Searching for Swing: Participatory Discrepancies in the Jazz Rhythm Section

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"Swing" is sometimes described as a groove, pulse, or feel, and I assume that there are as many words for comparable concepts as there are musical styles, languages, and cultures. On the syntactical level (that is, in the realm of crotchets and quavers and their subdivisions), jazz swing has never been effectively notated. Ridgetaps, the drummer's tapping on a ride cymbal, are often represented by dotted rhythms or eighth note triplets, while a bass line is usually written as straight quarter notes. To these notated sketches, musicians add the "swing," making the notes come alive. What is it that they add? What is swing on the sub-syntactical level? Some may argue that swing results when musicians are playing precisely together, while others may insist that swing occurs when the musicians are a bit out of time, or out of phase with each other. Both musicians and analysts may disagree about these "together" and "apart" issues, so it is important for us to develop a systematic method, an etic grid, for measuring degrees of synchrony and discrepancy between musicians. In this article I will explore the concept of "participatory discrepancies" (Keil 1987), focusing on the jazz rhythm section, and present some preliminary research findings in the hope of encouraging continuing work in this area. Briefly, what I found is that participatory discrepancies are observable at the subsyntax level and they can be precisely measured. This allows us to say something concrete about swing or groove as crucial elements of musical style.¹

My findings may best be understood in the context of ongoing research into what makes jazz swing, and so I begin with a review of what some others have hypothesized. While musicologists have sought to define swing, music producers, particularly those working with electronic synthesizers, have attempted to program swing into their rhythmic algorithms. The music industry producers are discussing some of the same kinds of notions as the jazz community: groove, swing, and feel. The producers' views are in a way

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emic, since they are practicing what they are theorizing about, and feeling their way toward grooves that will hook more buyers. But their views can have etic dimensions since they can and do adjust the technology to create measurable degrees of discrepancy between parts. The jazz literature is also confusing, with some analysts simply reporting or compounding the differing emic judgements of their informants.

An idea that emerges from some of the jazz literature is the notion that swing is somehow embodied in the syntax of a piece of music, but no one explains how this happens. This recalls Keil’s critique of Meyer, in which he drew a distinction between “embodied meaning” and “engendered feeling” (Keil 1966:338–39, and see his article in this issue). Keil argues that process takes precedence over syntax in most music making, and stresses that “something approaching complete comprehension of the processual aspect will only be possible when we are able to determine accurately the placement of notes along the horizontal dimensions” (1966:345). In order to do this, he recommended using some kind of measurement device, which is what I have attempted here.

The common thread in both jazz studies and the musing of music industry specialists is an interest in finding out how swing works. After outlining some of the issues that have been discussed in these approaches, I will present some of my own research findings. These emphasize the concept of participatory discrepancies as a productive tension (rather than opposition) which is central to swing, and this is explored empirically. Finally, I will consider the potential relationship between technical and ethnographic work.

**Dimensions of Swing**

**Electro-mechanical Dimensions**

Music industry producers and inventors have noted the importance of understanding concepts like swing and groove in their quest to “humanize” electronically produced musics. No one wants to be the Dr. Frankenstein who produces the dreaded Mechanical Man or a music that sounds machine-made. Musician, producer and MIDI programmer Michael Stewart describes his first experience with what he calls the “feel factor.” Stewart’s mentor, master editor Ron Malo, once told him that “he liked splicing Ron Tutt’s (Elvis Presley’s drummer) parts because Ron always put the kick drum right on the beat, the snare a little behind the beat, and the toms and cymbals trailing after that. Conversely, cutting to John Guerin (a great jazz-rock player) was tough because John staggers his drums the other way: kick on the beat, snare a little bit ahead, and the hi-hat and some other drums leading that. When I began remembering that Guerin’s playing always felt light and snappy to me, and
Tutt's always felt big and powerful, I thought I was onto something" (Stewart 1987:57).

Since those early observations, Stewart has become one of the most successful designers and programmers of MIDI hardware and software, and has been a leader in the trend to "humanize" electronic and computer music. For example, he designed the "Human Clock," which he describes as a device that "lets a biological drummer (whether you record the drummer or not) drive your drum machines and sequencer" in order to make the music "come alive" (ibid.); he has worked on a device that allows real time manipulation of individual MIDI channels for greater control over adding "feel" (1989); and he has theorized about ways to achieve "synergy and reflective soul in computer music" (1988:48). Stewart's work has interested other electronic music producers, such as David Edwards, who devised a "feel formula" for livening up his own digital sequences (1988).

In his recollections of working with Ron Malo, Michael Stewart is describing the participatory discrepancies that they hear in between and within each drummer's feet and hands; and though coming at the issues from a different angle, the Malo-Stewart perceptions converge on and further complicate Keil's hypothesis about the tensions between players (see Keil 1966 and 1987). Like Keil, who draws connections between his participatory discrepancy hypothesis and the cosmology of the Gaia hypothesis (see his article in this issue), Stewart also seems to sense a larger context for his discoveries, musing that "we see the same patterns over and over in nature and in our own creations. What you see in the swirling cream in your coffee cup comes from the same forces that shape the galaxies" (1987:62). The demands of the music industry require something more concrete, however, so Stewart devised a "feel spectrum" which identifies different types of musical feels and suggests how much discrepancy is needed to achieve the desired results using electronic instruments. He illustrates his recommendations in a diagram (see Figure 1) entitled "graphic display of feel in relative milliseconds at 130 bpm" (1987:64).

Other electronic music producers are aware of what Keil is calling participatory discrepancies. For example, musician, composer and music technology consultant Kalle Nemvalts discusses the concept of swing in relation to MIDI hardware and software. In his view, digital sequencers can be made to "swing" by using techniques known as "track shifting" and "quantization." He expresses the "degree of swing" as a percentage of the total beat. For example, "57% swing eighth notes" means that the first in a pair of eighth notes would take up 57% of the total duration of a beat, while the second eighth note would get 43%. He also gives examples of how to achieve various degrees of swing at different tempos and in different meters (1988:62-63).
Michael Stewart's "feel spectrum," illustrating his prescriptions for generating an assortment of rhythmic feels at 130 beats per minute. He uses a plus (+) to denote milliseconds "on top" (or before) the beat, and a minus (-) to denote after. This should not be confused with the system used in the present article, where a plus (+) is used for after the beat and a minus (-) for before. The spectrum Stewart gives is envisioned for use with synthesizers and drum machines, and some of the values differ considerably from those given in the present article.

A number of "how-to" articles and columns have outlined ways in which electronic music composers and producers can liven up their music. David Jaffe discusses how to loosen up the rigidity of music played by computer and elaborates upon the concept of "tempo perturbation," which is a method of staggering attacks of notes slightly to let the music breathe (1985:39). Tony Reed, in a review of the Roland TR 626 digital drum machine, mentions using the "Flam" and "Shuffle" features of that device, each with four "offsets," and also other methods of achieving "feel," such as muting some drum voices and playing drum patterns on cymbals (1987:48–49). Travis Charbeneau discusses how to "ditch the dreaded Mechanical Man with a little help from your friendly computer" (1989:42). According to Charbeneau, an important technique for humanizing the Mechanical Man is to utilize "velocity adjustments" (ibid.:43–44). He also recommends some time shifting techniques as well: "shift to a 64th and try bunching your strikes closer together and further apart until the playing is just broken enough to satisfy, but not so broken as to throw off the time. Using a 64th note to shift the start of main beat hi-hat strikes slightly behind or ahead of the kick can also simulate the little inaccuracies we expect of the odd breed of human known as 'The Drummer'" (ibid.:44). He also recommends minute tempo shifts, such as from 117 to 120 beats per minute (ibid.:46).

These various attempts at humanizing electronics or programming swing and feel have not always been endorsed by critics. In the course of reviewing the recording *Words of a Mountain* by composer and musician Wally Badarou (Island Records 91260-2, 1989), music critic Mike Zwerin is somewhat
skeptical about using synthesizers, even those that can be "humanized": "With this hardware, however, the human touch is meaningless without electric current. It has a pacemaker for a heart, better than no heart at all but where's the electronic equivalent of soul? If not intrinsically 'cold,' a synthesizer still is not played but programmed. Recent technology makes it possible to program a rhythm box to simulate the sort of human 'imperfections' in time-keeping that produce the pulse called 'swing,' but it still sounds like a drum machine. Never mind. Along with Joe Zawinul and only a handful of others, Wally Badarou manages to program his own personality into the software" (1989). Keil concurs (1993a) that Badarou did get his "feel" or "personality" into most of the pieces on an earlier recording, Echoes (Island Records P35D5001, 1924). Again, the question is "How?"

