MTO A JOURNAL OF THE SOCIETY FOR MUSIC THEORY

Gestural Forces in Steve Reich's Augmentation-as-Process Works*

Martin Ross

NOTE: The examples for the (text-only) PDF version of this item are available online at:
https://www.mtosmt.org/issues/mto.25.31.3/mto.25.31.3.ross.php

KEYWORDS: Steve Reich, process music, minimalism, gesture, semiotics, musical forces, animation

ABSTRACT: Much of the scholarship on Steve Reich's process music has been on his "phase-as-process" works, but there are two notable early works that do not use phase to convey process: *Pendulum Music* (1968) and *Four Organs* (1970). The former literally realizes the physical forces of gravity and inertia through swinging microphones, and the latter metaphorically represents the effects of the same forces. While *Pendulum Music* augments the length of individual tones over time, *Four Organs* lengthens a dominant eleventh chord as the work progresses. Due to their seemingly straightforward design, these "augmentation-as-process" works tend to receive less analytical attention from scholars than the phase works for which Reich is better known. This analysis demonstrates how the sounds signifying process are expressed through literal and metaphorical forces to create salient musical gestures. Because I assert that *Four Organs*, realized through a score, emulates the process of *Pendulum Music*, realized through instructions, I will rely upon animated representations of the compositional activity rather than score examples.

DOI: 10.30535/mto.31.3.7

Received August 2023

Volume 31, Number 3, August 2025

Introduction

[0.1] In his 1968 essay, "Music as a Gradual Process," Steve Reich describes how a process can be applied to music as an audible and perceptible phenomenon, predetermined in construction, synthesizing form and content, and rejecting improvisatory actions and/or events. The composer of process music has personal control over a process (referred to by Reich as "*it*") simply by establishing its parameters and letting it play out. This "playing out" subsequently transfers control of the musical process to a listener, whose perception and recognition of minute details shape their experience of the overall process. As Timothy Johnson has characterized it, a listener's engagement invites a form of participation in the construction of the process itself (1994, 744–47).

[0.2] Most theoretical scholarship on Reich's early music has focused on his "phase-as-process" works, including *It's Gonna Rain* (1965), *Come Out* (1966), *Piano Phase* (1967), and *Violin Phase* (1967).

In these works, a listener follows gradual changes between one fixed voice and another voice that progressively accelerates to the next unit. In *Pendulum Music* (1968) and *Four Organs* (1970), however, gradual change is conveyed through the progressive lengthening of the musical material. Both Reich's phase and what I will call "augmentation-as-process" works exemplify his interest in "a compositional process and a sounding music that are one and the same thing" (Reich 2002, 35).

[0.3] Most analyses of minimalist music have primarily focused on the objective, formal aspects of the composition rather than the role of a listener. This is not intended as a critique: scholars conducting structural and systematic analyses of process music—and minimalist music more broadly—have identified compelling, quantifiable characteristics. An alternative analytical method would incorporate the listener's role, address the compositional aspects of the music, and allow for multiple subjective interpretations. Although more speculative in nature, such an approach affirms the validity of the listener's experience and acknowledges Reich's philosophy and original intentions. Naomi Cumming's (1997b) scoreless analysis of *Different Trains* (1988) serves as a primary example of this approach towards Reich's music.

[0.4] Whereas Cumming approaches Reich primarily through a psychoanalytic framework, I will use musical gesture. In his book on gesture in common-practice music, Robert Hatten asserts that gesture relies upon "the ability to recognize the significance of energetic shaping through time" (2004, 93). Identifying this energetic shaping involves several analytical considerations, including the influence of musical forces and their impact, the effect of compositional techniques on the listener, and the recognition of musical passages that represent significant energetic shaping through time.

[0.5] In this article, I apply a semiotically grounded theory of musical gesture to analyze parallels between Reich's *Pendulum Music* and *Four Organs*, his two augmentation-as-process works. I begin by discussing how an ontological understanding of process music engages a listener. Next, using *Pendulum Music* as an example, I introduce my theory of musical gesture. The remainder of the article analyzes musical gesture in *Four Organs*. The significant events within these works are grounded in the idea that the representation of sound—literal in the former and metaphorical in the latter—resembles process itself. Using animated representations, I show how *Pendulum Music*'s "pure" realization of a temporally augmented process is emulated in *Four Organs*. I conclude by further considering the role of the listener as the interpreter and potential modes of engagement with process music.

1. Process music and listening subjects

[1.1] Above all else, listening guides my analysis; therefore, I begin this discussion with process music and the role of the listener in analysis. By "process music," I mean music in which a single musical process determines the work's form and content (e.g., *Pendulum Music* and *Four Organs* are augmentation-as-process works). By "musical process," I am referring to Reich's affinity for creating works through the permutations of a single predetermined procedure. As previously discussed, phasing is Reich's most well-known musical process.

[1.2] The predetermined structures employed in Reich's process music suggest a relationship between form and content that is uncommon in Western art music. As Reich explains, "Material may suggest what sort of process it should be run through (content suggests form), and processes may suggest what sort of material should be run through them (form suggests content)" (2002, 34). Material is prescribed in order to determine process just as process is prescribed in order to determine material. The result of this is a musical style where form and content continuously inform one another.

[1.3] Because of this fusion of form and content, Reich asserts that process music does not contain any hidden structural devices, but rather lays "all the cards on the table" (2002, 35). Even then, perceptual irregularities that may arise from listening are considered "impersonal, unintended, psychoacoustic by-products of the intended process" (35). Whereas the existence of these mysteries might draw the attention of the listener, Reich's intention remains the same: he wants listeners to be aware of the objective, predetermined, and, above all, *audible* musical process.

