A Cross–Cultural Grammar for Temporal Harmony in Afro–Latin Musics: Clave, Partido–Alto and Other Timelines

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Introduction

This article presents an in–depth study of the musical concept called *clave direction*. The significance and regulative role of clave and similar cyclical timelines[1] in Afro–Latin music have been established by many scholars, including Ned Sublette, Tomás Cruz, H.W. Soebbing, Rebecca Mauleón–Santana, and Ronald Herder.[2] Clave is typically identified as the rhythmic anchor of Cuban music. Furthermore, Eugene Novotney, Hugo "Foca" Machado, Willy Muñoz, Jorge Sadi, and Chris Washburne, among other musicians and scholars, have argued that clave is central not only in Cuban music but in all Afro–American music.[3] Although there is agreement on the importance of the concept, previous work has either been precise but culturally narrow in scope, or broad in scope but imprecise in its details. The present work builds on these earlier efforts to establish an understanding of clave direction that is precise, parsimonious (only two concepts suffice), and widely applicable.

My analysis proceeds from the hypothesis that musics emerging from the transatlantic slave trade with significant Yorùbá influence share common traits including what has come to be called "clave." Ruth M. Stone links observations of the musical role of clave–type patterns to the geographical origins of the patterns in West Africa, and emphasizes that this pattern–as–concept was brought to the Americas with the transatlantic slave trade. In particular, she states that clave "fits, of course, with other patterns played at the same time . . . Therefore, it has a role in keeping everything appropriately linked. Players use it as a reference point to synchronize the drum, bell, and vocal parts" (Stone 2005:81).[4] D. A. Tobias has written that "the clave beat is the foundation of Latin–American rhythm and practically all of the other instruments are guided by this beat" (Tobias 1965:270). More recently, Arturo Rodriguez has argued that "clave is the key to understanding how Afro–Cuban music is arranged and flows" and that it is "a concept that is fundamental to Afro–Latin music" (Rodriguez 2003:41). Consequently, clave should be understood not only as a pattern but also as a critical musical

concept (Rodriguez 2003:41–45; Mauleón–Santana 2005:5–8; Spiro and Ryan 2006:12–17).

The word "clave" has several meanings,[5] so it is important to specify which I am addressing here. Three of these meanings are well–known: (1) *claves*, the instrument; (2) *clave* in the harmonic sense, as in "the key of C major" (in Spanish); and (3) a small family of patterns, which is what musicians typically have in mind for clave. I refer to the latter as the clave proper. This article focuses on a fourth meaning of clave, one frequently discussed but rarely investigated. I refer to this as *clave direction*. Clave direction is a concept and a rhythmic–regulative principle. It is analogous to the key of a piece of music, but instead of governing tonality, it governs fine–scale local timing (mostly without regard to pitch[6]). Clave direction gives a composer or improviser a set of preferred timing options and the appropriate places within each phrase to place them (a sort of micro–phrasing), along with acceptable ways to break these rules (more freely in *batucada* than in *Candomblé*, more so in *axé* than in samba, in *timba* than in *songo*, etc.). Just as the key determines the tonal center of the piece, the clave direction is the overarching determinant of the timing preferences for the piece, but like its tonal counterpart, it allows for variety in musical expression, and even tricks, puzzles and multi–layered playfulness in its execution.

In order to make the most artistic and culturally sensitive use of this principle, I offer an approach to understanding clave direction that I call *wide–sense clave*. In this wider sense, clave–the–concept denotes not just the existence of specific patterns, but the *relationships* that any pattern may have with a family of associated patterns. It is because of this wide–sense quality of clave that Frank Malabe and Bob Wiener are able to note that "any rhythmic figure can serve as a clave" (Malabe and Wiener 1990:9) and that Sublette can contend that "clave is not a beat . . . [but] a key: a way of coordinating independent parts" (2004:170–171).

The relationship between cyclical timelines that act as clave patterns and the specific role they play in their respective traditions is precisely explained here, in a manner that unifies these musical traditions under one regulative concept distilled from traditional practice as taught by cultural authorities and exemplified by recording artists. Valuable attempts at analyzing and decoding the clave concept have been made by Novotney (1998), Bertram Lehmann (2002), Godfried T. Toussaint (2002), Mauleón–Santana (2005) and Dan E. Wilson Jr. (2010). The analysis presented here is novel because of its greater consistency from case to case, parsimony, and precision.[7] As long as one can express rhythmic patterns as strings of sixteen onsets (through quantizing and thresholding), a conclusive identification can be made as to the clave direction (or lack thereof) for any pattern.[8] (A few outstanding

issues regarding these simplifying assumptions are listed in the conclusion, as well as in end notes.)