Many other electronic music producers are concerned with the same kinds of "imperfections," "inaccuracies," "perturbations," "offsets," "adjustments," "shifts," and "feel" issues as those mentioned in this brief survey, and all of these are illustrative of the various kinds of processual participatory discrepancies that are observable in other musics (see also Johnson 1987; Bralower 1986). By labeling their "degrees of swing" or "feel factors" with terms such as "snap," "drag," "loose," and "stretched," these researcher/practitioners have posited a close relationship between quantitative and qualitative elements in music. They have also claimed that there is a prescriptive dimension to the concept of participatory discrepancies, that we can tell people what to do with their equipment to achieve more "light and snappy" or more "big and powerful" rhythmic feels.  

Descriptive Dimensions

To help in notating aspects of jazz performance, a system of "grid notation" was developed by Milton Stewart to compensate for shortcomings in representing the amount of "rhythmic displacement that usually occurs in jazz" (1982:3). Grid notation builds upon staff notation by marking beats with vertical lines and then placing the note heads before, on, or after these lines to show more precisely where a note falls in relation to the beat. To demonstrate his system, Stewart transcribed a solo by the late trumpet artist Clifford Brown, and noted how Brown used rhythmic displacement "to create the aesthetic sensation known as 'swing'" (ibid.:4). Grid notation is useful for visually representing the amount of displacement of notes from their "takt or stroke" positions, while still utilizing standard staff notation, and it also allows the transcriber to show "when and where areas of rhythmic displacement resolve to areas of rhythmic conformity"; Stewart shows that Brown "creates swing in these measures by leaving the takt and returning to it without losing contact with it," and that swing is created by the "alternation of displacement with conformity during certain measures" (ibid.:5–6).
In choosing a form of notation that is closely based on standard European staff notation, Stewart is laying emphasis on the syntactic dimensions of Brown’s performance; he notes that other methods, such as using the Seeger Melograph, can also facilitate notation of jazz, but this is hindered by limited access to such machines (ibid.:7). Stewart does not discuss how he arrived at the amount of rhythmic displacement for the examples he notated, which suggests that he did his transcriptions “by ear.” If this was the case, we really cannot know how accurate his transcriptions are, and his work does not establish a rigorous methodology for achieving replicable and testable results.

The concept of “rhythmic displacement” has also been examined by Frank Kofsky in his study of Elvin Jones’s drumming style, where he stresses that rhythmic displacement is “essential to swing” (1977:13). Some examples of rhythmic displacement include sharp and unexpected accents, especially as found in bebop; Kofsky also uses “rhythmic displacement” in some cases to refer to a displacement of emphasis, while in other cases it can mean the use of subtle cross and counter rhythms (ibid.:17–18). Kofsky notates his ride cymbal with triplet figures, and points out that, though the ride is often written as dotted eighths and sixteenths, this sounds “choppy” and “impairs” swing (ibid.:31, note 18). He analyzes parts of a few songs featuring Jones’s work with the Coltrane quartet, mostly in terms of playing on or off the beat. Again, Kofsky does not discuss how he arrived at his transcriptions, so we must again assume that they were done “by ear.” Perhaps realizing the shortcomings of his methodology, Kofsky admitted that his transcriptions may not be “entirely correct” (ibid.:32, note 20), and urges the reader to consult the recordings along with the examples.

The issue of effectively notating swing for prescriptive purposes has been addressed by some drum teachers. In his classic drum instruction manual, Advanced Techniques for the Modern Drummer, Jim Chapin reminded his students that swing can be notated in straight eights, dotted figures, triplets, or in 12/8 (1948:3A–3B). Chapin recommends that drummers be aware that playing the dotted rhythms exactly as written in his manual would result in a “ticky” sound, and that the drummer can interpret them as “shuffle” rhythms with a triplet feel.

The ongoing saga of describing and defining swing includes attempts which consider degrees of synchronization between soloist and accompanying. Rachel and Hao Huang examined aspects of “rhythmic expressivity” in performances by vocalist Billie Holiday. They found that “to be intelligible, the soloist’s line must exist within a metric framework, hence, some regular subdivision of time must be implied. But the suggested meter of the solo is often at odds with the simultaneous meter of the accompaniment” (ibid.). The emphasis on “line” and “meter” gives privileged position to the syntac-
tical dimensions of Billie Holiday's approach. The authors compare performances of a single tune by Billie Holiday and Ella Fitzgerald. Their main research question is: “how often does a beat or subdivision of a beat in a given solo coincide with a beat or subdivision of a beat in the accompaniment?” (1988:21). One of their transcriptions "schematizes the convergences and divergences of solo and band," and they attempt to offer “insight into the expressive tension created by dissynchrony of simultaneous meters” (ibid.).

Studies of individual style have highlighted the role of phrasing in generating swing. Thomas Owens noted that the Melograph model C can facilitate analysis of jazz by singling out the improvised solo from the accompaniment, and demonstrated his findings in analyzing a slow blues performance by Charlie Parker (1974). By using the loudness curve of the Melograph, Owens was able to provide a good rhythmic orientation for analysis. Using this method, he calculated the time durations of measures, and noted that the "high level of error" in Parker's pitch accuracy is "due largely to the extreme rhythmic complexity of Parker's improvised melody," and that Parker uses "unusual" time values and divisions of the measure (ibid.:167). The notions of "error" and "unusual" point to a research approach that is heavily dependent on a syntactical model for musical style. Owens ran into difficulty with the Melograph in attempting to isolate parts within a performance and had to work at times with unclear readings (ibid.:168). Much of his research centers on calculating pitch levels, though he discovered as well some "interesting phrasing techniques" and insights into Parker's vibrato (ibid.:170). Owens notes well that "perhaps the most striking information provided by the melogram is the fact that the length of a measure fluctuates throughout a performance" (ibid.:172). In describing pitch discrepancies, he used the word "deviations," while using "fluctuations" to describe rhythmic discrepancies.

With the above-mentioned perspectives and their serious limitations in mind (few or no objective measurements, little or no theory), we can turn to another piece of research that focuses on demonstrating a particular feel or groove while at the same time developing a systematic method. In a 1987 study, Peter Reinholdsson observed a single bass player demonstrating conceptions of different types of swing. The bass player performed two basslines along with a metronome, one demonstrating "push," which is described as being ahead of the metronome clicks, and the other demonstrating "layback," which is playing behind or after the beat. Reinholdsson indicates that his findings clearly show that the bass player had a conscious control of the feel. After an acoustical analysis, he suggests that the "adverse relationship" between elements in a performance is at the root of swing (1987:121–22). On the methodology used in his study, and in particular the
decision to utilize a metronome, Reinholdsson reports that “an experimental approach with digital registrations was used, aiming at empirical substantiation and demonstration of how a performer of the rhythm section can play in relation to the beat (in this case an objectified beat, i.e. metronome clicks) with different rhythmic feelings and intentions; e.g. playing with push—slightly ahead of the metronome, layback—vice versa. Actually, considering the musical setting of the experiment, the metronome clicks may be thought of as a stubborn and unimaginative drummer!” (ibid.:121). Reinholdsson showed that there can be a conscious effort to generate tension in order to make the music swing. I think he realized that by using a metronome, or other objectified beat, the researcher can answer an important question: how does a musician attempt to generate a groove in a situation that is inflexible and under controlled circumstances? The idea of an attempted demonstration of a preconceived feel or groove plays an important role in the present article, and I will discuss this issue later as it emerged in my research.

More recent work has attempted to verify a swing hypothesis by utilizing acoustical analysis and a systematic methodology. Composer and jazz historian Gunther Schuller, in comparing the orchestras of Basie and Lunceford, noted that despite the different approaches of the two band leaders, “they had one element in common: swing—even though they went about achieving it in quite different ways. . . . With Lunceford swing could take very subtle forms or occur in highly complex orchestral passages, almost always in the rhythm known as ‘two beat.’ With Basie, by contrast, swing was almost always set in a blues-rooted 4/4 beat and in structures and textures of the utmost simplicity” (1989:222–23). Schuller suggests that there is more than one way to swing, and he offers a definition of swing in both general and technical-acoustical terms. In either case, swing occurs when “a listener inadvertently starts tapping his foot, snapping his fingers, moving his body or head to the beat of the music” (ibid.:223). He also notes that “metronomic accuracy and rhythmically regular placing of time points (or beats) do not by any means guarantee swing” (ibid.). Schuller’s “pre-conditions” for swing include: a regular reiterated beat and a regular pulse (explicit or implicit); these rhythmic impulses must be felt, not calculated, counted, or intellectually arrived at; they must arise “from one's instincts and natural, at times even unconscious, impulses and feelings. When swing occurs it is innate, not studied” (ibid.:224). Schuller feels that emotions are not generative of swing, though swing may generate emotions, and that this combination of feeling and mental control, coupled with control of one's instrument, are necessary for swing, but do not necessarily generate swing. He stresses that the swinging musicians must maintain “a perfect equilibrium between the horizontal and vertical relationships of musical sounds” (ibid.). (“Horizontal relationships” refers to the melodic or linear aspect of musical structure, while
"vertical relationships" refers to the harmonic or chordal aspects of musical structure, as well as the rhythmic aspects of musical structure.)