[1.4] In *American Minimal Music*, one of the earliest books on the "Big Four" American minimalists (La Monte Young, Terry Riley, Steve Reich, and Philip Glass), Wim Mertens describes an ambiguous relationship between American repetitive music and the listener. Mertens suggests that "[t]he music exists for itself and has nothing to do with the subjectivity of the listener," yet he also recognizes that the listener "actively participates" in the work's construction (1983, 90). Process music's simplicity invites listeners to be present, participate, and engage. Patrick Nickleson suggests that this simplicity offers precisely the level playing field that makes imagining the simultaneous presence of listeners possible, *even part of the design*" (2023, 38, emphasis mine). Paul Epstein's analysis of *Piano Phase* also supports this notion by describing the listener's experience as the discovery of both the "physical laws embodied in the process and of the psychological laws affecting the listener's interaction with the process" (1986, 494).

[1.5] The listener's engagement can provide further insight into process music. As Reich explained, listeners that attend to compositional qualities—including minimal materials, repetition, and slow rate of change—will find not only the surface-level sonic results of his process (the cards laid on the table), but also the "unintended byproducts." The latter may come from the "impersonal" process, but a listener's experience is anything but.(1) My approach is grounded in the possibilities of how listeners infer musical gestures in these works, and that is possible from viewing process music from a subjective lens. The article proceeds with the semiotic method while recognizing the significance behind the listener's engagement, which will be further explored in the conclusion.

2. Representing augmentation in Pendulum Music (sign and object)

[2.1] In his process works, Reich is interested in the integration of the compositional process and the resulting sound, viewing them as inseparable entities. One such process, according to Reich, resembles a swing being pulled back, released, and gradually coming to rest (2002, 34). He first explored this concept in *Slow Motion Sound* (1967), a work in which the performer is instructed to "very gradually slow down a recorded sound to many times its original length without changing its frequency or spectrum at all" (Reich 2002, 28). Technological limitations halted Reich from further developing *Slow Motion Sound*, and *Pendulum Music* was written the following year.

[2.2] *Pendulum Music* is arguably as close to being musically equivalent to Reich's swing metaphor as one could conceive. The work instructs two to four performers to each pull back a microphone "like a swing" and release them simultaneously, thereby creating pendular motion in each microphone. Reich specifies in his notes that "each microphone's cable is plugged into an amplifier which is connected to a speaker" (Reich 1980b). After the performers release the microphones, they are instructed to slowly turn up the amplifier so that the feedback becomes audible when the microphones are in close proximity with the speakers.

[2.3] Epitomizing an objective performance practice, discussed in the next section, the musicians' role in *Pendulum Music* is to initiate rather than to perform; their task is complete once they release the microphones. With no further personal intervention required, the musicians are effectively replaced by the physical forces of gravity and inertia—prompting Reich to describe the work as "strictly *physical*" rather than musical (2002, 95, original emphasis). By pulling down the microphones and setting them into alternating motion, gravity and inertia assume the role of unseen performers, their actions essential to the successful realization of the process.(2)

[2.4] The following three excerpts are from a performance of *Pendulum Music* (Langlois 2014). **Video Example 1** shows four people initiating the work. From left to right the microphones are released from opposite ends; in this performance, two pairs of adjacent microphones are dropped in sequence. As the work continues, physical forces gradually slow the rate at which the microphones swing, thereby lengthening the duration of each feedback tone. I define this musical process as *temporal augmentation*, reflecting the longer durations as the work progresses. **Video Example 2** captures a moment in which the feedback tones are noticeably "slower"—longer in duration and less distinctly articulated. Finally, the process is fully realized in *Pendulum Music* when no discernible differences remain between the feedback tones produced by each microphone. I refer to this as the music "flatlining" wherein the microphones cease meaningful motion and produce a sustained, homogeneous feedback texture. This is shown in **Video Example 3**.

[2.5] The process in *Pendulum Music* exhibits a musical (and physical) equivalent to Reich's description of pulling back a swing, releasing it, and observing it come to rest. Such an equivalence is conceivable through its musical representation: the sounds gradually elongating represent the augmentation that Reich intended. In other words, *Pendulum Music* audibly enacts a slowing process analogous to the decaying motion of a swing as it comes to rest.

[2.6] To better contextualize Reich's musical application of the swing metaphor, I turn to Charles Sanders Peirce's theory of semiotics. Peircean semiotics is structured around an interpretive triad: a sign (*representamen*) stands in relation to an object, and such a relation forms an interpretation (*interpretant*) (CP 2.274).(3) In *Pendulum Music*, we can hear (and see) how physical forces determine the duration of sound. The sound represents the process of slowing down—a sign representing its object. There is a dynamic quality to this: the listener's mode of attention to the triadic relationship between representamen and object effectively determines the resulting interpretation. Based on Peirce's system, the three most common interpretive inquiries involve the kind of sign it is, the sign's relation to its object, or how the sign is meant to be taken.(4)

[2.7] Because Reich's interest is a sounding music and process being "one and the same," my focus will be on the sign-object relation.(5) A given sign may relate to its object in three different ways: through a likeness or resemblance (icon), through a particular directedness (index), or through a conventional understanding (symbol). Since my focus is on the sonic resemblance of Reich's musical process, the sounds in *Pendulum Music* are best denoted as iconic signs.