The analysis of clave direction presented here is intended to be useful to the ethnomusicology, music–education, music–theory and Latin–music communities— researchers, educators, performers, listeners—by contributing to a broader understanding of clave while respecting its form and tradition. The present approach arose from my commitment to performing the music with an appreciation of its nuances as developed and preserved by generations of indigenous performers. I have expounded the grounds for this approach and the ways such an analysis can benefit music analysis, music–making, and the music industry in a previous article (Vurkaç 2011:28–34 and 38–40).

The regulative role of clave is aided greatly by a metric called *offbeatness* (Toussaint 2005:23), which is adapted here as *relative* offbeatness.[9] Through this key concept, the regulative role of clave can be explained simply and consistently. I should note that clave also plays other organizational roles such as those related to improvisation and time–keeping, as discussed by Herder (1972) and Mauleón (1993). Wide–sense clave provides resolutions to common difficulties (e.g., Section III.d.) musicians may encounter in reconciling the African–based, Cuban–developed clave concept with its offbeatness–regulative function in other Afro–Latin musics.[10]

The clarifications offered below for understanding and applying clave direction in a variety of circumstances, for various instruments, and to a variety of Latin American musics will help musicians at virtually any level of experience further their understanding and appreciation of clave. Nonetheless, this analytical approach is only offered as a theoretical tool for the clave–conscious musician's toolbox, not as an alternative to developing an intuitive feel for clave through practicing and listening.

In my examination of clave I make a couple of necessary assumptions: (1) that quantized attack–point rhythm—which disregards durations, releases, and expressive timing—is sufficient for a basic, initial study of clave direction; and (2) that the time–keeping and phrasing aspects of clave are both less challenging to performers and not part of the goal of this article. This leaves the offbeatness–regulative aspect of clave as the sole focus of the present article.

The main points made in this article are that 1) the absolute onset count should be abandoned; 2) upbeats and downbeats are onbeats as far as clave direction is concerned; 3) the inner/outer demarcation (suggested in Figure 2) should be preferred over the standard approach of dividing phrases into a first and second half; and 4) it is the relative offbeatness of consecutive sections that determines the sense of clave, not counting onsets or template–matching against well–known patterns.

I have made two intentional substitutions in this article (one terminological and one notational) that depart from the norm in the musicology literature. The first is the use of the term *offbeatness* in place of the more familiar *syncopation*.[11] The second is the use of the Time–Unit Box System (TUBS: Koetting 1970:115–146), also known as "matrix notation" (Rodriguez 2003:63). Strong support for the use of TUBS is given by James Koetting and Roderic Knight in their discussion of hemiola, hocket, and "fastest pulse" (Koetting and Knight 1986:60). Although not standard for written music, TUBS[12] is included here because of the correspondence between the geometrical positions of onsets and the timing of note attacks (Figure 1).

The technique offered in this article is not intended to impose an etic analysis on these art forms, or to claim that clave can be reduced to numbers. On the contrary, the intent is to contribute to a better understanding of clave while respecting its tradition. Although the way to internalize and *feel* clave is to listen, practice, and play in clave–aware settings, the analytically oriented reader may still benefit from the present analysis.

I. The Basic Claves (Clave–Proper) and Clave Prototypes

a. The (Afro–Cuban) Son Clave: A Seemingly Obvious Starting Point

Son clave is a form that appears in many music styles worldwide (Figure 1). If we took the standard course in the discussion of the clave, and broke it up into the first half and second half of the phrase, examining each half in terms of syncopation and resolution, we would find three onsets in one half and two onsets in the other. (In fact, it was after these numbers that the clave directions were named). While making perfect sense in terms of the *son* clave, this approach does not engender a conception of other patterns which are traditionally understood (heard) to be in *clave agreement* with the *son*.

I will refer to this typical method of counting the onsets in the first and second halves of the phrase as the "standard approach," and show how the novel concept of relative offbeatness supplants and surpasses it. Although the *son* clave lends itself easily to the standard approach, experience with many other rhythms in their traditional contexts shows that analysis based on relative offbeatness works (in terms of agreeing with the respective traditional practices) in a significantly greater number of musical situations.