While Schuller assumes that some mystical "innate" phenomenon is at work when a performer is playing swing, he gives a privileged position to the syntactic aspects of music in generating swing. As I have already noted, Keil long ago rejected this latter assumption and sought to show that swing and groove are not embodied in syntax but occur in process (1966). My own position, which I will discuss in more detail later, is that groove and swing are engendered processes that are from time to time affected by the syntactical dimensions of music, in a sort of mutually dependent balance. Schuller senses that a balance is at work in swing, but he sees it in terms of two syntactical elements being balanced out in a perfect equilibrium: "this equilibrium occurs when both the verticality and horizontality of a given musical moment are represented in perfect equivalence and oneness;" he calls this equilibrium the "performance-energy balance" (ibid.). To this concept he adds another dimension, related to the attacks and releases of notes, which begins to approach the ways of looking at musical processes that Keil hypothesized. Schuller states that "this is an incredibly subtle process which, although audible to the unaided ear, is analyzable only in the realm of microacoustics." He then relates attack to context, noting the "amazing degree of variety from player to player," and also asserts that notes are attacked differently depending upon which part of a phrase they occur in (ibid.:225).

Schuller attempts to illustrate some of his assertions through acoustical analysis of jazz performances. Using an analog-to-digital converter and computer software, Schuller produced illustrations of "envelope traces." These illustrations depict envelopes of sounds and indicate the relative level or volume of the sound (1989:855–59). He employed this apparatus to analyze the attack, decay and fluctuations of sounds in two "classic" jazz solo passages, one on trumpet by Louis Armstrong and one on bass by Ray Brown. He then had studio musicians replay these passages in a consciously "non-swinging" manner to compare a recognized swing rendition to a purposefully non-swinging rendition. Schuller notes that the most graphic difference is in the decay patterns of notes, and that, in the case of the bassline, the swinging performance is marked by notes that flow together into a continuous musical line while the non-swinging performance shows considerable interruptions between notes. To Schuller, this resulting lack of "line" correlates with a perceived lack of swing, and he uses an analogy from computer language jargon, describing the non-swinging performance as similar to "synthetic speech" and the swinging performance as similar to "connected speech" (ibid.). However, he gives no objective measurements to bolster his claim, and is still, like other researchers cited above, only
making impressionistic judgements of a performance—this time “by eye” instead of “by ear.” Schuller concludes with a basic technical description of the digitizing and compression of the sounds used in the figures, and notes that “Envelope traces allow precise visual comparison of the attack, decay, and fluctuation in the level of a tone” (ibid.:859). He also mentions that, though this is not a spectral analysis and gives few clues as to timbral elements, “notes that show an envelope that starts gradually have a softer, springier, pure-sounding start. Notes that display an irregular envelope outline are likely to sound raspy or rough; where the envelope is smooth, the tones generally have a correspondingly smooth, uniform sound” (ibid.).

Though his acoustical analysis appears as an almost appended afterthought to a rather substantial work, Schuller was trying to ground his speculations, impressions and hypotheses about jazz swing in some kind of measurements, using an apparatus that can permit objective observations and replication. On the theoretical end of things, Schuller relies on assumptions of the primacy of syntax in jazz, coupled with some kind of ethereal “innateness.” He also seems to be getting “process” and “texture” confused, but, on the other hand, he may be approaching the place where processual and textural PDS overlap. Unfortunately, he never got to the point of comparing the onsets and attacks of bassist and drummer (or any other pairings) envelopes. In sum, Schuller and the other jazz describers noted above are all looking at things from a music-centered, syntactical point of view, while virtually ignoring the musician-centered, processual dimensions of jazz performance.

Ethnographic Dimensions

The ethnography of music performance in the jazz community is receiving attention by ethnomusicologists lately. Ingrid Monson emphasizes the ethnographic over the descriptive in her work, as in her presentation of musicians’ views of “groove” (as both noun and verb) and “swing” in metaphorical and social terms (1991). She takes issue with Schuller’s model of swing being generated in the balance between horizontal and vertical elements, and notes that his technically-based description is at odds with many jazz musicians’ reflections on swing and groove, stating that “while many musicians would agree with Schuller’s identification of vertical, horizontal and attack elements as entering into the creation of swing, the participants in this study expressed their own definitions in more metaphorical and social terms” (ibid.:37). Monson indicates that Keil’s model (1966) is more compatible with what the musicians in her study reported. She notes that Keil’s ideas of “vital drive” (Hodeir 1956:195–209) and “rhythm section attack” are about the interplay between drums and bass. To Monson, the most important
concept in Keil’s model is the idea of compatibility between bassists and drummers, and she notes Keil’s idea of “engendered feeling” taking priority over syntax (ibid.:42). She concludes her mention of Keil by suggesting that his model is an important part of a larger picture: “While a musician’s relationship to the beat (on top, ahead, or behind the beat) is only one of the parameters that participating musicians have suggested contribute to musical compatibility between musicians in jazz performance, Keil’s discussion of ‘swing’ in relationship to the jazz rhythm section stands out in the literature” (ibid.:44).

Drummers in Monson’s study described notions of rhythmic “hookup” or “synchronization” between the drummer and the bassist in terms adjusting their playing to bassists who may be playing “on top of” or “behind” the beat (ibid.:147). In her conclusion, she notes that “Within the drum set, the playing of relatively free ‘left hand’ parts ‘against’ the relatively fixed ride cymbal rhythm is a tension to producing a feeling of swing” (ibid.:293), echoing Michael Stewart on Malo’s perceptions of Tutt and Guerin, cited above. Kofsky, as I have noted earlier, has also recognized the importance of understanding a drummer’s individual sense of groove. From these and other similar studies, it is clear that someone needs to investigate the discrepancies between the four attack points (right foot on kick, left foot on high hats, right hand on ride cymbal, left hand “fills”) of a few jazz drummers.

The ethnographic dimension of swing is further enriched by Paul Berliner’s much awaited book, which delves deeply into the worlds of jazz musicians and how they talk about their trade (1994). In chapter 13, one of the things that the musicians in his study discuss is “striking a groove,” which incorporates “connotations of stability, intensity, and swing.” Berliner notes that to many musicians a critical element of striking a groove is the synchronization between the drummer and bass player, and he found that many musicians discuss this in terms of “precision,” “unison,” and being “tight.” At the same time, Berliner notes that musicians notice a “world of subtle nuances involving the collective maintenance of the beat.” So while there are notions of precision and tightness, there are also notions of “elasticity.” Some musicians, such as bassist Rufus Reid, observe that there is a certain “edge” when playing “on top of the beat,” which he likens to “walking into the wind.” Berliner tries to reconcile the conflicting notions by terming musicians’ interactions as sometimes being dependent upon “controlled flexibility.” Another important issue that comes up in Berliner’s interviews is the interplay between “the tempo’s ebb and flow” and the “structural features” of a piece, hinting at a kind of balance between process and syntax.

Berliner helps to highlight the interactive and processual elements of jazz swing, while also hinting at the relationship between process and syntax, noting that the “qualities of a group’s groove, achieved through the
masterful manipulation of musical elements, ultimately transcend the technical features of jazz to provide improvisers with a rich, varied experience, a dimension of which is distinctly joyful and sensual.” In recalling some of the “problems” that can affect group interaction, Berliner mentions what one respondent terms as “discrepancies in the way players interpret rhythm.” From other musicians’ views on this issue, Berliner concludes that “unresponsiveness to normally acceptable time fluctuations with the group contributes to the problem.” Note that the use of the term “discrepancy” in the above statement is somewhat different than the way Keil and I are using it. Discrepancy has both negative and positive connotations, and it seems important to observe when a desirable discrepancy becomes an undesirable discrepancy and how and when this occurs. This points to the need for developing a systematic methodology that can begin to measure degrees of discrepancy, which may be more meaningful than just saying “yep, they exist.” I will suggest ways in which such a methodology might proceed below.