3. Musical gesture (interpretant)

[3.1] Attending to the deceleration in *Pendulum Music* and discerning the underlying augmentation process constitutes an act of interpretation. To analytically demonstrate this interpretive act, I turn to the concept of musical gesture, which offers a means of tracing how listeners apprehend such processes. In her analysis of J.S. Bach's "Erbarme Dich" from the *St. Matthew Passion*, Cumming argues that gesture functions as an interpretant, allowing signs to represent their objects (1997a, 8).(6) Given the genre I am working with, however, my focus is more narrowly defined. Unlike Cumming, who examines the connection between melodic figures and expressive bodily movements,(7) I am concerned solely with how sound and process are conveyed in the music itself, and the moments in which a listener surmises the sign-object relation.

[3.2] Broadly speaking, gestures are significant actions that are typically communicative in function. Since they are most commonly associated with physical expression, much of the scholarship on musical gesture has focused on bodily movement and instrumental considerations in musical performance (Cole 2024, Momii 2024, and Gardner and Shea 2022 are recent examples). Process music, however, presents a potential challenge to this framework, as it complicates the inference of gesture. One could argue that performers of process music should act in service of the process itself, rather than as expressive agents. Reich characterizes the musical process as impersonal and fully self-contained, describing the composer's role as one of establishing control and "going together" with the process (2002, 35). As such, any inflection, articulation, or somatic events should emerge inherently from the process rather than from the performer. Regardless of medium, the semiotic content of process music should not originate from deliberate performative gestures. When performers do not mark or emphasize specific gestural moments, the process is allowed to unfold autonomously.(8)

[3.3] Several scholars have recently discussed gesture in twentieth-century music: Michael Buchler (2020) examines ornamentation in post-tonal music as musical gestures; Antares Boyle (2023) analyzes Salvatore Sciarrino using gesture, temporality, and Peircean iconicity; and Christoph Neidhöfer (2024) develops a post-tonal taxonomy of musical gesture in Camillo Togni's pluridimensional serialist works. Each of these analyses is grounded in Hatten's (2004) theory of musical gesture, and all three intuit some segmentation principles that attend to the salient musical parameters of the pieces being analyzed: passages are segmented through their ornamentation choices (Buchler), changes in intensity (Boyle), and differences of inner cohesion (Neidhöfer). In each case, identifying musical gesture relies on perceptible aural cues rather than tonal hierarchies or familiar gestural tropes.

[3.4] However, these scholars acknowledge the challenges in defining the "significant" application of gesture in their work. Any discussion of gesture as a vehicle for meaning is explicitly "left aside" by Buchler (2020, 28), and Neidhöfer concludes his analysis by suggesting that his semiotic framework for Togni's music could also offer further insights into other gesturally oriented post-tonal repertoires (2024, [4.12]–[4.15]). Boyle employs Peirce's concept of the icon to situate her musical gestures temporally, noting that later passages in *Recitativo oscuro* are "reminiscent" of earlier ones; however, she explicitly states that she does not pursue Peirce's theory in greater depth (2023, [1.5]). While Boyle's approach is broadly aligned with mine, it does not extend to positioning the icon within Peirce's interpretive triad.(9) Given that Reich's process music explicitly engages a sign-object relationship—namely, between sound and process—approaching gesture from a semiotic perspective is particularly appropriate.

[3.5] My use of gesture will still adhere to certain established parameters. According to Hatten, musical gestures are salient (2004, 102), meaning the gesture itself is a perceptually distinct entity. In common-practice music, such gestures are often delineated by stylistic features including formal themes, harmonic cadences, and rests. These features naturally segment the music into discrete, interpretable units, making the identification of gesture relatively straightforward. In process music, however, the situation is more complex. Rather than being punctuated by contrasting events or cadential closures, process music is characterized by a continuous, unidirectional flow. Its momentum is sustained by the gradual unfolding of a predetermined process, and this continuity is further reinforced through repetition. Unlike in common-practice idioms, where gestures are framed by musical syntax, gestures in process music must emerge from subtle changes in texture, duration, and intensity—parameters that unfold over time.

[3.6] Alfred Frankenstein, writing in 1969 during the early years of the minimalist movement, described *Pendulum Music* and other minimalist works as examples of "extended time music." He observed that "repetition is supposed to have a soporific effect, but a good 'extended time' composition is the least soporific music in the world" (quoted in O'Brien and Robin 2023, 121). This observation underscores the fact that repetition in process music is not aimless or ornamental, but rather deliberate and functional. Specifically, repetition serves to regulate the rate of change, making even the subtlest variations perceptible. Rather than being repetitive for its own sake, this strategy enables the listener to distinguish what has occurred from what is occurring—a perceptual shift that is itself salient, and, in the context of works like *Pendulum Music*, gesturally significant.

[3.7] To illustrate, repetition in *Pendulum Music* is established from the very beginning: the listener can observe the motion of one or more microphones, each swinging in alternating directions. The augmentation increases during each repetitive motion. Recognizing the rate at which the microphones slow during each pendular motion—whether individually or collectively—allows the listener to perceive discrete, salient events within an otherwise continuous process.

[3.8] Repetition, then, arguably serves as the foundational mechanism in much of minimalist music because of its role in making gradual change perceptible over time. In this context, salience becomes a key condition for identifying musical gestures, which may emerge not from dramatic contrasts but from subtle shifts in duration, texture, or intensity. The listener's ability to perceive these shifts as meaningful actions—gestures—depends on the clarity with which repetition frames and articulates change. As such, repetition is essential to analytically engaging with minimalist music's carefully controlled and process-driven structures.

[3.9] **Video Example 4** is an excerpt of a gesture in *Pendulum Music* shortly following the work's initiation (Langlois 2014). This video is coupled with four pendulum animations that show the motions of each pendulum and their sounding events. My pendulum animations correspond to the order in which the video's microphones are shown from left to right. Each microphone will have its own pendulum animation that shows the middle arrivals (sounding event) and direction (motion). The former is represented by an orange node and the latter is represented by an arrow.

