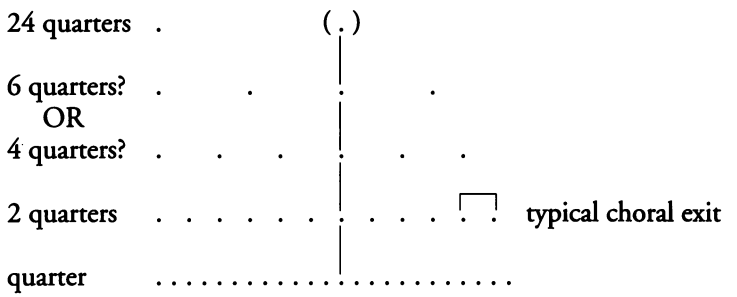
Example 4b. Durations (in quarter notes) of five-chord pattern: Emerging regularities.

Bass of chord:	A	C	E♭	F	D	
Opening through R4:	47	(24)	(24)	20	28	
R5 - R9:	(24)	30	(24)	20	(24)	
R10 - R14:	26	(24)	(24)	20	30	
R15 - R20:	(24)	30	(24)	20	(48)	(18)

quarters, note that a majority consists of twenty-four quarters, and all but the first endure for an even number of quarters.

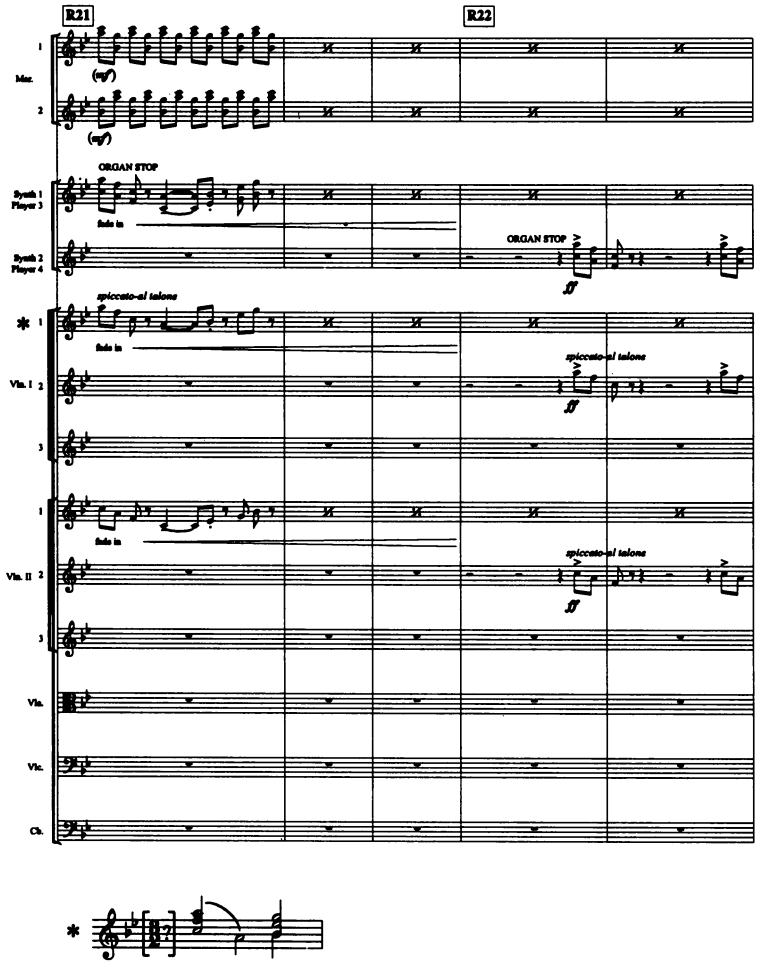
This consistency must certainly contribute to the half-note pulse many of us may infer in the introduction: if we attempt to count halves, we are repeatedly rewarded when a harmony changes. Even so, there is no continuous event in the music that subdivides the twenty-four quarters into twelve halves. Instead, the half-note pulse is suggested in a more subtle (and certainly less typical) way, arising from the interaction of chorus and orchestra. The chorus's chanting is coordinated with the harmonic rhythm of the instruments: entering shortly after a change of harmony, the chanting stops most often four quarters before the following change (see the bracket on Example 5, which shows the inner construction of a typical twenty-four quarter span). The absence of voices thus helps to predict the next harmonic change, as well as to mark a duration of four quarters; this duration always begins on an odd-numbered quarter of the larger span (in other words, on the first quarter of a half-note pulse).[27]

Example 5. An emerging 24-quarter grid, with typical choral exit.



