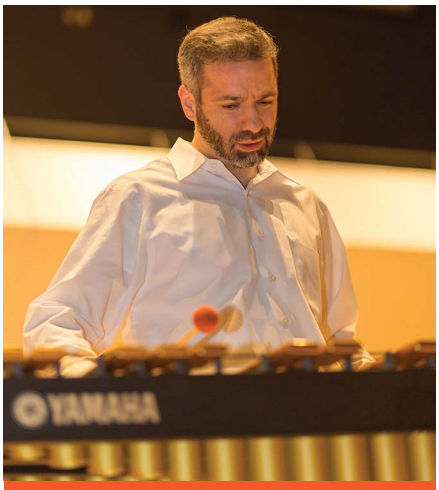
What Really Happens in Steve Reich's "Drumming"?

By Michael Schutz

What really happens when trying to phase? This is something that Russell Hartenberger often wondered when playing Steve Reich's "Drumming." This landmark composition asks percussionists standing across from one another to drift in and out of synchrony—a request very much at odds with a lifetime of training to play together in synchrony. Specifically, some passages call for one player to gradually pull ahead while the other stays at the original tempo.

The quality of the sound is somewhat akin to the sight of two cars racing neck and neck on a track, with one slowly pulling ahead of the other. Given enough time and a consistently higher speed, the faster car will eventually pull a full lap ahead. After enough time the cars would once again be neck-and-neck, with the faster driver one lap ahead. Essentially, this is what happens musically in "Drumming," with one performer gradually pushing ahead to the point where the two drummers re-align simply displaced by a full beat. This continuous approach to gradual desynchronization is a cousin of the discrete approach to phasing used in Reich's well-known "Clapping Music," which similarly explores the complex composite rhythms emerging when performers align their parts in different ways.



Michael Schutz
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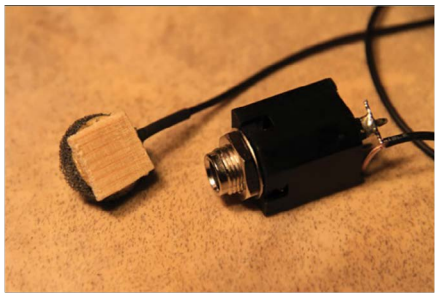
The difficulty of executing discrete "jumps" between sections in "Clapping Music" pales in comparison to that of "Drumming," which challenges performers to gradually drift in and out of phase. Consequently, Hartenberger's question is an important one—no doubt pondered by many who have played this landmark composition. However, the fact that even he remains unsure of what *really happens* when attempting to execute Reich's instructions is particularly interesting, given his deep connection with the piece and having recorded it hundreds of times around the world—including its premiere under the composer's direction in 1971.

PHASING ON THE BONGOS

Although the concept behind phasing is simple, its execution is notoriously difficult. By challenging us to think about performance through this perspective, it asks us to think about music in fundamentally different ways. Although exhilarating, it can also be disconcerting for the uninitiated. In a chapter discussing his thoughts on performing this piece in his book *Performance Practice in the Music of Steve Reich* (2016), Hartenberger wrote:

> When I first began phasing in "Drumming," I felt like I was entering a space-time continuum and was losing all sense of contact with the other player, the music, time, and my hands. I felt I had no control over the process that was unfolding and simply hoped for the best. As I moved out of phase with the person across the bongos from me, I felt as though I was leaving earth's atmosphere and all that was comfortable and secure. In the most irrational part of the phase, I had no idea whose hands were making which sounds, and I did not know where my pattern was in relation to the other part. If I was lucky enough to reach the next interlocking pattern, I was elated, but surprised, and had no sense of how much time had elapsed during the phase. I was happy to be back on familiar ground and did not think about what I

FIGURE 1



Eight Scheller piezo transducers registered independently record the timing of attacks on each of the eight drums. Each was "sandwiched" between a piece of birch a thin foam pad. They transmitted signals over a ¼" phone jack.

Triggers were mounted using releasable tie-wraps. This allowed for adjustments and movement as needed to find the optimal locations.

The pickups attached to the underside of each head near the intersection of the head and shell. They were positioned to avoid being directly underneath the striking area (locations shown with arrows above).

should be doing musically while participating in the new composite pattern.