[3.10] During each swinging motion, the microphone is further distinguished by its directionality. In Video Example 4, each microphone going back and forth creates a sense of controlled repetition, meaning there is arguably no perceptible change in speed during the fourteen-second excerpt. As the work progresses, a microphone's speed will slow down and consequently make each sounding

event longer. In either case, gravity and inertia ensure that the rate of temporal augmentation is progressive and even throughout the performance.

[3.11] With gravity and inertia at work, two sonic effects arise when the microphones come into close proximity with the speakers. The first pertains to the length of a singular sound (i.e., the feedback from one microphone). The duration of the sound is determined by each microphone's distance from its own speaker and the speed at which it is swinging. The sounds are short to begin with and gradually become longer until each microphone comes to a halt. The second effect concerns the number of sounds produced. When multiple microphones are dropped, multiple sounds are made, forming composite rhythms.

[3.12] In Video Example 4, all four microphones are swinging at approximately the same speed, which results in feedback of approximately equal duration for each microphone. This is visually represented by the length of the orange dot's appearance, which marks the onset of the sound. Each orange dot is qualified as an onset. There are three individual onsets for each repetition: microphone 3, followed by microphone 4, and then microphones 1+2 together. In this performance, microphones 1 and 2 move in opposite directions, but their speed and timing are aligned such that they make one onset that is approximately the same length as the onsets from microphones 3 and 4. I interpret this composite rhythm as a "short-short-long" pattern. Although the onset durations are all approximately equivalent, I view the 1+2 onset as a long rhythm because there is a longer period between their onset and the arrival of microphone 3's next onset. **Example 1** shows a representation of this rhythmic grouping.

[3.13] This gesture was inferred from the composite rhythm formed by the microphones. The rhythm's repetition—marked by the change in each microphone's direction—becomes a salient event, allowing the augmentation process to be observed. Because of the performative variables, such as the number of microphones used, when they are released, and their initial speed, every performance of this work will be a singular, particular realization of the augmentation process. This also means that the gestures inferred will vary between each performance (i.e., they are tokens of a type). Thus, gestures in *Pendulum Music* can be qualified as articulate moments of the microphones (i.e., composite rhythms formed) undergoing temporal augmentation. These gestures become longer as the work progresses.

4. Four Organs's gestural forces

[4.1] Whereas *Pendulum Music* relies on physical forces to generate audible gestures through a visible process of augmentation, *Four Organs* presents a more abstract realization of the same principle. In this work, gestural salience is fully composed rather than realized in physical motion, requiring listeners to perceive augmentation through the manipulation of musical structure alone. This shift from physical to compositional control over gesture highlights the role of intention in shaping perceptual experience, and it positions *Four Organs* as a compelling extension of *Pendulum Music* within Reich's broader exploration of process. In the program notes, Reich states this work is the only work he knows that "is composed exclusively of gradual augmentation of individual tones within a single chord" (2002, 50). Like *Pendulum Music*, which Reich described as "audible sculpture" (2002, 95), *Four Organs* was first performed at the Guggenheim Museum in 1970.[(10)] Reich composed *Four Organs* with the idea that one sonority would gradually get longer as the work continued.[(11)] Accompanying the four electric organists is a maracas player who provides a constant eighth-note pulse throughout, serving as a temporal grid against which the augmentation unfolds. As K. Robert Schwarz observes, the effect of this notated, gradual augmentation is to draw the listener into anticipating each successive stage of the process. This creates a distinct sense of directionality that is, according to Schwarz, absent from Reich's earlier phase-based works (1981, 230).

[4.2] The following analysis uses metaphorical pendulum animations to represent gestural activity in *Four Organs*, drawing on Steve Larson's concepts of musical gravity and inertia. Each animation corresponds to a single musical gesture and models the trajectory of one metaphorical pendulum slowing down—unlike the multiple literal pendula in *Pendulum Music*. Each gesture is marked by a full iteration of the dominant eleventh chord. Since this is the prominent sounding event, it is

marked as the middle arrival in which the pendulum moves towards and away. This middle point is analogous to the moment in *Pendulum Music* when each microphone swings toward the speaker and produces a feedback tone.

[4.3] *Four Organs* begins its metaphorical demonstration of the effects of gravity and inertia in three different stages. The piece parallels the motion of a pendulum: when an object is released from one end, it accelerates toward a central point. This initial movement represents the first stage: Reich establishes a rhythmic pulse with the maracas to constitute a musical "center." Larson describes this phenomenon as "rhythmic gravity"—a rhythmic quality that, like physical gravity, creates a sense of pull toward a point of resolution or stability (2012, 149). In this first stage, Reich uses rhythmic gravity to emulate the acceleration and convergence of motion toward the center.

[4.4] After reaching the center, a pendulum does not come to rest; instead, inertia carries it past the middle point, continuing in the same direction until it reaches the opposite end. In *Four Organs*, this motion is mirrored musically. Steve Larson characterizes this continuation as "the tendency of a pattern of motion to continue in the same fashion, where the meaning of 'same' depends on how that pattern is represented in musical memory" (2012, 96). The opposite end is then accentuated by a full attack of the chord at the beginning. Finally, after the second attack of the chord, the third stage involves the gravitational force pulling the music back toward the center. This reversal of direction not only reinitiates the process but also generates new gestures, suggesting a dynamic interplay between repetition and transformation within Reich's minimalist framework.(12)

[4.5] This introductory section of *Four Organs* spans approximately the first two minutes of the piece.(13) The eleven maraca beats played before the organs' first entrance suggest an uneven rhythmic division. As the work progresses, more beats are gradually added to the meter. Sumanth Gopinath describes this evolving structure as an "additive-metrical groove," a rhythmic pattern into which one settles (2019, 25). Despite the increasing complexity, the maraca pulse remains a constant, serving as a temporal anchor that enables both performers and listeners to track the unfolding rhythmic process.(14)