In addition to Monson and Berliner, other researchers have been exploring conceptualizations of swing, groove and group interaction from an ethnographic perspective. Travis Jackson has looked at small group interaction among jazz musicians in New York City (1992), and Keil is preparing a collection of interviews with jazz musicians speaking about grooves and processes. With all this recent emphasis on emic data, it is increasingly important that we establish a consistent and easily expanded etic method and framework for evaluating the emic statements. To give a sense of how the two kinds of research might complement each other, I will return later to the ethnographic dimension and include some brief excerpts from Keil’s interviews and two of my own with jazz musicians.

**Measuring Participatory Discrepancies in the Jazz Rhythm Section**

Data for my study of participatory discrepancies in the jazz rhythm section were gathered from three sources: a recording session with Charlie Keil playing bass and ride cymbal; recording sessions and interviews with four Buffalo area jazz musicians (drummers Maurice Sinclair, Abdul Rahman Qadir and Jimmy Gomes, and bassist Sabu Adeyola); and a “music-minus-one” record album featuring rhythm section work by bassist Steve Rodby and drummer Mike Hyman.

My earliest experiments in searching for swing utilized basslines performed by Charlie Keil. Preliminary observations suggested that he attempted to generate swing on the bass by consistently playing ahead of metronome clicks. In a subsequent session, another bassist, Sabu Adeyola, chose
to weave in and out of the metronome and play around with the time in his interpretation of swing. Later on, drummer Maurice Sinclair noticed this when he said, "that last bass player was messin' with the time all over the place." Sinclair heard this even though the metronome was removed from his headphone mix. After the initial recording sessions, I had two bass players' interpretations of swinging to a fixed pulse that confirm and complicate the Reinhoeldsson findings. These were valuable data that suggested how musicians might perceive themselves in practice relative to another force, even though using controlled circumstances gave me a different context than bandstand performance.

Adding the percussion side of the rhythm section team, Charlie Keil demonstrated his version of a "Kenny Clarke" ridetap and an "Elvin Jones" ridetap over his own basslines. By no means should this part of my research be taken as a way to gain insights into the drumming styles of Elvin Jones or Kenny Clarke specifically; rather, it is one way to look at how these styles are conceptualized by someone who is attempting to portray them and theorize about them. Whether or not these ridetaps actually represent the intended "feels," what they do show is a conscious effort, similar to that in the Reinhoeldsson study, to demonstrate a preconceived notion of swing. What they also show is that what people think they are playing isn't always what they actually do play. I will discuss the specific findings later.

As I invited other musicians to participate in the study, I chose not to describe the details of the project to them until after they were recorded, so as not to influence their performances. The musicians were all asked to simply "swing" along with the pre-recorded tape, which consisted of either a metronome or another musician's performance minus the metronome. Maurice Sinclair said afterwards, "I'm glad you told me what this is all about after I played. You would have given me another something to think about." After each session, the performer was paid a scale fee, and the whole thing was treated like a studio gig. Then Keil and I conducted interviews to determine individual reactions to the process and to get personal views on the nature of swing.

The standard performance situation for all experiments was a twelve-bar blues in B flat at three tempos (60, 120, 240 beats per minute [bpm]). The first samples consisted of Keil, and then later, Adeyola, playing basslines to a metronome at the three tempos. Keil provided a clear and somewhat predictable bassline borrowed from Red Mitchell, which stuck close to I-IV-V, and he generally used the same notes at each of the different tempos. Adeyola performed with a much "looser" feel, and used several chord substitutions. According to Keil's earlier model (1966:343–44), I had one "chunky" bassline—Keil's—and one "stringy" bassline—Adeyola's. The next step was to bring in three drummers individually and add their ridetaps to
these pre-recorded basslines. They wore headphones and heard only a bassline, with the metronome removed from their headphone mix. In retrospect, I could have started with the ridetaps and then added basslines, but I had to start somewhere and simply chose the bass first. Later, as I will show, I decided to try one experiment in which a bassline was performed to a prerecorded ridetap. The methodology at times unfolded as the project proceeded and as questions arose, so this report can be taken as encouragement for other researchers rather than as a completely rigorous, preconceived, well-controlled and closed scientific inquiry. What I have done is more observational than experimental.

I recorded all performances onto four-track cassette tape using a Tascam 246 as follows: track 1, metronome; track 2, bassline; track 3, ridetap; track 4, ridetap or bassline as needed. Different combinations of the four tracks were later mixed and digitized into the Macintosh with a commercially available and relatively inexpensive hardware/software package known as the MacRecorder with SoundEdit. This system basically utilizes a pair of simple analog-to-digital converters and a two channel sound editing program with some measurement and editing features.10

After recording some ridetaps in relation to basslines, I asked Adeyola to return and re-do his part, this time hearing only the ridetaps in his headphones. He performed basslines along with ridetaps by the various drummers, who had played their ridetaps to Adeyola’s original bassline. By doing this, I was testing to see if the relationship between his bassline and the ridetap would remain constant. Did Adeyola have a “pocket” or “niche” in which he likes to play in relation to the ridetap? This question stemmed from an initial observation that all performers in our experiments sounded like they were simply playing ahead of the bass, ridetap or metronome to generate swing. I will turn to a description of the results shortly.

In the process of analysis, I decided to utilize the most minute interval of measurement which the SoundEdit software allowed, in the hopes of capturing the most minute gaps between the events of each sample. Actually, at times these gaps turned out to be quite wide.11 I share Keil’s contention that it is the gaps, large or small, which provide the push or layback feel of a particular performance, and this concept underlies the whole idea of participatory discrepancies being part of an engendered and processual act, a subsyntactical groove.

At first I thought that including Keil in the study would invalidate it on the grounds of “researcher bias” (Of course there will be PDs, I feared, because here’s the primary PD protagonist himself laying down the grooves). I later realized that the issues are more complex than that. If Keil was able to intentionally add participatory discrepancies and perform in different shades of swing, then this confirms Reinholdsson in the sense that a performer can control and alter his feel in relation to an objective beat. So
the experiments featuring Keil’s performances can be viewed as similar to the Reinholdsson experiments. They can also form a basis of comparison for the later experiments in which Keil did not directly participate. The presence of Keil in the data adds another piece to the PD puzzle, while illustrating the praxis of a long time theorist. At times, he was surprised at how his ridetaps looked when analyzed with the digitizer; he hadn’t always played what he thought he had.

While there was a clear distinction between the two styles of tapping as demonstrated by Keil, his “Kenny Clarke” ridetap more closely parallels the bassline, and is generally placed further away from the bass than the “Elvin Jones” ridetap. However, both taps were placed ahead of the bassline, even though Keil thought he was playing at least some parts or all of the “Elvin” tap behind that bassline. This is illustrated in Figure 2, which shows a segment from Keil’s portrayal of his “Kenny Clarke” and “Elvin Jones” ridetaps, performed with a bassline at 120 bpm. The horizontal axis shows the metronome clicks, which Keil heard only while playing the bassline, and the variously shaded lines above the horizontal represent the bassline and two sets of ridetaps. Notice the fourth beat of measure 8, in which all three lines have a “spike.” This is the beat just before the harmonic change to the V chord in the progression, and may be in anticipation of that, which suggests that syntactical dimensions do play some role in generating a swing groove. I’ll return to this finding later.

Keil wrote that Elvin Jones plays behind the beat (1966:342)—in which case we should expect something different in his “imitation.” Without laying too much emphasis on an analysis of Jones’ style, it may be enough to say that Keil’s “Jones” anticipations are narrower than his “Clarke” anticipations, and note that intentions may not be relevant to the actual tensions.

Keil rarely placed his basslines or ridetaps after the beat, and this seems to be a feature of his playing. The common element of all lines in Figure 2 is their placement before the beat, mostly in a range of 30 to 70 milliseconds. I initially thought that the static context of metronomes and pre-recorded basslines led to this phenomenon, but later observations showed that this was not always the case. Could it be that Keil the theorist was trying too hard to “swing” because he had something to prove? Or is this a feature of a control-oriented player, one who always wants to push the performance ahead? The questions are easier to ask than to answer, but what we can say in any case is that an intention to vary the qualitative elements of a performance can indeed result in measurable, subsyntactical quantitative differences, even though they may not match the stated intentions of the performer.

Beyond the original intention of the Keil trials to demonstrate particular feels, some unexpected questions emerged from further analysis of his performances. The tempo of the performance affected the amount of discrepancy, most strikingly in the consistent widening of the ridetap pickup.
Figure 2.