In the method proposed here, we compare numbers of onsets according to their rhythmic function (more onsets supporting this function, fewer supporting that function) instead of fixed numbers (three onsets here, two
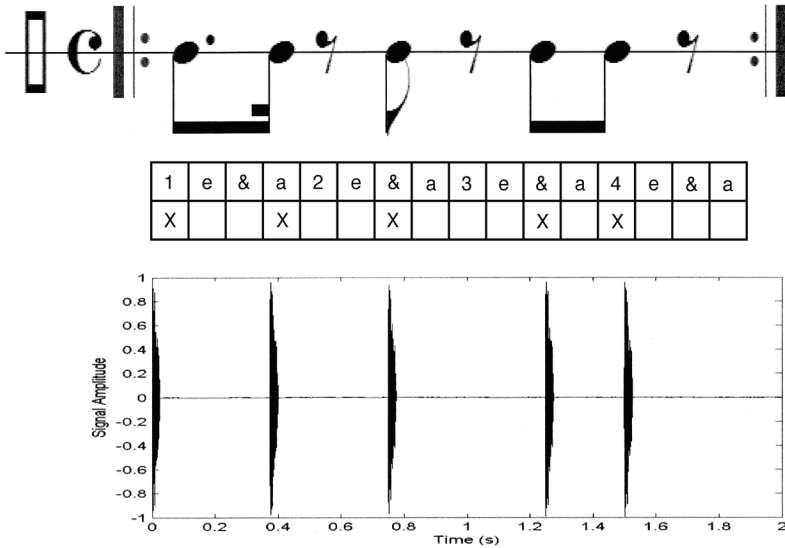
1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X			X			X				X		X			

Figure 1: The 3-2 son clave in standard notation, TUBS, and sound waveform. Note the visual correspondence between the waveform and TUBS. Careful spacing is required in standard notation to get the same correspondence. (The first line of the TUBS representation shows one way to vocalize sixteenth-note subdivisions, pronounced "one, ee, and, ah.")
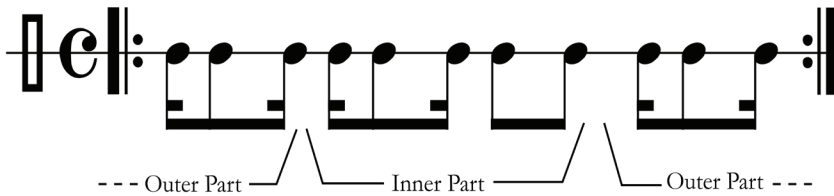

Figure 2: The inner and outer parts of the okele (phrase cycle, Ekwueme 1974, 46), depicted using the cáscara.

there). The relevance of this approach becomes most apparent in the discussion of *surdo de tercera* in Section III.d. Thus, instead of first half/second half, we look at the inner part and the outer part of the pattern (Figure 2). And instead of syncopation and resolution, we consider offbeatness and onbeatness. Unlike the standard approach, the inner/outer perspective combined with relative offbeatness works in virtually every case from Ghanaian *gahu* (Toussaint 2002) to American funk (see Section III.b), and from Haitian *konpa* (Section III.a) to Brazilian *axé*.

I define the *inner part* of the phrase as ranging from the downbeat of *two*, up to the downbeat of *four*. The *outer part*, then, ranges from the downbeat of *four*, around to the downbeat of *two* (Figure 2). (This overly simple definition is loosened later in Section II.d.) I also use a common
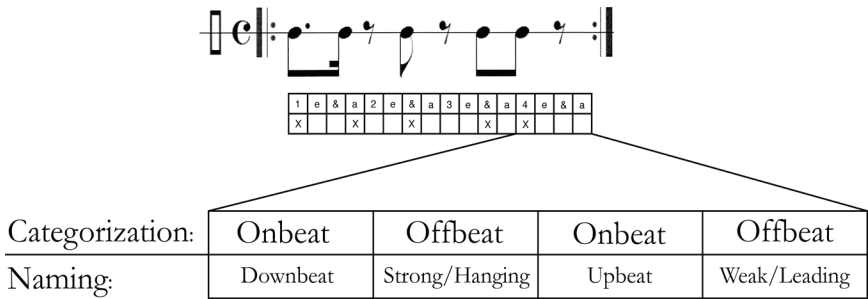
	Onbeat	Offbeat	Onbeat	Offbeat
Categorization:	Onbeat	Offbeat	Onbeat	Offbeat
Naming:	Downbeat	Strong/Hanging	Upbeat	Weak/Leading

Figure 3: Suggested naming scheme and categorization for sixteenth-note subdivisions of the quarter note.

naming scheme for the subdivisions of the quarter note (Figure 3) such that both downbeats and upbeats are considered *on*beats.[13]

The inner part of the 3–2 *son* clave consists solely of two onbeats while the outer part has two onbeats as well as one offbeat. Since this pattern is typically called 3–2, we will refer to any other pattern exhibiting this offbeatness behavior (more *off* outside, more *on* inside) as 3–2. This label will apply even when two onsets show up in the first half, or three in the second half, as long as relative offbeatness follows the same arrangement. The reasons for this scheme will become clearer as we examine other patterns.