[4.6] The majority of my gesture animations are from the introductory section, which prepares the later augmentation section by progressing through different ways in which Reich can articulate the "lead-in," "arrival," and "departure" of the full dominant eleventh chord. Each new articulation generates a distinct musical gesture, and with it a new pendular motion. To maintain the symmetry in the pendulum metaphor, each gesture should be conceptualized as its own separate pendulum. The animations are taken as singular instances of these gestures, functioning analogously to Video Example 4 from *Pendulum Music*, where a single motion is isolated and observed.(15) The composite rhythm I segmented earlier was from a specific point in time where the directionality (gravity and inertia) was steady enough to not only form a rhythm but also repeat it, subsequently reinforcing its salience. In *Four Organs*, the rate remains steady through the maracas pulse, and the augmentation is brought on by longer time signatures rather than through natural means. As a result, both changes and segmentations in the work are more discrete.

5. Setting up the augmentation

[5.1] **Video Example 5** represents the initial gesture in *Four Organs*, using Bang on a Can's 2000 Nonesuch recording as the reference for all time markings in the examples.(16) Modeled after a pendulum, this gesture is visualized through three key nodes: two outer points and one central point, each representing moments of musical articulation. The central node, which features the complete dominant eleventh chord, is labeled attack "x," while the two outer nodes, which also feature the full chord, are labeled attack "y."(17) For an articulation to qualify as a "full" attack, the complete dominant eleventh chord must sound. The first instance of this full chord occurs at attack x, always positioned at the pendulum's midpoint. The motion toward x is metaphorically represented by musical "gravity"—a directional force represented visually by an arrow. The continuation into the second attack, y, manifests the perception of musical inertia (Larson 2012, 143). Upon arrival at y, musical gravity moves the arrow in the opposite direction, initiating a new sequence of attacks. This gesture exemplifies how *Four Organs*, like other phase-as-process works,

introduces an idea (in this case, a predominantly rhythmic idea) and subjects it to systematic transformation.

[5.2] As the gesture develops and new material is introduced, remnants of the full dominant eleventh chord from attack x continue into y. Because the chord is not held entirely from x to y, the orange nodes become more transparent and ultimately disappear as the music progresses, reflecting the attenuation of the sound. Notice how, in **Video Example 6**, x remains perceptible even as nodes appear and vanish. This persistence is due to musical inertia: the nodes are conceptually bound to x and disappear only once y fully materializes. This visual representation emphasizes the relationship between rhythmic momentum and textural change, reinforcing how Reich's process unfolds through overlaps in sound rather than abrupt shifts.

[5.3] As y fades and the pendulum changes direction, new nodes begin to appear *before* x, representing notes that anticipate and prepare for the next full articulation of the dominant eleventh chord in the pendulum center. In **Video Example 7**, we see this preparatory material introduced in the motion from y to x, establishing the groundwork for an expanded gesture. Following this, **Video Example 8** illustrates how Reich staggers the entry points of this material between y and x. This staggering is represented by successive nodes travelling to the center. By displacing the entrances across time, Reich creates the potential for each separate entrance to be augmented later in the work. **Video Example 9** continues this pattern but introduces further transformation. Here, the duration of x is extended, and the subsequent material moving from x to y is temporally closer to the next attack y. This shift tightens the relationship between x and y, compressing the pendular motion and increasing the perceived density of musical activity.

[5.4] The next significant change occurs when y is no longer fully articulated, as shown in **Video Example 10**. Reich only relies on one attack of the full chord to continue the process, meaning that there are no remnants going to and from the center and being articulated an outer node. However, the formal location of y can still be surmised through the release of attack x; again, x disappears when y appears. Thus, "implied (y)" marks the disappearance of x and the change in direction. As a result, implied (y)'s location is more formally ambiguous because it is less aligned with the directionality than it was previously with its y proper counterpart.

[5.5] Following the removal of y, Reich lengthens attack x, thus making the time between implied (y) to x shorter. As in the previous gesture, there is also no remnant material from x to implied (y). Rather, it is just the full chord. This absence of x material further destabilizes the perceived formal boundary at implied (y), enhancing its ambiguity. However, as shown in **Video Example 11**, the implied (y)-to-x material coupled with the downward gravitational pull helps rationalize the change in direction.

Augmentation proper

[5.6] All the compositional steps discussed up to this point function to set up the second large-scale section of *Four Organs*, in which the process of temporal augmentation is initiated. The remaining material, and thus the remaining gestures, operate as follows: additive notes lead into a full articulation of the dominant eleventh chord (attack x), after which the notes are gradually removed, eventually arriving at a sustained E–A dyad before repeating. This stage marks the point where the music is subjected to a temporal stretching, metaphorically analogous to the slowing pendulums in *Pendulum Music*. Reich described *Four Organs* as "a sort of slow-motion music" (2002, 50), and this section embodies that aim. Just as the physical pendulums in *Pendulum Music* literally slow down and settle, the metaphorical pendulum here must also decelerate. **Example 2** shows how the outer nodes visibly shift closer to the center point, symbolizing a reduced rate of oscillation and thus a temporal expansion of each gesture.

[5.7] To preserve formal and visual consistency, the metaphorical pendulum in the video examples will continue to display the same distance between its outer nodes as in the earlier gestures. As shown in **Example 3**, the consistency is achieved by "zooming in" on every moment the pendulum slows down. This allows the reader to conceptualize the pendulum slowing down as well as keeping the same pendulum representations (i.e., same distance between the nodes).