A composite four-bar excerpt from a series of performances by Charlie Keil.

width, which we have seen above termed as “degree of swing” (Nemvalts 1988:62–63). Figures 3 and 4 show bars 1–2 and 5–6 of Keil’s basslines and ridetaps at slow, medium and fast tempos. These diagrams show three elements of the performance: the bassline (vertical lines below the horizontal), the ridetap on the beat (longer vertical lines above the horizontal) and the ridetap intermediate beat (short vertical lines above the horizontal), which is sometimes called a pickup note, or the short tap. This is the second half of the swing eighth note pattern that often appears after beats 2 and 4 as a “pickup” to beats 1 and 3. Monson notes that the length of the short note in the ride cymbal tap is an identifying feature of a jazz drummers style (1991:144). At 60 bpm, Keil’s short ridetap pickups to beats 1 and 3 are about 20% of the total length of the beat (how would we write this in notation?); at 120 bpm, the pickup gap shifts to about 25% of the beat width (loosely describable as a sixteenth note); and at 240 bpm the ride pickup tended toward 33% of the beat width (or something like a triplet eighth). To be more precise, we can call this phenomenon “pickup degree of swing” or “inter-
mediate beat degree of swing,” rather than “degree of swing” alone, noting that the percentage of this short tap gap increases as the tempo increases, but also recognizing that this may not be the only factor in an effective swing groove.

**Figure 3.**

A two-bar comparison of Charlie Keil's basslines and ridetaps at 3 tempos. The vertical lines below the horizontal represent attacks on the bass and the vertical lines above the horizontal represent the ridetaps. There are two kinds of ridetaps, the tap which falls on or near the beat (long vertical line), and an intermediate tap (shorter vertical line). The intermediate tap is referred to as a “ridetap pickup” or “short tap” in the article.

**Figure 4.**

From the same source as figure 3, except illustrating bars 5 and 6.
There are two levels of discrepancy occurring here: one within the ridetap itself, and another between the ridetap and the bassline.\textsuperscript{13} Observe that the eight ridetap pickup gaps found in Figures 3 and 4 at 120 bpm are remarkably consistent (their exact gap measurements are 114, 109, 105, and 113 milliseconds [ms] for Figure 3, and 114, 114, 112, and 111 ms for Figure 4). The relationship between the ridetap downbeat and the bassline downbeat is less consistent, which suggests that the ridetap is swinging on its own plane, and that this plane is going in and out of phase with the plane of the bassline. Feld describes a similar phenomenon in Kaluli lift-up-over sounding: "the overall feeling is of togetherness, of consistently cohesive part coordination in sonic motion and participatory experience. Yet the parts are also 'out of phase,' that is, at distinctly different and shifting points of the same cycle or phase structure at any moment" (1988:82). While the degree of discrepancy is different in Keil's swing interpretations than in Kaluli lift-up-over sounding, this does suggest that there are various elements at play in his performances, and that swing as a groove can be a matter of relativities.

It took a few beats for Keil to orient his tapping to the bassline into a groove that he felt comfortable with and tended to maintain for the remainder of each performance. Notice in Figure 3 that in each case the ridetap starts out behind the bassline in the first four beats at each of the three tempos. By the second measure a mirror image effect takes place, as the ridetap orientation drifts steadily into an "ahead of the bass" groove, which is visible throughout the remainder of Figure 3 and most of Figure 4. By the end of the first measure of his performance, Keil had eased into his ridetap "niche," which hovers ahead of the bass with different degrees of space between thirty and seventy ms.

Some drummers maintain a steady ridetap with a pickup to beats 1 and 3, while others vary the placement of that pickup tap, or all but omit it. Keil utilized the pickup tap very consistently—even at the slowest tempo—and this seems to be an important part of his perception of a swing groove. At 60 bpm, the pickup tap can sound a bit forced, and other drummers in the present study tended to leave it out altogether. Does 60 bpm swing? Perhaps the swing feel is more associated with medium or faster tempos. This is something that clearly needs to be investigated further.

One of the things I attempted to discover was whether two basslines by the same bassist would fall into a consistent pocket regardless of aural input, or if the bassist would orient himself differently depending upon whether he heard a metronome or a ridetap in his headphones. In testing this with Sabu Adeyola, I found that he played in relatively the same pocket in both pre-ridetap (with metronome) and post-ridetap (without metronome) situations. Many more examples need to be analyzed before any generalizations can be made, but we can say that Adeyola seems to have a pre-determined
orientation for his swing feeling in relation to a ridetap. Figure 5 shows a micro view of a portion of this experiment as it appears on the computer screen after being digitized, depicting measures 1 and 7 from Adeyola’s performance of a bassline to a pre-recorded ridetap. That ridetap had been recorded to Adeyola’s original bassline. In other words, the chain of recordings went like this: metronome, Adeyola’s bassline #1, ridetap, Adeyola’s bassline #2. Analysis of Adeyola’s performance suggests that his sense of swing tells him to orient his bass notes into a niche after the ride tap, and he maintains this relationship for 85% of the beats. This is clearly illustrated in Figure 6, which shows a complete twelve-bar performance of Adeyola’s bassline as played to a pre-recorded ridetap at 120 bpm. The gap between bassline and ridetap fluctuates between 4 and 80 ms, with an average of about 40 ms after the ridetap. Aside from the spike in the fourth bar, it is easy to see that Adeyola oriented himself in an after-the-tap niche in relation to the ridetap.\(^\text{15}\)

Accent patterns were discovered in some of the performances I analyzed. In more than one case, there is a spike on the fourth beat of a bar, as in bars 1, 2, 3, 4, 8, 9, and 11 of Figure 6. As we have already seen, there

**Figure 5.**

This is the way a performance featuring Adeyola playing a bassline to a pre-recorded ridetap at 120 bpm looks on the computer screen after being digitized. This kind of readout is most useful in determining attacks on both the ride cymbal and the bass. Releases, though not included in the present study, are visible on some of the bass notes. However, for the purposes of this study, the bass was measured from attack to attack (this is the approach Alén uses in his accompanying article), and the complex interplay between attacks and releases remains to be studied.
A macro view of the same performance described in Figure 5. For the purposes of illustrating Adeyola’s relationship to the beat, the ridetap is treated here as an abstract “beat” and therefore appears as a straight line.

does appear to be a syntactical dimension to some of the swing grooves collected in this study. The largest spike, on beat 4 of bar 4, is the note just before the IV chord in the progression, and points to a phenomenon that we have also seen earlier: the possible effect of harmonic progression on swing. Other places where such accents can be found are on beat 4 of bar 1 and beat 4 of bar 9 in Figure 6. The latter instance, which is the beat before the V chord, is the same place in which Keil’s performances in Figure 2 showed a spike, again evidence of a relationship between harmonic progression and swing. In one of Keil’s interviews, Jimmy Gomes mentioned “rolling up” to the bridges and new choruses. This is the kind of ethnographic data that the present research can help to illustrate from an etic point of view. In turn, the etic data can help the ethnographer ask questions directed at getting at these issues in more detail, and we may find that there is a subtle interplay between groove and syntax in generating swing.

A most remarkable phenomenon emerged upon observation of the performance data for Abdul Rahman Qadir’s and Maurice Sinclair’s ridetaps
over the Keil and Adeyola basslines. There is a consistent tendency of both drummers to orient themselves to the bassline in a specific way, and this allows us to say something about their different styles. In these experiments, both drummers played to the same pre-recorded basslines by Keil and Adeyola. The diagrams in Figure 7 are micro-view excerpts from various performance permutations at 120 bpm, and these examples illustrate that Qadir tended to place his ridetap ahead of both basslines. The millisecond tabulations show that he kept his ridetap within a range of 10 to 60 ms ahead of the bass most of the time. Sinclair, on the other hand, placed his tap after the same two basslines, in about the same range of ms as Qadir placed them before. Both later stated in their interviews that their examples "swing," yet they oriented themselves differently in relation to identical basslines. This tendency is not completely consistent, however, and both drummers also shift their taps onto the opposite side of the bass note. In other words, Sinclair taps mostly after the bass but also tapped before the bass, and Qadir tapped mostly before the bass but also taps after the bass. The remarkable thing is that, in relation to Adeyola’s bassline, the percentage of before or after the bass is identical for both drummers. In a complete twelve-bar performance, Sinclair tapped after Adeyola’s bassline 63% of the time and Qadir tapped before the same bassline 63% of the time. By comparison, Sinclair tapped

Figure 7.