[27] While this silence has the potential to suggest the next higher level of meter (six units of four quarters each), two factors prevent a whole-note pulse from emerging. First, the choral silence is not always four quarters long; rather, silences two or six quarters in length reinforce only a half-note pulse. Second, not all harmonic cycles consist of durations of a multiple of four (review Example 4b).

Example 6. Violin ostinato (*) at R21 marks half-note pulse.



Because the confirmation of a half-note pulse is neither continuous nor unvarying, the process of emergence is by no means direct, or for that matter, definitive; rather the higher duple grouping arises as a probable regularity over the course of the introduction, as does one's sense that twenty-four quarters form a likely duration for a single harmony. The method differs from a typical establishment of tonal meter because it does not build up levels of meter in the most efficient (shortest) way.[28] Rather, the intentionally slow pace at which we come to count higher levels of meter enlivens (or even justifies) the multiple repetitions of the chord pattern. And even if listeners infer a half-note tactus, they cannot connect this level hierarchically with the inconsistently appearing twenty-four quarter span: there is still at least one missing level between two and twenty-four quarters, as shown on Example 5.[29]

At the start of the second section (R21, shown in Example 6) a new ostinato in first and second violins continues the metrical development. Lasting six quarters each, the repetitions of the ostinato confirm the value of even-numbered spans. Additionally, the ostinato's internal pitch structure fortifies the half-note tactus, as shown by the reduction below Example 6, where the arpeggiation of an F-major triad from one A to another marks two half notes and the following B♭ is heard as an anticipation of a decorative E♭ major triad. We might even attempt to count in 3/2 for the first few bars, although shortly, additional offset ostinati weaken this larger level considerably.[30]

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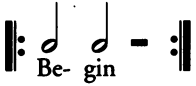
[28] From the perspective of cognition/perception studies, I am suggesting that the entrainment process is deliberately slow; see Justin London's "Loud Rests and Other Strange Metric Phenomena (or Meter as Heard)" in *Music Theory Online* 0/2 (April 1993).

[29] An additional complication to the establishment of a metrical hierarchy is Reich's practice of continuing one harmony after the new one has already begun; while I don't consider the overlappings to impede the boundaries of harmonic change, they certainly may obscure them in some peoples' hearings.

[30] Taken alone (without the preceding introduction), the twelve eighths of the ostinato might suggest divisions other than the 4 + 4 + 4 described above. For example, one might count in 12/8 with a downbeat on the second notated eighth note. However, this alternative reading violates the well-established quarter-note pulse from the introduction.

Example 7. R26-34: Multiple hypermeters.

I. R26: six-bar unit



x 6 = 6 bars

12 bars: 6 + 6 (2 + 2 + 2)