ANATOMY OF A PHASE

After attending a music perception conference, Hartenberger realized it might be possible to scientifically explore a nagging musical question. Specifically, what *actually happens* when attempting this challenging musical feat? Does he really move smoothly and continuously from beat to beat? Sometimes, he felt he was slowing down despite always landing a beat ahead; was that even possible? Or were the piece's atypical performance requirements resulting in errant perceptions of its rhythms?

In order to better understand the technical execution of this fascinating composition, Hartenberger approached me about attempting an analysis of the phasing as performed with his longtime Nexus colleague and phasing partner Bob Becker.

MUSIC PERFORMANCE AND MUSIC PERCEPTION

As Associate Professor of Music Cognition/Percussion at McMaster University, I serve as a core member of the McMaster Institute of Music and the Mind. In addition to conducting our Percussion Ensemble, I direct the MAPLE Lab, researching Music, Acoustics, Perception & LEarning (www.maplelab.net)—the world's first psychology lab with a percussion focus. Consequently, I am fortunate to be able to research a variety of topics through our half-dozen concurrent projects. For example, my interdisciplinary team of graduate and undergraduate students explore percussion-focused issues such as the gestures used by percussionists to trick audiences into "hearing" long and short notes on the marimba (www.maplelab.net/illusion), the communication of musical emotion, and optimal ways of understanding musical rhythm. Many of you may recall and/or even have partici-

Setup used for data collection. Hartenberger (left) and Becker each played on his own set of bongos, allowing for independent capture of all timing information (photo by Michelle Hwu). This slight variation on the original approach of sharing bongos actually made the voice separation clearer and has been explored as artistic practice in subsequent concerts.

FIGURE 2

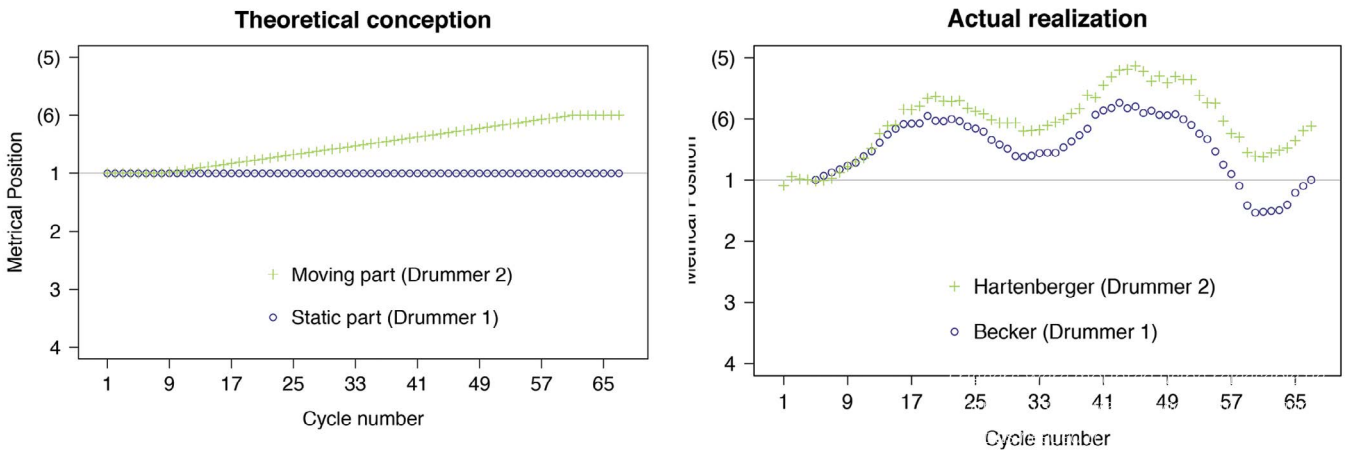


Figure 2. Visualization of the theoretical and observed rhythms. The left panel depicts a theoretical realization as called for in the score, with the players phasing steadily from complete alignment (first 7–8 repetitions), a gradual separation (repetitions 10–50), and resynchronization with a one-beat displacement at the end. The right panel depicts the pattern of phasing actually observed, with a surprising amount of speeding and slowing in both the moving part (RH), and the nominally steady part (BB). Figure reproduced from Hartenberger (2016).

pated in some of our experiments at PASIC in 2013 and 2014, which offered novel insight into the role of body movement in rhythm perception (*www.maplelab.net/rhythm*). Above are images and a description of the phasing data collection rig.