Composite micro views of three different elements at a tempo of 120 bpm. Using the original digitized samples, these comparisons were constructed to illustrate how two different drummers relate to the same pre-recorded basslines. Both diagrams show the ridetap/bassline relationships for bar 7 of the twelve-bar form.
after Keil's bassline 85% of the time, and Qadir tapped before Keil's bassline 79% of the time. The predominant orientation for each—Qadir tapping before the bass and Sinclair after it—varied depending upon the bassline with which they were performing. Keil's "stiffer" or more consistent location of notes elicited greater consistency from both drummers while Adeyola's "looser" bassline elicited less consistent locations of ridetaps.

Other interesting phenomena emerged from these analyses. For example, the two ridetaps seem to weave in and out of one another, in relation to the bassline. This is illustrated in Figure 8, which shows a complete twelve-bar performance of Sinclair and Qadir playing to Adeyola's bassline at 120 bpm. While Sinclair is ahead of the bassline, Qadir is behind it (as in bars 2 and 3), and while Qadir is ahead of the bassline Sinclair is behind it (as in

\[ \text{Figure 8.} \]

A macro view of the same kind of comparison shown in Figure 7, except here we see only one set of relationships. For the purposes of illustrating Sinclair's and Qadir's ridetaps in relation to the beat, Adeyola's bassline has been treated as an abstract "beat," and therefore appears as a straight line.
bars 5, 6, 7 and 8). Recalling that they did not hear one another during this experiment, but that they did play to identical basslines, this phenomenon might be related to something they each heard in the bassline which made them move into a particular niche and then switch to another. It is almost as if the two tappers have an opposite conception of what swings, judging from these excerpts, at least. This appears so until about bar 9, when the two ridetaps suddenly appear to converge. Is this again related to something in the bassline, or is it their own individual senses of "bringin' it on home" or "rollin' up" as the final phrase of the chord progression leads back to the top? What exactly is the role of syntax in relation to groove in these and other performances? Are these the places where syntax engages groove? These are the kinds of questions that the ethnographer can attempt to answer, perhaps even in the context of a shared relistening with the musicians, after performances like these have been analyzed for kinds and places of participatory discrepancies.

The "catching up" phenomenon, as noted earlier in Keil's ridetaps, takes on a different shade of meaning in Sinclair and Qadir's performances. The two change their orientations at around beat 4 of measure 1, as Keil did, but the complete graph in Figure 8 shows that this may not be "catching up" but instead could illustrate a cyclical approach to playing. Sinclair and Qadir appear to cycle their ridetaps in and out of phase with the bassline, unlike Keil, who, once "caught up," stayed in that niche. Does this mean that Qadir and Sinclair are looser than Keil? More "playful"? It could be that Keil had more of a preconceived notion of what he wanted to do, whereas Sinclair and Qadir were going with the groove. Whatever the answers to these compelling questions, these results have allowed us to begin to comment upon stylistic elements at a subsyntactical level.

What are a musician's perceptions—both conscious and unconscious—in relation to "the other?" The "other" in the cases shown above has been a pre-recorded bassline, but could have been another performer. Interaction may be heightened in a live situation with more participants, or it may actually be subdued. Certain kinds of participatory discrepancies may decrease as the number of performers increases. One performer has to generate swing alone, but with two a kind of push/pull interaction begins. And perhaps with a full ensemble each person's participatory discrepancies will tend toward shifting from ahead to behind, and back to ahead, as the performers constantly re-orient themselves to each other, sliding in and out of phase with each other. In sum, participatory discrepancies appear to be contingent upon context and personal touches, but we need more experimenting and interviewing to get at these issues.19

Turning to another set of performers, this time from a commercial "music-minus-one" recording featuring bassist Steve Rodby and drummer
Mike Hyman (Ten Jazz Standards with Jimmy Raney. Jamey Aebersold, JA1230, 1979), it is possible to make some comparative observations. Played at a tempo of roughly 180 bpm, Mike Hyman’s ridetap pickup was about 33% of the beat width, unlike Keil’s ridetap pickup which, at a similar tempo, was about 25% of the beat width (see Figures 3 and 4). Furthermore, Keil’s ridetap was relatively consistent, whereas Hyman’s fluctuates. Nor does Hyman always place short taps after beats 2 and 4. Recall also that Keil’s ridetap fell consistently ahead of the bass. Hyman’s ride tap also falls ahead of the bass on many of the beats shown, except the fourth beat of bars 1 and 19 (see Figures 9 and 10).

As we saw above, Keil takes approximately 4 beats to settle into a ridetap-ahead-of-bassline groove. Hyman “catches up” to the bass (if we can

Figure 9.

![Diagram showing ridetap and bassline](image)

The first four bars of a performance by Mike Hyman and bassist Steve Rodby playing roughly at a tempo of 180 bpm. Ridetaps are represented by the verticals above the horizontal and bass notes are represented by vertical lines below the horizontal. Pickups or intermediate beats are shorter than the main beats.
still even use that phrase after looking at the cyclically phased performances of Sinclair and Qadir) after the first beat, as shown in Figure 9. Unlike Sinclair and Qadir, Hyman’s ridetap is placed consistently before the bass, and he doesn’t cycle before and after. We must, of course, consider that the Rodby/ Hyman recording was not done in my studio hooked up to my apparatus, and may represent a somewhat more “real” and more interactive performance situation. This adds another piece to the PD puzzle.

Recall that Hyman has a tendency to place his ridetap ahead of Rodby’s bass notes, as shown throughout the performance excerpts in Figures 9 and 10. This corresponds with some of the results from the recordings I made, and shows that one model for swing appears to position the ridetap consistently ahead of the bass. This is only one model, however, and we have seen another in the examples presented by drummer Maurice Sinclair, who prefers to place his tap after the bass more of the time. The predominant approach in my study does, however, appear to rely on placing the ridetap
before the bassline (or the bass after the ride, depending on which way one perceives it).

Evidence of Feld's phasing phenomenon can be found in the Rodby/Hyman performance in Figure 9. If one slides the ride plane a little bit to the right in this example, it will nearly exactly line up with the bass plane, which suggests that the two planes are "in synchrony," but "out of phase" (Feld 1988:82–83). In measure 3, the pickups to beat 3 for both ridetap and bassline are nearly the same distance from what might be called their target notes. The bass pickup gap is 92 ms, and the ride pickup gap is 99 ms. This "in sync/out of phase" relationship is also apparent in bar 4 of figure 9, where the ride plane, if moved a little bit to the right, would again line up with the bass plane. This phenomenon is observable in other places as well, and gives further weight to the in sync/out of phase relationship as it applies to a jazz rhythm section. More research needs to be conducted into this phenomenon, to see if the in sync/out of phase model applies to a wide variety of situations, and how it operates over longer segments. Using the empirical data as a point of departure, the ethnographer can begin to ask questions in terms of these kinds of relationships.

We have already seen a prominence for some kind of outstanding phenomenon on beat 4 of certain measures, and another example of this is shown in Figure 10. This time there is a degree of "tightness" on the fourth beat of bars 17 through 20 in the Rodby/Hyman performance. In bars 18 and 20, the ridetap is virtually right on the bassline, and in bars 17 and 19 the ridetap is closer to the bassline than on other beats. Taken along with Olavo Alén's findings (see his article in this issue), in which he determines that some notes in a repeated groove pattern have more tightness than others, this "tightness" phenomenon is significant. Is the fourth beat more "exact" than others? Beat 4 seems to be tighter than beat 2, which seems to be tighter than beat 3 (see Figure 10). Of course, this is only preliminary generalizing, but it does pose compelling questions and seems to verify or at least extend Alén's findings that there is more flexibility in some places within a repeated groove pattern than in others. This can help in understanding how aspects of form interact with feeling in the process of creating a groove from a repeated pattern. In cases such as this it is difficult to tell where the groove ends and the phrasing of syntax begins. Let's discuss how to make these distinctions.

**Toward a Multidimensional Engaging of Swing**

How do jazz musicians talk about their interactions with one another, and what it is that causes a particular performance to "swing"? As I mentioned
earlier, recent attention has been given to this kind of question in the ethnographic studies by Monson (1991), Jackson (1992), and Berliner (1994). In the interviews with the musicians in my study, these issues were touched upon as well. Abdul Rahman Qadir said swing happens when "we lock into that big pulse. It's just like the air—we can't see it but without it we can't survive" (1989). After taking part in our experiments, Maurice Sinclair said that "it's like a tree, the leaves on a branch. It swings regardless of whether it swings to a meter or it swings out of meter. There's still a pendulum motion" (1989). Sinclair described another important part of a jazz musician's framework, that "they are aware of each other's moods, their whims, their wherefores, their problems, and this is what makes one rhythm section better than another. They've reached another level of humaneness with the music. The music is totally spiritual" (ibid.). Bassist Red Mitchell used a poem to verbalize his idea of swing, "It isn't really rigid metronomic time that counts. It's sound and soul, communication, love, support and bounce" (1992).