R27: six-bar unit

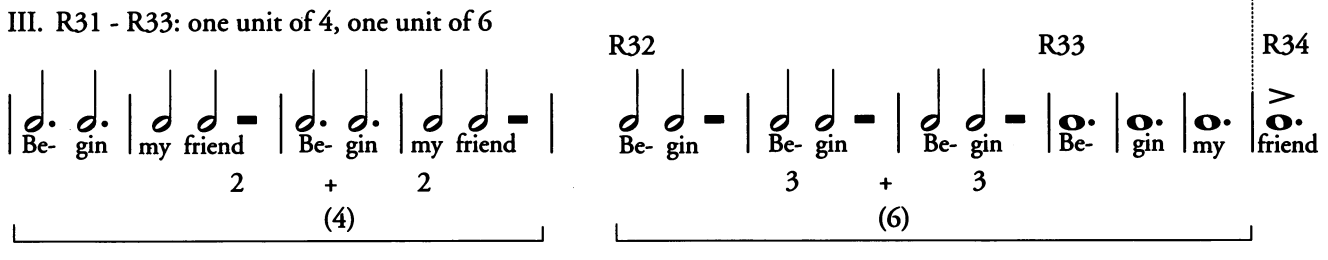
x 3 = 6 bars

II. R28 - 30: four-bar units

x 3 = 12 bars

12 bars: 4 + 4 + 4

III. R31 - R33: one unit of 4, one unit of 6



Nonetheless, as irregular chords give way to the steady reiterations of an ostinato at R21, the decrease in metrical tension is palpable, and this process continues when the voices finally enter at R26. The choral reiteration of the word "begin" solidifies both the half-note tactus and the 3/2 meter (see Example 7), and further texted music begins to group that meter into hypermeasures. Although perhaps less dramatic than the definition of pulse and measure, the grouping of measures into hypermeasures continues the metrical development through the first movement's middle section. Instead of pulsed chords, Reich reiterates the piece's first line of text (appropriately, "Begin, my friend") in alternating six and four-bar hypermeasures, a process summarized in three stages in Example 7.[31] The chorus "begins" six times over before completing a line of text!

Neither hypermeasures of four or six bars are prototypical for this passage. Instead, the alternation of the two lengths has a character of a competition, giving reason for the chorus to repeat the text: they must begin in several ways before continuing. It is only when the middle section gives way to the conclusion that six-bar hypermeasures "win": at R51, Reich sanctions this length by recapitulating the opening chords. Their reappearance here, in the context of the rock-solid 3/2 meter, recalls the metrical distance we have traveled over the course of the movement. Example 8 is formatted to compare the chords' recapitulation with their original appearance shown in Example 4a; not only have six-bar units assumed hypermetrical predominance, but the pitch closure provided by the return of the first chord at R56 suggests the accumulation of another layer of hypermeter. The emergence of measure from pulse, and hypermeasure from measure, is a goal-oriented process encompassing the entire movement. It comes to an end when an extensive metrical hierarchy is finally complete.[32]

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[31] That Reich delays texted music until now might indicate that the chorus could not "begin" until basic elements of metrical organization—i.e., pulse and measure—were in place. Note the composer's continued use of a mixed value on Example 7: six-bar hypermeasures are subdivided into both two-bar and three-bar units and twelve-bar hypermeasures are divided both by four and six.

[32] The chords play an equally important role in the metrical structure of the second movement. Because in their final appearance in the first movement they are imprinted with a stable metrical identity, their return in movement two

Example 8. Recapitulation of five-chord pattern: Hypermetric periodicity.

Bass of chord:	A	C	E♭	F	D	
R51 - R55:	36	36	36	36	36	(36 quarters = 6 bars)
R56:	36					

Metrical Dissolution: *The Desert Music*, V

The last movement of *The Desert Music* reverses the processes of the first: a metrical emergence becomes a dissolution. The movement consists in large part of recapitulated material from the first movement. By bringing this music back, Reich recalls its metrical identity only to break it down. In other words, rather than representing a return to stability, this recapitulation serves a developmental role: the variations made to returning material are not decorative, but substantive, transforming its very nature and function. As its accentual identity becomes less apparent, a repetition becomes more static, less capable of making projections for the future. As such it becomes appropriate closing material.

The last movement first recapitulates the violin ostinato (shown in Example 6), and although three movements of the piece have intervened, this first reappearance of the ostinato immediately recalls 3/2 meter.[33] By the first movement's end, the pairing of this ostinato with the original five-chord cycle lent to the chords both a 3/2 metrical identity and the suggestion of a six-bar hypermeter. Such a hypermeter does not reappear here, and before