[5.8] In the previous gesture (Video 11), the entrances occurred in close proximity and the releases were evenly spread out. **Example 4** shows how temporal augmentation metaphorically operates in *Four Organs*. Before the augmentation proper begins, Reich first spreads out the lead-ins to approximately match the same rate of the releases (4a–c). As both sides of x become evenly distributed (4c), the rate at which the lead-ins and releases occur gradually slow down (4d). In actuality, Reich first slows down the release of x rather than its lead-in, and then slows the lead-in material soon after. In other words, while the music is not perfectly symmetrical, the metaphor still holds: the resulting gesture reflects the behavior of a slowing pendulum. This generalized visual representation maps the musical augmentation in *Four Organs* onto the same temporal logic found in *Pendulum Music*.

[5.9] **Video Example 12** shows the beginning of the temporal augmentation process, which is represented best by Example 4a. The significant point of interest is the means by which Reich changes the direction at the respective outer node and moves back into x. The final remnant of x—an E–A dyad—functions dually: it marks the end of the release and simultaneously initiates the lead-in to the next x. This clever elision enables Reich to momentarily break from the dyad and seamlessly reintroduce the preparatory material leading back into the full chord. It also ensures that the metaphorical gravitational pull continues to dictate directionality, reinforcing the pendulum motion.

[5.10] The remainder of *Four Organs* builds upon the gesture shown in Video Example 12, replicating it with progressively increasing durations. As the piece continues, the lead-in to x becomes longer such that both sides are equivalent in length during one pass, and finally the notes augment on either side of x until Reich deems the work finished. The final gesture (**Audio Example 1**) is presented without animation.

6. Closing: the listener as interpreter

[6.1] My animated representations of the gestures in *Four Organs* parallel the process enacted in *Pendulum Music* by demonstrating how musical gravity and inertia guide the composition's development. This includes the directional flow from one end to another, the central arrival and release, and the return to the center. Much like a pendulum coming to rest, Reich structures *Four Organs* with two full iterations of the chord, followed by separate parts of the chord leading into either full iteration, and finally one full iteration undergoing a process of temporal augmentation. This reveals two primary formal areas in the work, the preparatory section and the augmentation section. Whereas the sounds in phase-as-process works represent continuous flow between patterns in order for gesture to emerge, the sounds in *Pendulum Music* and *Four Organs* rely upon physical and metaphorical forces to signify the process of augmentation.

[6.2] Listening to these processes unfold—whether physically in *Pendulum Music*, or metaphorically in *Four Organs*—is inherently interpretive. Process music invites listeners to engage in real-time perception, shaping individual interpretive experiences.(18) My analytical approach constructed an atemporal framework that fosters such hermeneutic engagement. From this perspective, the way one listens to a piece directly impacts how they interpret it. A possible engagement of *Pendulum Music* could be as follows: a listener creates a connection between swinging microphones and longer chords as sounding *like* a process unfolding (e.g., "I can hear the music slowing down.").(19) In this regard, Cumming remarks, "What is important is to recognize that a semiotic account of experience, as conceived by Peirce, starts with a quality *insofar as it creates an interpretive response*" (2000, 112, original emphasis). In this way, musical gestures may be understood as interpretive responses to the musical qualities being expressed in the work.(20)

[6.3] Using a semiotically grounded theory of musical gesture, I interpreted the slowing of musical material not just as an aural phenomenon, but as a representation of a swing coming to rest. Just as *Pendulum Music* literally depicts the deceleration of motion, my reading of *Four Organs* uses the pendulum metaphor to model its process of augmentation. The sound of the augmentation is, in itself, *gestural*, meaning the qualities stemming from gravity and inertia operate as gestural forces.(21)

[6.4] The interpretive result of these forces, the musical gestures, allowed me to conceptualize the sounds in *Pendulum Music* and *Four Organs* as an iconic representation (sign) of Reich's augmentation process (object). Both works share the musical quality of tones beginning with short attacks that slowly undergo temporal augmentation. While *Pendulum Music* augments the duration of individual tones, *Four Organs* augments a single, continuously unfolding chord. Furthermore, the augmentation in *Pendulum Music* is facilitated by the literal forces of gravity and inertia, whereas *Four Organs* relies on the metaphorical musical equivalents described by Larson (2012). For Hatten, the gestural application of Larson's model does not directly refer to a conventional gesture; instead, the forces in question are considered an "implied *source* of gestural energy," meaning that the forces contribute to the energetics behind the gesture (2004, 115, emphasis in original). This implies that there is an energetic dimension to the sound within the gesture, informed by the underlying musical forces. These sounds, then, serve as iconic representations of Reich's process of augmentation. The gestural interpretants derived from this semiotic framework should not be understood merely as generalized patterns, groupings, or figurations, but rather as meaningful, signifying elements.

[6.5] My animations of the musical process's metaphorical qualities illustrate how musical gestures can be depicted without reliance on traditional written scores. Hatten explains that "notation cannot adequately represent the continuities of gesture" (2004, 113). This is particularly evident in process music, where scores often serve as performance instructions rather than definitive representations of the music. In such works, the semiotic framework I apply underscores the central role of interpretation, with each auditory gesture becoming a sign of an unfolding process. This interpretive approach is not confined to Reich's music alone; rather, it can be extended to other minimalist compositions as well. Although my methodology was developed through Reich's music, it opens avenues for exploring the ways in which musical gestures can represent larger processes across a range of minimalist works. Analyzing minimalist music, I have found, invites an intuitive engagement, precisely because it was composed with intuition as a guiding principle. Peircean semiotics and pragmatism, with their focus on perception, logic, and qualitative experience, align particularly well with the interpretive demands and richness of minimalist music.