Although already overcommitted to other projects when first approached about this study, the opportunity to design a novel exploration of such an important composition with this group was too tempting to pass up! In order to obtain accurate timing information from both parts as they phased, we needed a way of attaching independent triggers to each drum. Percussion recording veteran and PAS Music Technology Committee member Ray Dillard built triggers placed inside parallel sets of bongos (Figure 1). This allowed us to capture the precise timing of every note in eight parallel .wav files. Then, my McMaster colleague David Ogborn wrote a script to extract this information based on the peak value of each attack, translating the strikes into a master data file with precise timing information for every note in their phase. This offered unprecedented insight into timing information during "Drumming" needed to explore the fascinating question that had been irking Hartenberger for decades—what *really* happens when executing phasing in Reich's landmark composition?

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RESULTS AND CONCLUSIONS

Theoretically, following the composers' instructions precisely would lead to a performance such as that shown in Figure 2 (left panel). The players would start each cycle together, and after several repetitions the steady voice (blue circles) continues at the same tempo while the moving voice (green crosses) accelerates monotonically until ending up one beat ahead. Our observed timings are displayed in Figure 2 (right panel). Blue circles mark attack times for notes played by the nominally steady voice (BB), and green crosses those played by the moving voice (RH). Note that consistent with their typical performance practice, here the moving voice began first, with the steady voice joining partway through the fourth cycle.

The individual plots exhibit a clear pattern of ebb and flow, with the nominally steady voice (BB) fluctuating considerably. Nonetheless, it is clear that Hartenberger was successful in his phasing goals. Over the course of the performance, he successfully realigned one beat displaced with the downbeat of the steady part by the end. Over the course of the performance, Hartenberger averaged a .25% beats-per-minute increase in tempo per cycle (approximately .5 ms/beat). Although small, this difference realized the composer's request (and Hartenberger's intentions) over many repetitions. However, in contrast to the theoretical figure in the left panel of Figure 2, desynchronization and resynchronization was neither smooth nor monotonic, and in one-fifth of the cy-

cle repetitions, the nominally "accelerating" voice *actually slowed down*.

This analysis provides clarity to one of Hartenberger's initial questions—whether it was possible for a part nominally speeding up to feel like it was simultaneously slowing down. For although he was continually pushing ahead of the nominally steady timekeeping of Becker, they were at times both slowing down, creating a complicated situation in which their sense time felt simultaneously as if it were both speeding up *and* slowing down! Returning to our car-racing analogy, it is as if both cars at times sped up and slowed down when navigating the track, but overall one maintained a slightly faster speed. Ultimately, they ended up in the same situation as described previously—one a complete lap ahead of the other.

This description provides a high-level summary of the project—the details of which are both fascinating and too complex for this overview. To further explore this novel data, my team built an interactive visualization tool that is now available online at *www.maplelab.net/reich*. This information will be useful to anyone interested in performing, studying, or even simply appreciating this landmark composition for the percussion repertoire. To the best of our knowledge, this is the first technical exploration of Reich's "Drumming" to be analyzed using this approach. By applying contemporary data visualization techniques to an excerpt of this piece captured by custom-built triggers, we are able to gain new insight into this widely performed composition.

PASIC SESSION

My session in Indianapolis will feature a demonstration of the passage of "Drumming" analyzed in this study, given by two of the most experienced interpreters of this music—Russel Hartenberger and Bob Becker. Hartenberger will also share some personal insights into his experience with the development of Reich's "Drumming," offering additional useful perspective on this work. Not only an acclaimed interpreter of his music, Hartenberger is a full-fledged Reich scholar, having published an authoritative book on the history and performance practice of Reich's music (2016) and presented on this topic at previous PASICs.

Given the extensive experience of these two PAS Hall of Fame percussionists performing "Drumming" through the acclaimed ensemble Nexus, it is hard to imagine a duo better suited to provide performance data for this project. Also included in my PASIC 2019 session, Ray Dillard will offer an explanation of his technical approach to creating the triggers that provided such precise and valuable data (Figure 1). Together, the wealth of experiences given to the project by this trio provides a unique element to this project difficult to capture in this preview article—all the more reason to attend the session in person!

This project provides a fascinating way to better understand a historically important composition, and through this work I have gained further appreciation for the value of exploring connections between music perception and music performance. It is the latest in a series of percussion-related studies offering useful information for performers and teachers of percussion. For those interested in additional information on how science can offer useful information for percussionists, please see my chapter "Lessons from the Laboratory: The musical translation of scientific research on movement" in Hartenberger's *Cambridge Companion to Percussion* (2016).

REFERENCES

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