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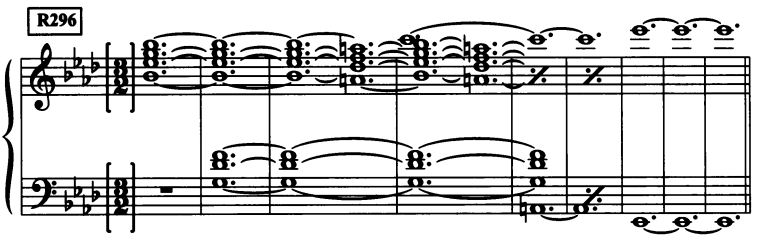
reinstates meter at moments of metrical ambiguity; later in that movement, in music strongly reminiscent of the "Augurs of Spring " from *The Rite of Spring*, they are themselves again subject to reinterpretation (see Rehearsals 74-79). The complex and drawn-out changes of meter in this movement are in the service of the text, which describes the complexity of the listening process: "I am wide awake. The mind is listening."

[33] Interestingly, a different violin ostinato also introduces low-level metric identity in the third movement; however, its twelve eighths suggest two bars of 3/4 rather than one bar of 3/2, another example of Reich's multiple use of this mixed value.

the inevitable return of the chord cycle there are instead striking, if short-lived, attempts to establish hypermeasures. In each of these sections of music, a repeated gesture is varied so that periodic statements give way to metrically irregular versions: expansions or contractions of the original dissolve the previous hypermeter. Example 9 describes the hypermetrically unstable music that takes place from R296-R324; each variation of the original pattern becomes longer, attenuating its metrical identity. For reasons of length I will not discuss subsequent music, noting only that Example 9 has the strongest periodic prototype, strengthened by its large number of reiterations before being subject to variation, and to note that none of this music bequeaths a hypermetrical identity to the concluding music.

Example 9. Start of metric dissolution at the end of The Desert Music.



Prototype beginning at R296. Nine-bar contrapuntal pattern, appears six times: R296, R299, R302, R305, R308, R311

Variations. Same contrapuntal pattern in longer versions: R314 (12 bars); R316 (12 bars); R318 (14 bars); R321 (18 bars)

When Reich finally does recapitulate the familiar five-chord pattern at R353, metrical dissolution becomes inexorable, following a straightforward and uninterrupted course summarized in Example 10. Reich does not bring back all of the regularities established by the pattern:[34] in its first reappearance at R353, the pattern loses both its characteristic opening, beginning midstream on its second

[34] Review Example 8 for a summary of the pattern's features.

member (i.e., on the chord with a bass of C rather than A). It also loses its hypermetrical identity, as two of the chords last only five measures. The integrity of the cycle further dissipates during what would be its third statement (beginning at R362) when the lowest instruments drop out (R363), leaving the chords without their original basses. Eventually the borders of each harmony disappear, first as common tones are sustained between chords and finally as changes of harmony disappear completely. While it is impossible to identify the exact moment where the integrity of the measure dissolves, there remains by the end of the movement at most a half-note pulse; and even this pulse has no confirming articulations in the score, but remains only as a residue of the movement's opening. The entire piece has come full circle: pulse returns to pulse.

The Desert Music's Central Canon: A Complete Process

At the center of *The Desert Music*,[35] Reich composes a canon on provocative words taken from William Carlos Williams's "The Orchestra":[36]

> it is a principle of music
> to repeat the theme. Repeat
> and repeat again,
> as the pace mounts. The
> theme is difficult .
> but no more difficult
> than the facts to be
> resolved.

Reich writes about this text that "[t]hose at all familiar with my work will know how apt those words are for me..."[37] A canon is a

[35] The canon is in the middle section of the third movement (designated IIIB by the composer), and the third movement is itself the center of the five-movement work where movements two and four share the same text. We have already noted the shared opening and closing material, which completes the symmetrical organization of the entire work. As the center of this symmetry, the canon is a focal event.

[36] *The Desert Music and Other Poems* (New York: Random House, 1954): 14.

[37] Liner notes for Nonesuch CD 9 79101-2.