Some musicians did have a sense of swing that was based on things like time, tempo and precision. Drummer Jimmy Gomes had given the matter of swing a great deal of thought by the time we asked him what he thought was going on. In his thirty or so years of tapping a ride cymbal, he arrived at a paradigm for rhythm section performances that revolves around a pendulum concept. For example, in a rhythm section of three elements—bass, drums and piano—Gomes hears them as falling into a groove with one being a bit ahead, one being a bit behind, and a third swinging like a pendulum back and forth between the two extremities (1989). Was this swinging back and forth alluded to by bassist Sabu Adeyola, who used the term "buoyancy" to describe what he felt (1989), or by Sinclair when he described the music as having a "lilt" when it swings (1989)?

Keil has found that most musicians have conceptions of swing based on unity and maintaining tempos (1993b), while others assume ahead, behind and on top tensions, using the groovy metaphors that we have seen above and that some of Monson's and Berliner's respondents used. Are two kinds of conceptual approaches emerging here? Can we make any connections between metaphors used and the actual performances? Only further ethnographic work which is informed by and engaged with the kind of empirical data that I am offering here can answer these questions.

Sabu Adeyola, after he performed a bassline along with a metronome, shook his head with a smile and said, "that dude don't wanna move."20 What he may be telling us is that he perceives and/or desires a sort of push and pull interaction between musicians within a rhythm section. Was Sabu trying to nudge the metronome/drummer along, provoke an interchange, perhaps rush a bit on "the bridge" and be nudged back at "the head?" Is the drive toward interaction and participation at the bottom of the in sync/out of phase
relationship? Is this an example of what Keil calls the "urge to merge" (see his article in this issue), albeit with the "Mechanical Man?" These kinds of questions can be answered by returning to our musicians for another round of ethnographic work after analyzing our technical work.

During the initial interviews Keil and I conducted after the recording sessions, all participants stated one way or another that their performances were swinging, but sometimes with reservations. Maurice Sinclair noted that "what we just did swung, but it swung in a different entity, as opposed to if it were a live session. The real life rhythm section swings on another level. These people have a certain degree of academics, and they have a large degree of hanging out together, and they have a large degree of spiritual awareness" (1989). Abdul Rahman Qadir: "I got enjoyment out of that. That swing was there. That thing is there" (1989). When pressed to elaborate on the difference in a live session, Qadir used the term "ultimate swing" to differentiate the two, and acknowledged that the studio gig was more "conscious," and the live gig "looser" (ibid.). These are more pieces to a puzzle that I cannot fully put together in a study with a limited scope.

Although all musical examples in my experiments were performed with the intention of playing along with either a metronome or a pre-recorded performance, the word "play" took on a new, multiple meaning after the examples were analyzed. The instrument attacks were rarely on the beat—whether that "beat" was provided by a metronome click or by another instrument. Instead, things fell or were placed either before or after that beat. So, rather than playing with the beat, some performers were playing with the beat. This was visually apparent in a few of the computer printouts, and seems to verify the initial assumption that swing is generated in the open spaces between attacks and releases of a performance. In other words, there is a certain amount of "play" in a musician's relationship to other phenomena, with the word "play" being used here in the sense of "leeway." These out of time or out of phase relationships do not imply that something is wrong. As Keil asserts, this idea of play is positive (1987 and his article in this issue). Musicians participate in "musicking" and play around with the beat as well as with each other. There is a constant push and pull, orienting and re-orienting; a playful interaction of groovy processes.

The open spaces between the quavers are tiny, and not easily realized within the framework of conventional music notation. In fact, the very nature of music notation obscures the element of play. This is particularly so when notation is applied to music that did not necessarily result from notated or composed forms. Notation can also often fall short in determining stylistic differences. More importantly, we are reminded of the general shortcomings when using nice and neat standardized representations for complex phenomena. But rather than disclaim notation, we can continue to supplement
its use by suggesting new methods and parallel modes of representation, while recognizing that there's always going to be a little or a lot of play.\textsuperscript{23}

In this article I have demonstrated four things. First, participatory discrepancies can be found in musical performances, and these discrepancies are observable at the subsyntax level. Second, participatory discrepancies can be measured quite precisely. Third, the amount of play appears to depend on the individual and the context. Fourth, we can begin to make quantitative descriptions of individual performances and get closer to describing personal styles in tangible ways. These descriptions can then add a crucial dimension to ethnographic work, and help to find how the qualitative informs the quantitative and vice versa. Regarding the stylistic elements, there are two kinds of conclusions that can be made. First, there are generalized types of conclusions which can be used to describe broad characteristics of swing that may be common among many performances. Second, there are specific kinds of conclusions that can be drawn to describe stylistic traits of individual performers and performances. Both kinds of conclusions have been drawn from the present data, despite the limited scope of the project. The field is clearly wide open for further research, and an infinite array of possibilities exist, especially when the empirical dimension informs the ethnographic, and in turn, the ethnographic informs the empirical. A few examples: Can we map the tensions between the four limbs/contact points of one drummer? What does a drummer say about generating grooves all by himself before and after such measurements? Can we do this for jazz drummers, rock drummers, funk drummers, polka drummers, and other drummers? Can we team the drummers up with various bass players? What do they say they are doing? What do they actually do? What do they say after the measurings when their "models" and their "actions" don't always match up? Can we record and measure three players more organically? Is the Gomes model of "ahead," "behind," and "pendulum" players true for at least some jazz rhythm sections?

In a very general sense, my preliminary findings show that at least some examples of swing are in Keil's sense somewhat "out of time." Beyond this, some possible patterns have emerged, particularly the tempo relationship to percentage of swing and the consistency of the ride-ahead-of-bass pattern. In addition, the cycling and phasing effects may turn out to be patterned as well. All we can do is continue making predictions, and then test for results. Will we find a few standardizable and mechanizable patterns, or are swing and groove chaotic and unpredictable? What are the relationships between grooving and phrasing or inflection?

To me, the most intriguing thought seems also to be the most basic. Music and musicking are not about exactitude, quantification and precision in the sense of achieving abstract perfection, fulfilling a Platonic form,
measuring up to a mechanical standard; yet getting into a negotiated groove with one or more other players may turn out to be a very exacting and precise process, style by style and context by context across cultures. Music and musicking are about participation and play, about "touch" and feeling your way. Having been involved in education for some time, I am also interested in the implications of these ideas for music teaching and learning. I am wondering what will happen if we show the youngest musicians that some of the great masters leave spaces, are "sloppy" and like to play? Will there be less weight on their shoulders as they learn? More listening and mimesis, and less worrying if they are "out of time?" Or will the Zen koan-like contradictory challenges of "feel your own way/feel with others," "perfect your imperfections," "work at playing," "you must take pleasure in being tightly loose," simply paralyze some learners if we are not very careful? Can pleasure, play and "precise looseness" be taught at all, or are we teachers simply responsible for making the best grooves available daily and encouraging participation in them by having a very good time ourselves? We need to think about the simple fact that things are not always as ordered as some would like them to be, and that there is room for movement, room to breathe and room for play. In this sense, I agree with Keil's notion of "discrepancy" being a positive attribute, and I suspect that it might even be the norm in music making everywhere.

Finally, I wish to suggest the use of relatively inexpensive and accessible technology such as I have used here, in order to encourage participation by many in this kind of research. Hopefully this will counteract the effects of techno-hegemony, the notion that if you don't have one of those Sempods, Melographs or Synclaviers, or other highly specialized and pricey devices, you cannot do any meaningful research. I propose putting participation and play research into the hands of many, and look forward to some collaborative and continuing work.