Martin Ross
University of Western Ontario
1151 Richmond Street
London, ON N6A 3K7
mross255@uwo.ca

Works Cited

Almén, Byron, and Robert S. Hatten. 2013. "Narrative Engagement with Twentieth-Century Music: Possibilities and Limits." In *Music and Narrative Since 1900*, ed. Michael L. Klein and Nicholas Reyland, 59–85. Indiana University Press.

Botha, Marc. 2017. *A Theory of Minimalism*. Bloomsbury.

Boyle, Antares. 2023. "Gestural Temporality in Sciarrino's *Recitativo oscuro*." *Music Theory Online* 29 (4). https://doi.org/10.30535/mto.29.4.9.

Buchler, Michael. 2020. "Ornamentation as Gesture in Atonal Music." *Music Theory Spectrum* 42 (1). https://doi.org/10.1093/mts/mtz021.

Cole, Christa. 2024. "Hands, Fingers, Strings, and Bows: Performance Technique and Analysis in J.S. Bach's Largo for Solo Violin." *Music Theory Online* 30 (3). https://doi.org/10.30535/mto.30.3.1.

Cumming, Naomi. 1997a. "The Subjectivities of 'Erbarme Dich.'" *Music Analysis* 16 (1): 5–44. https://doi.org/10.2307/854112.

————————. 1997b. "The Horrors of Identification: Reich's 'Different Trains.'" *Perspectives of New Music* 35 (1): 129–52. https://doi.org/10.2307/833682.

————————. 2000. *The Sonic Self: Musical Subjectivity and Signification*. Indiana University Press. https://doi.org/10.2979/3018.0.

Epstein, Paul. 1986. "Pattern Structure and Process in Steve Reich's 'Piano Phase.'" *The Musical Quarterly* 72 (4): 494–502. https://doi.org/10.1093/mq/LXXII.4.494.

Gardner, Samuel, and Nicholas J. Shea. 2022. "Gestural Perspectives on Popular-Music Performance." *Music Theory Online* 28 (3). https://doi.org/10.30535/mto.28.3.3.

Gopinath, Sumanth. 2019. "'Departing to Other Spheres': Psychedelic Science Fiction, Perspectival Embodiment, and the Hermeneutics of Steve Reich's *Four Organs*." In *Rethinking Reich*, ed. Sumanth Gopinath and Pwyll ap Siôn, 19–52. Oxford University Press. https://doi.org/10.1093/oso/9780190605285.003.0002.

Hartenberger, Russell. 2016. *Performance Practice in the Music of Steve Reich*. Cambridge University Press. https://doi.org/10.1017/CBO9781316584965.

Hatten, Robert S. 2004. *Interpreting Musical Gestures, Topics, and Tropes: Mozart, Beethoven, Schubert*. Indiana University Press.

————————. 2012. "Musical Forces and Agential Energies: An Expansion of Steve Larson's Model." *Music Theory Online* 18 (3). https://doi.org/10.30535/mto.18.3.3.

Johnson, Timothy. 1994. "Minimalism: Aesthetic, Style, or Technique?" *The Musical Quarterly* 78 (4): 742–73. https://doi.org/10.1093/mq/78.4.742.

Kozak, Mariusz. 2021. "Anna Teresa De Keersmaeker's *Violin Phase* and the Experience of Time, or Why Does Process Music Work?" *Music Theory Online* 27 (2). https://doi.org/10.30535/mto.27.2.11.

Larson, Steve. 2012. *Musical Forces: Motion, Metaphor, and Meaning in Music*. Indiana University Press. https://doi.org/10.2979/6363.0.

Mertens, Wim. 1983. *American Minimal Music*. Kahn & Averill.

Momii, Toru. 2024. "Performing Te: Gesture and Timbre in Fujikura Dai's *neo* for Solo Shamisen." *Music Theory Spectrum* 46 (2): 185–207. https://doi.org/10.1093/mts/mtae002.

Neidhöfer, Chrisoph. 2024. "Gesture through the Lens of Pluridimensional Serialsim in the Music of Camillo Togni." *Music Theory Online* 30 (2). https://doi.org/10.30535/mto.30.2.5.

Nickleson, Patrick. 2023. *The Names of Minimalism: Authorship, Art Music, and Historiography in Dispute*. University of Michigan Press. https://doi.org/10.3998/mpub.10207791.

O'Brien, Kerry, and William Robin. 2023. *On Minimalism: Documenting a Musical Movement*. University of California Press. https://doi.org/10.2307/jj.455898.

Peirce, Charles Sanders. 1931–1958. *Collected Papers of Charles Sanders Peirce*, vols. 1–8. Edited by Charles Hartshorne and Paul Weiss. Harvard University Press.

Reich, Steve. 1980a. *Four Organs*. Universal Edition.

————————. 1980b. *Pendulum Music*. Universal Edition.

————————. 2002. *Writings on Music: 1965–2000*. Edited by Paul Hillier. Oxford University Press.

Ross, Martin. 2022. "Gesture in Steve Reich's Music and its Signification: A Referential Approach to His Process, Stylistic, and Postminimalist Works." PhD diss., University of Western Ontario.

————————. 2024. "Indexing a Narrative: Gestural Patterns, Plentitude, and Cultural Metonymy in Steve Reich's *Music for Pieces of Wood*. In *Music and its Narrative Potential*, ed. Carolien Van Nerom, Ann Peeters, and Bart Bouckaert, 291–310. Brill. https://doi.org/10.30965/9783846767726_015.

Schwarz, K. Robert. 1981. “Steve Reich: Music as a Gradual Process: Part II.” *Perspectives of New Music* 20 (1/2): 225–86. https://doi.org/10.2307/942414.