Example 10. Recapitulation of de-de*'s and five-chord cycle.*

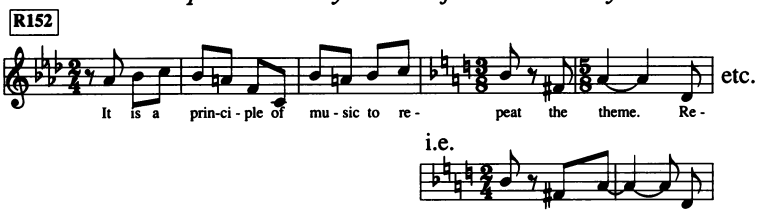
Prototype: missing here! (Prototype is 5 units of 6 bars, shown in Example 8)

Variations	R353: 22 bars =		6	5	5	6	
	R357: 28 bars =	6	6	5	5	6	
	R362: 28 bars =	6	6	5	5	6?	(unclear harmonic border)
	R367: 24 bars =	? (no clear change of harmonies)					

particularly appropriate means for Reich to display his sophisticated use of repetition; I will portray the repetitions of this canon as participating in a complete process of metrical emergence, multiple meter, and metrical dissolution, and as such it is a microcosm of the piece as a whole.

The mechanics of the canon are impressive in and of themselves: the canonic melody is quite long (thirty-two quarter notes) and is repeated in two additional women's parts separated by the distance of three and two eighth notes. As the canon is repeated, it is augmented by additional accompanimental voices (some themselves in canon); the top half of Example 11b shows the fourth statement of the canon at R163 where a three-part canon in the piccolos (replicating the voice entrances) and a lower strings/brass accompaniment are also present (because Reich uses repeat signs here, the start of the *dux* voice, with words "It is a" appears at the last notated bar of the soprano 1 part). Although Reich's introduction of a melody quite similar to the canonic one earlier in the movement might suggest a half-note pulse (see Example 11a, from R152, where I have rebarred the melody entirely in 2/4), intervening irregularly accented music probably weakens any connection one might make between these two.

Example 11a. Early version of canonic melody.



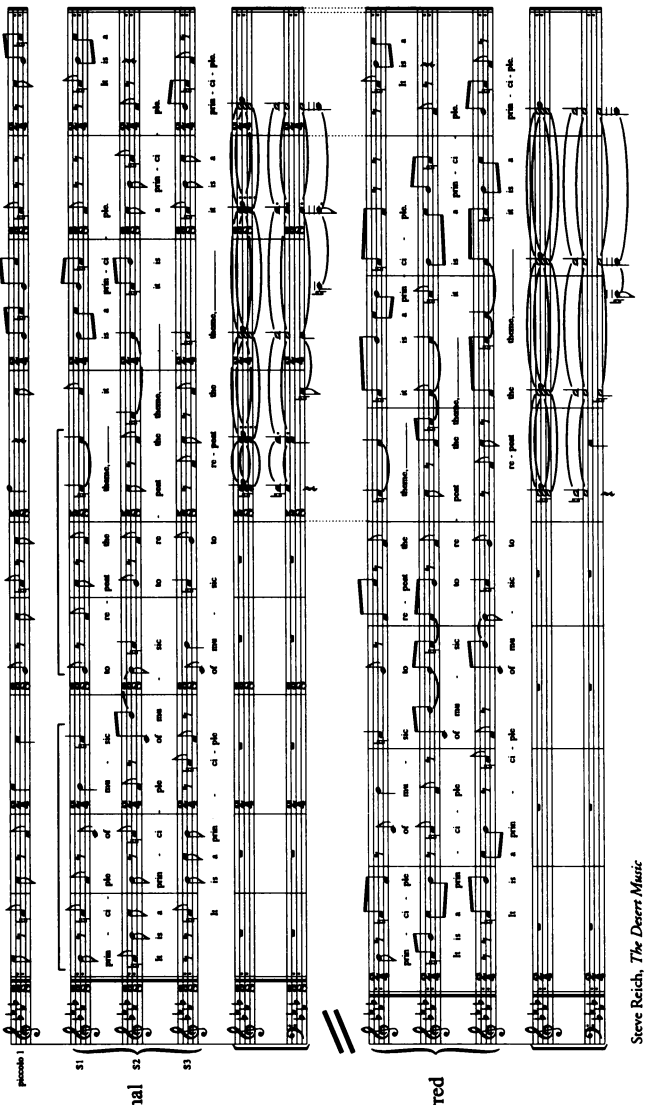
In other words, there is not much in the way of a pre-existing identity for the melody, or of an ongoing pulse as the canon begins, and the asymmetrical entrances of the voices suggest both pulses of two or three eighths. On the other hand, each repetition of the canon lasts thirty-two quarters, a pure value (in other words, one with multiples only of two), meaning that a listener familiar with the entire canon cannot count it periodically in threes. Additionally, the three-part counterpoint begins to mark periodically important locations in the thirty-two note span:[38] the first soprano arrives at the key word "theme" on the seventeenth eighth (the midpoint, shown with an asterisk on the upper half of Example 11b) and marks that midpoint with a half note, the longest duration in the melody. In this way duration and text reinforce both a division of thirty-two by sixteen and by four. The seventeenth eighth is also a point of harmonic arrival: at that moment, and for the next following four eighths, the three sopranos join to "repeat the theme" on the members of an F-major triad.