Notes

1. This article is dedicated to the late Red Mitchell, a jazz master and purveyor of PDs whom we will all greatly miss. I can only imagine the kinds of responses he might have had to what I've said here, but I hope that this loss will encourage other researchers to talk with expert practitioners about their craft soon and to record their touches in relation to other players. I wish to extend special thanks to the Buffalo area musicians who graciously and patiently participated in this study: Jimmy Gomes, Maurice Sinclair, Sabu and Dawood Adeyola, and Abdul Rahman Qadir (a big salam 'alaykum to you all). Several people and groups have contributed references, leads, or ideas to this work, including the Colored Musicians Club of Buffalo, Chris Waterman, Jim Patrick, Steve Feld, Travis Jackson, Paul Berliner, Alan Lomax, Michael Stewart, Electronic Musician magazine, Allen Farnelo, Vijay Kichlu, and the Sangeet Research Academy. I also wish to thank those who have read and commented upon earlier drafts of this paper, including Charlie Keil, Dan Cavicchi, Jeff Titon, J. Terry Gates, and especially Ghada Ramahi. Above all, I must express humble gratitude to Barry Tala, upon whom I have relied throughout this work.
2. For performances at a similar tempo, Stewart's measurements are smaller than the ones presented in the present article. According to his chart, some of the career musicians who participated in the present study would be in the "day job" or "get some sleep" categories. In addition, Stewart's prescriptions imply that the amount of discrepancy is consistent for a particular feel, whereas the present article points to the conclusion that a feel involves fluctuations within a range. All of this may of course be a result of the sonic differences between electronic and acoustic instruments, but it does add another piece to the puzzle.

3. I share Keil's concern that PD research can affirm diversity and participation, but that it also can lead to what he calls "cyborg über alles" (see his article in this issue). Can a machine be used to counteract the "megamachine" and "megatechnic culture" (Mumford 1970:238-41, 367), or are these always reinforced by machines? It seems to come back in part to the intentions of the user. I can't help thinking of the conversation I had with Vijay Ichiulu, the director of the Sangeet Research Academy in Calcutta (in 1989, while he was in Buffalo), who described their use of acoustical analysis equipment to test young performers for "talent." They had recorded and digitized the voices of several old great masters of singing, and used these data as an "objective" way to screen and evaluate voice students (see also Chakraborty et al. 1984 for a similar discussion of "accuracy detection").

4. Other researchers have discussed the shortcomings of various kinds of acoustical analysis devices. Jost, for example, had difficulty in isolating Albert Ayler's saxophone from the ensemble sound in his study of free jazz (1974). Until I began using a two-channel digital to analog converter, isolation of different parts was a major difficulty that could be solved only partly by using filtering and gating devices.

5. For a description of the research apparatus used by Reinholdsson, see Bengston et al. 1972.

6. Sometimes the role of syntax in jazz is taken to extremes. Alan Perlman and Daniel Greenblatt, for example, see jazz improvisation as analogous to speaking a language, and they analyze jazz solos strictly in terms of syntax, all but ignoring the role of groove and process (1981).

7. I made this decision after the first bass player I approached was scared away when we described the project in detail before he participated. He apparently did not want to experience the close scrutiny we intended, and assumed we were looking for his "mistakes." This was also alluded to by Sinclair, when he mentioned, in passing, that we were measuring "abilities."

8. Keil interviewed Adeyola and Gomes, and I interviewed Sinclair and Qadir. A few of their statements are interspersed throughout the present article and in Keil's accompanying article. Since the initial session, Keil has assembled a larger collection of interviews on this topic, which I have also drawn upon—if not always directly—for my conclusions and observations. Alén also interviewed the musicians he worked with for his study (see accompanying article), but the results are not available at present. As PD research broadens, a systematic methodology which combines interviews and performances—theory and practice—may yield the best results.

9. The bassline Keil played was based on Red Mitchell's first opening line of "Blues Going Up," from California Concerts by Gerry Mulligan (Pacific Jazz P11201, 1954).

10. Before using the MacRecorder and SoundEdit, I used SoundWave and SoundCap. Each of these had certain limitations that I need not go into now. Basically, two MacRecorders allow synchronized two-channel recording while SoundEdit permits measurements in milliseconds. While using the earlier single channel devices and softwares, I tried various forms of filtering and gating to try and isolate the various attacks of the bass and cymbals, but later found this to be unnecessary with the MacRecorder and a carefully mixed tape.

11. Gaps of 10 or more milliseconds are generally audible, but this also depends on tempo. I found that some gaps were as wide as 80–90 milliseconds.

12. Recalling Michael Stewart's "feel spectrum," this puts Keil squarely in the "day job" category! As I noted earlier, it may be possible to explain the wider gaps as demonstrating the differences inherent in acoustic and electronic instruments.
13. The two levels of discrepancy that I suggest here are paralleled by Farmelo (1993:34), who notes that while musicians can groove alone, groove is both that which unifies the separate parts, and that which is created by the unification of separate parts. This is an aspect of what he calls the “completing consequences” of groove.

14. It is not my purpose here to describe the digitizing and analyzing procedure in detail. In general, one can utilize various features of the software to pinpoint and measure different aspects of a digitized sample. Options include magnification of the wave form, compression, filtering, and some cut and paste features. There is no on-screen measurement scale, but there is an internal measurement feature which allows the user to identify durations in milliseconds by placing the cursor on the desired spot and then recording the distance from the beginning of the sample. For example, in Figure 5, the first ridetap is 00 ms on the scale. Placing the cursor on Adeyola’s first bassnote gives a measurement of 40 ms. By continuing to pinpoint attacks with the cursor, one can determine the location of a sound within the cumulative duration of a sample, and then perform the proper mathematical operations to determine various relativities. The various hardware/software packages I used were not necessarily designed for music analysis alone, but were intended for broader applications such as sound design and speech studies. For a discussion of how digitizers might be utilized by ethnographers while editing interviews, see Pröglér 1991.

15. The ridetap is treated here as a constant, and therefore shown on the graph as a straight line. The only measurement that this type of graph shows is the relationship between the bass and this pre-recorded abstract “beat.”

16. This opens up a whole new avenue of inquiry: the relationship between harmonic progression (or melody, for that matter), and the conceptualization or performance of swing.

17. Sinclair’s ridetap is a big exception to the cymbal-ahead-of-the-bass rule, which prevails in this study and is suggested in the literature I reviewed. Is this because he is from an older generation of musicians, playing with a swing era feel? It’s time to check out the elders while we still have them here.

18. The choice of diagram seems to have a direct bearing on the kinds of phenomena that one can observe, both on a micro and macro level. I don’t profess to having exhausted all possibilities of presentation in this short article, but I think future PD research can benefit well from finding varied and flexible ways to present data in graphic forms.

19. In a short letter to Charlie Keil in 1987, Steve Feld schematized participatory discrepancies in terms of structural dynamics, and one of the grids he suggested involves actors—both individual and group—as yielding types of PDs. Feld’s configurations suggest that once we start looking at what is rubbing against what the possibilities are limitless, so the real task is to determine what is relevant. The present study only considers a very small part of the vast array of possible PDs. These encompass many dimensions of musicking beyond the attack-oriented rhythmic approach I have been using here. For example, in another study, I discovered the PDs of release in West African kora playing (1988). Regarding the relationship between number of performers and amount of PDs, it is possible that rhythmic PDs may decrease in, say, a large jazz band. But, how would a sax section sound if there were no timbral PDs? PD research has only begun; if it takes hold, it may revolutionize the way we talk about about music.


21. It was recently brought to my attention that the idea of “playing with” and “playing with” the beat in African and Afro-American music is traceable to Alan Lomax. Charlie Keil called professor Lomax in June of 1993 and asked if he recalled where he might have written that. Lomax responded that he and Gilbert Rouget discovered in Paris in 1962 that many peoples of the world have an element of “play” in their music, but he couldn’t recall where he had written that. If it isn’t clear, especially after my multi-pun on the word “play,” what Lomax really meant, let it suffice to say that the notion of “culture as play” (Hall 1992:224–25; Mumford 1967:7–8, 308; Huizinga 1955) has been out there for some time, and my work is reinforcing it.
22. I think the term "musicking" was coined by Christopher Small. I heard him use it in a talk he gave at a music education seminar I attended in the Fall of 1989 at SUNY Buffalo. Small pointed out that using "musicking" instead of "music" shifts the emphasis from product to process, and it is for this reason that I use it here. For a detailed exposition of his ideas on music and musicking, see Small 1980.

23. The use of subsyntactical analysis to supplement and enhance conventional music notation is one of the main issues in the accompanying article by Olavo Alén.

24. I am largely in agreement with Hall (1992:225), who makes a distinction between "acquiring" and "learning" culture, and who goes on to stress that culture cannot be taught, only reinforced. While the present work is not intended as an exploration in music education, I also think that Hall's distinction between "inside-out" and "outside-in" orientations in teaching and learning (ibid.:234) is relevant to Keil's participatory discrepancy hypothesis and our assertion that process takes precedence over syntax.

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