Short, Thomas L. 2007. *Peirce’s Theory of Signs*. Cambridge University Press. https://doi.org/10.1017/CBO9780511498350.

Wallentinsen, Kristen. 2022. “Fuzzy Family Ties: New Methods for Measuring Familial Similarity between Contours of Variable Cardinality.” *Journal of Music Theory* 66 (1): 93–128. https://doi.org/10.1215/00222909-9534151.

————————. Forthcoming. *Structural Multistabilities and Listening Experiences in Minimalist Music*. Routledge.

Discography

Bang on a Can. 2000. *New York Counterpoint; Eight Lines; Four Organs*. Nonesuch Records 075597948127. Compact Disc.

Phillipe LANGLOIS. “Pendulum Music Steve Reich 1968.” May 8, 2014. YouTube video, 9:28. https://www.youtube.com/watch?v=fU6qDeJPT-w&t=5s.

Footnotes

* I would like to thank John Cuciurean, Jonathan De Souza, Chantal Lemire, Patrick Nickleson, and Kristen Wallentinsen for their invaluable insight. Thank you also to the anonymous reviewers and *MTO* editors for their thoughtful feedback on this work. A final thanks goes out to those who provided suggestions along the way, especially at the 2022 Society for Minimalist Music conference.
Return to text

1. Furthermore, Wallentinsen 2022 and forthcoming argues that listeners can attend to the same stimuli (e.g., passages of a minimalist work) and perceive multiple, equally valid interpretations at different points in time.
Return to text

2. As Marc Botha states, “Repetition simultaneously dissolves, transforms, and reforms [*Pendulum Music*] as the energy of the swinging microphones dissipates” (2017, 81). The work becomes slower as more energy dissipates.
Return to text

3. Following the standard scholarly citations of Peirce’s *Collected Papers*, in-text reference is by CP volume and paragraph.
Return to text

4. These three inquiries categorize Peirce’s nine signs into three respective trichotomies. The first trichotomy (the kind of sign) consists of qualisign, sinsign, and legisign; the second trichotomy (the sign’s relation to its object) consists of icon, index, and symbol; and the third trichotomy (how a sign is meant to be taken) consists of rheme, dicisign, and argument.
Return to text

5. Musical analyses that use Peircean semiotics tend to use his second trichotomy. Peirce describes it as the “most fundamental” division of signs (CP 2.275).
Return to text

6. In his book on Peirce, Thomas Short also adopts the same framework: “R [interpretant, response] interprets X [representamen] as a sign of O [object]” (2007, 157–58).
Return to text

7. What does connect our approach to gesture, however, is its inference by the listener.
Return to text

8. An exception is *Violin Phase*, where Reich instructs the violinist to inflect certain rhythms within a composite pattern (i.e., played separately, not emphasized through accents). These separate patterns are known as resulting patterns.
Return to text

9. Not using a semiotic approach does not diminish the rigor of these three scholars' analyses, as there are facets to their respective musical examples that can provide sufficient context for gesture to be appropriately used.
Return to text

10. It also provoked a riot at Carnegie Hall in 1973, akin to Stravinsky's *Rite of Spring* premiere sixty years earlier. Gopinath explains, "The extremity of reaction to the piece at the Carnegie concert led to it being far and away the most commented-upon composition by the composer to that date, and the controversy thus virtually guaranteed him a foothold in the art-musical canon" (2019, 21).
Return to text

11. Analytically, this work and *Pendulum Music* function in Byron Almén and Hatten's "slow-motion time," a type of "dissolution of temporality" defined by "extremely slow but otherwise unperturbed [stylistically constrained sequences] that nearly exceed our capacity to recognize them" as such (2013, 66–69).
Return to text

12. While expanding upon Larson's musical forces, Hatten 2012 suggests several types of virtual agencies. In particular, he speaks of an "initiatory energy" that creates "implicative momentum," the latter of which is needed to "imply" a musical inertia. For Hatten, musical inertia not a force but rather "an acknowledgement that momentum from a virtual agent will tend to continue" (Hatten 2012, 17, Fig. 1).
Return to text

13. Reich 1980a shows how Reich creates the augmentation process in *Four Organs* through musical notation. This is mostly done by the time signatures becoming incrementally longer.
Return to text

14. See Ross 2024 for an analysis of rhythmic groupings against a pulse, and their subsequent effects, in Reich's music.
Return to text

15. These are considered sinsigns, which denote singular instances of a generality (e.g., an example, a token of a type) (CP 2.245).
Return to text

16. For an in-depth look on the instrumental choices and their subsequent effects on the sound in *Four Organs*, see Gopinath 2019.
Return to text

17. As there is no sounding event equivalent to attack x occurring in the outer points of suspension in *Pendulum Music* (i.e., the outer nodes of the animation), attack y's existence/purpose is for grouping gestures in *Four Organs*.
Return to text

18. Kozak 2021 and Wallentinsen 2022 and forthcoming are recent analyses that approach Reich's music from a phenomenological standpoint.
Return to text

19. Experiences can also vary between live performance versus recorded tracks, especially with regards to a visual work like *Pendulum Music*.
Return to text

20. In her book, Cumming describes three types of awareness that can be adopted as a listening strategy: attentive awareness, awareness of sound as "other," and alternative revisions to sound and/or their signification (2000, 61). Ross 2022 further explores attentive awareness as a listening

attitude for process music.
Return to text

21. Taken as signs themselves, the gestural forces' inherent qualities can be denoted as qualisigns (CP 2.244). The sonic result (i.e., what we hear via a sign-object relation) is iconic.
Return to text

Prepared by Lauren Irschick, Editorial Assistant