Additional accompaniments to the canon also support a division of the canon into two parts. At the canon's third statement (R162), the first piccolo line marks its midpoint (the sixteenth and seventeenth eighths) with a quasi-cadential, high-register C to F. During the next repetition of the canon (R163), lower strings join in at the seventeenth eighth, adding both a strong demarcation of that moment as a downbeat, as well as articulating a quarter-note pulse for the next three quarter-note beats. Each of these strata taken together, especially in the context of the remaining sixteen eighths (a value divisible only by multiples of two,) suggests a quarter-note pulse, and perhaps even a half-note measure.

The extent to which a listener is inclined to hear a metrical emergence, and to carry it forward into the next repetition of the

[38] In identifying locations within the canonic melody, I am counting from the first notated downbeat on the score, not from the upbeat on which the *dux* begins.

Example 11b. R163 canon, original and rebarred version.



canon, is probably dependent on factors beyond the music itself.[39] I wish to argue, however, that grouping by two has accumulated weight both within that canon—its second half is more easily heard periodically than its first—and also as the canon is repeated and augmented by additional strata. The lower half of Example 11b aligns a duply rebarred canon below Reich's original barring, identifying the strata that contribute to the 2/4 meter. The original barring shares with the duple version the very downbeat that divides it into two equal halves (this is indicated by the line drawn between the two readings).[40]

Nonetheless, even if we eventually come to count duply, we must also realize that there are significant and ongoing challenges to such a reading. Let us consider the barring given by the composer. It marks a durational pattern of 3 + 3 + 4 eighths (see the brackets beginning on the canon's downbeat above the upper half of Example 11b). This pattern, which repeats twice and follows the accentuation of the text, encompasses the entire first half of the canon. Although it seems difficult to continue that pattern beyond this point (a 3/8 reading seems plausible beginning on the twenty-first eighth), the pattern of ten eighths can even be counted in a quarter-note pulse if this pulse continues from the canon's second half. What I suggest is that this canon represents a

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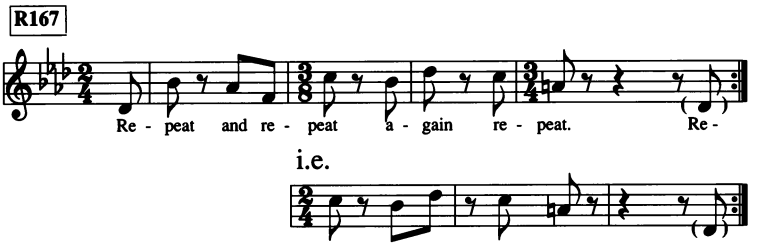
[39] Here I refer to the "conservative/radical" predilections of listeners, their willingness to give up periodic counting in the face of contradictory evidence (these terms come from Andrew Imbrie's "'Extra' Measures and Metrical Ambiguity in Beethoven," in Alan Tyson, ed., *Beethoven Studies* (New York: Norton, 1973): 44-66), as well as their familiarity with musics not dependent on metrical periodicity.

[40] The joint arrivals of the two readings is an example of what Pieter van den Toorn has called "background periodicity" in the music of Igor Stravinsky; see for example, chapter 3 of his *Stravinsky and The Rite of Spring* (Berkeley: University of California Press, 1987). One might also trace this synchronization to Reich's study of West African drumming, for the cyclic reappearance of superimposed drumming patterns is a fundamental feature of that style. For example, Simha Arom (in "Time Structure in the Music of Central Africa: Periodicity, Meter, Rhythm and Polyrhythmics," *Leonardo* 22/1 (1989): 92) designates as a macro-period "the cycle resulting from the superposition of periods of different dimensions...the macro-period then provides the sole point of juncture that is common to all the superposed periods." In other words, Arom's macro-period is very similar to van den Toorn's background periodicity.

complex example of multiple meter. It occurs in two guises: we may consider the canon as a whole to have both an irregular and a periodic reading, or we may even chose to hear a process of emergence within each repetition, where the first half's irregularity gives way to the second half's periodicity.

Each of these readings is edifying in various ways. The irregular reading respects textual accentuation, at least in the *dux* (for in *any* reading, the melody is superimposed with competing metrical versions of itself). In the completely periodic version, each of the three voices enters on one of three salient metrical locations: the downbeat, the offbeat, and off the beat. Accordingly, the melody receives three simultaneous accentual identities, evident in textual reaccentuation. Consider the recurrences of the word "repeat," highlighted by its leap from a tonic-like F up to the highest pitch C: after the first voice misaligns metrical and textual accentuation ("RE-peat"), the two echoes "fix" this unusual setting. Additionally, *within* each melody there is a metrical reaccentuation of the opening material: compare the first "It is a principle" with its repeat seventeen eighths later in any of the canonic lines. As the climax of the third movement, this canon is especially complex.

Example 12. Second shorter canon at R167.



Steve Reich, *The Desert Music*

The canon that follows directly releases the accumulated metrical tension. With its shorter text ("repeat and repeat again") and shorter, pure length (sixteen eighths) it is more likely to be heard in duple subdivisions. Additionally, its opening melodic and durational structure suggests 2/4, a reading continued on the lower staff of Example 12 and enhanced by the lack of canonic entrances

for the first four eighths. During its repetitions we may hear the quarter pulse group into 2/4 measures; perhaps those four measures even become part of duple hypermeasures.

The following texts, however, mandate a metrical dissolution. In all three clauses ("as the pace mounts", "the theme is difficult", and "but no more difficult that the facts to be resolved"), Reich juxtaposes varied repetitions with original statements, a process the reader will recall from the last movement. In the first, "as the pace mounts", starting at R170, Reich alternates a straightforwardly periodic motive with two other versions, one just an "extra" eighth too long, and another whose odd number of eighths and length obliterate a quarter pulse.[41] The top staff of Example 13 identifies each of the three versions in their original barring; on the example's lower staff I have rebeamed each version's durations to show how it supports or detracts from a quarter pulse. Reich sets the text "difficult" with a canon lasting thirty-three eighths at R182. This canon contrasts with both preceding ones, for even an eighth pulse is hard to track. Whereas the "it is a principle" canon is parsed at its midpoint, the current canon is assymmetrically divided by a comparable accompanimental entrance at its thirteenth eighth.[42]

When the chorus finally reaches the word "resolved," they repeat its two syllables in changing, irregular durations. No pattern emerges other than the two syllables have unequal lengths. The movement is ultimately "resolved" when the original pulsed chords return at R210. Resolution means dissolution, for the final music articulates only a single eighth-note pulse: earlier metrical complications have "resolved" back into pulsed chords.

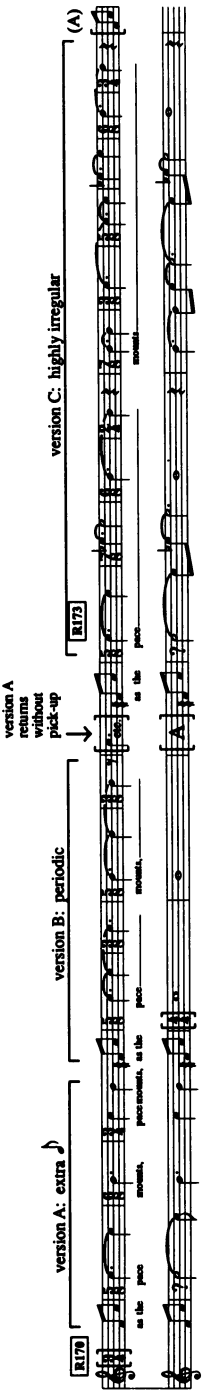
Conclusion: The Nature of the Metrical Process

I begin to perceive...minute details when I can sustain close attention and a gradual process invites my sustained attention. By 'gradual' I mean extremely gradual; a process happening so slowly and gradually that listening to it resembles

[41] I have chosen the start of each statement based upon the reappearance of the contextually long pitches C and B.

[42] Thirty-three eighths could conceivably be grouped into eleven dotted-quarter pulses; such a regularity has been evaded.

Example 13. Three versions of "as the pace mounts."



Steve Reich, *The Desert Music*
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watching a minute hand on a watch—you can perceive it moving after you stay with it a little while.[43]

Because meter is by its very nature cyclical, it sets forth a process of departure and return that may typically extend through eight or even sixteen bars; we hear these periodic replications as part of a gradual process. Reich's music demonstrates that the *creation* of meter may be even more gradual: the process of building up patterns of accent may take place over an entire section of music. The gradual evolution of metrical identity is an especially appropriate method of formal development in a style of music based primarily on repetition. As motives gain layers of metrical identity, their repetitive features are superseded by their growing projections for future music. Reich sustains long-term continuity when metrical emergence moves beyond the typical goal of metrical hierarchy to multiple meter. Metrical dissolution is a closing gesture, for a passage losing its metrical identity is also losing its implications for the future.

Emerging and dissolving meters arise from the purposeful omission of metrical accent in a mixed span, or from contrasting accentuations in repeated spans; multiple meter results when a *single* span has contrasting identities. Although they occur at several metrical levels, both techniques are most striking when they engage tactus and measure, where we direct our primary counting efforts. They are distinguished from common-practice counting by the very gradual way in which metrical identity is established. These pieces are *about* discovering one (or more) accentual interpretations at one or more levels of counting. The limited pitch material becomes an essential feature of such a process: it is necessary to "stay with it a little while" to comprehend the "slight differences of accent" that eventually create rather large differences.

Both *Piano Phase* and *The Desert Music* share a reliance on metrical process for formal definition. But Reich's metrical manipulations are far more nuanced in the later work: the phasing process has given way to more extended and gradual motions. Here the composer's careful control of variation with repetition enables him to withhold and delay the establishment of low levels

[43] "Music as a Gradual Process (1968)," in Reich, *Writings About Music*: 36.

of meter over many minutes of music and his ingenious use of contrasting patterns of accent creates opportunities for multiple interpretations both within mixed spans and pure ones. Moreover, the ebb and flow of meter in *The Desert Music* simultaneously shapes sections, individual movements, and the entire piece. Whereas *Piano Phase* merely stops,[44] remaining caught in an unending cycle of repetitions, the pulsing chords that fade away in *The Desert Music* bring it to an end. Equally engaging is the connection such processes have with William Carlos Williams's text. As another portion of the text goes, the listener is "wide awake. The mind is listening." Reich writes about this text that "I want you [the listener] to be wide awake and hear details you've never heard before."[45] His metrical techniques give us just such an experience.

[44] In the score's liner notes Reich describes the end of *Piano Phase* as follows: "After several repeats in unison one performer nods his or her head on the downbeat, and after four repeats, both performers end together."

[45] Liner notes for Nonesuch CD 9 79101-2.

Erratum for *Intégral* 14/15

p. 275 Delete each small box between pairs of numbers. There should be an empty space; refer to the label for the fourth staff: "5 (11)".