It is important to reiterate that although speaking of a neat division into first and second halves would have helped us understand the *son* clave just as well, the standard approach fails with many of the more complex patterns found in Afro–Latin musics. Two characteristics make the *son* clave easy to model as a "tension half" and a "resolution half": 1) The particularly neat distribution of inter–onset intervals (time between note attacks); 2) the complete lack of onsets from beat four to beat one. This rare arrangement gives rise to potentially misleading models for clave. The second characteristic, as we will shortly see, is not true for the so–called *bossa* clave, a more difficult pattern (Toussaint 2002:4–7) that is generally considered vague as an explanation of clave direction. On the contrary, offbeatness–based analysis shows the *bossa* clave to be even more revealing than the *son* clave for indicating clave direction.

b. The So–Called Brazilian (Bossa) Clave

The *bossa* pattern has very different characteristics than the *son* and *rumba* claves (Rodriguez 2003:48; Tomás, Moore et al. 2004:75; Spiro and Ryan 2006:13), even though it may appear similar to them. As a result of the

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X			X			X				X			X		

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X		X		X					X				X		

Figure 4: Top: The 3-2 bossa clave. The onset shown with a triangle indicates how the last note of son can be delayed to obtain this form. Bottom: An arbitrary pattern in 2-3, illustrating that counting onsets does not always indicate clave sense.

seeming similarity *and* underlying difference, it better illuminates the wider implications of clave direction, because in the *bossa* clave offbeatness and onbeatness exhibit themselves (and then expire) earlier than the first–half/ second–half notion would imply. (The position of the fifth onset is what gives the *bossa* clave this additional explanatory power.) The "3–side" really begins *before* the first half of the phrase, and ends sooner than the midpoint of the phrase. Likewise, the 2–side begins and ends sooner than the second half. This pattern, sometimes called *bossa* clave, is widely used in various Brazilian styles. It indicates the *partido–alto*—the true key to samba—more closely than the *son* clave. Though controversy exists over whether there is clave in Brazilian music (Rosauro 2004:7; Gomes 2007:88; Machado, Muñoz et al. 2002:10; and Wilson 2010:38, as discussed in Vurkaç 2011:392–3), samba is indeed played within the partido–alto form (which is analyzed below). Since musicians are expected to know, feel, and play within the underlying rhythmic structure of each Brazilian form, Afro–Brazilian music evidently does follow clave.

To derive the *bossa* clave from the *son* clave (Figure 4), the last onset of the *son* clave (Figure 1) is delayed by one subdivision. Note that the sense of finality found in the Cuban *son* clave vanishes in the "wrap–around" feel of the Brazilian pattern. Inter–onset intervals in each half of the bossa clave are the same, so the distribution of onbeat and offbeat onsets is more even than in the Cuban claves. Hence, speaking of the first and second halves gets us nowhere in terms of tension and resolution, the terms typically used to analyze Cuban claves, because there is both tension and resolution in both halves.

 If we consider the demarcation shown in Figure 2 instead, we find that the outer part only has one downbeat onset and two offbeat onsets (the *a* of *one*, and the *e* of *four*). The inner part has the same two onbeats as the *son* clave. Hence, the pattern has greater outer offbeatness (or, greater inner onbeatness) consistent with the label of 3–2. (See Section I.a.) It is no longer a problem that the 3–side of either clave has the main downbeat and that the 2–side does not.[14] This is partly because downbeats and upbeats contribute roughly the same sense of onbeatness to the overall pattern. (There are, of course, context–dependent differences, but in this initial approach to clave direction, we can overlook these without harm.)

 In finding the direction of the *bossa* clave, it is not sufficient to count three onsets in the first half and two in the second half because many examples like Figure 4 (bottom) can be generated with three onsets on the "2–side" and two onsets on the "3–side." Besides, dividing the phrase in two and counting note onsets cannot be sufficient to identify implied direction because clave, as attested to in many sources, governs the timing and phrasing of all parts and all instruments. Clearly, all instruments at all times cannot be limited to five notes per phrase. It is the local variations in offbeatness that determine (and are determined by) clave direction, not whether two or three note attacks are being played. Hence, resolving the overall clave direction effected by any pattern requires intuiting the relation between rhythms of interacting instruments, *not* counting notes. The standard approach would give the same clave direction (3–2) for the patterns in Figure 4. But the bottom figure is considered "crossed" (in the wrong clave direction) if used as an ostinato in any 3–2 instance of Afro–Latin music. The wide–sense clave approach correctly identifies clave direction in this and many other patterns.

 When approaches and interpretations of clave direction differ, the final arbiter ought to be the accepted practice in the tradition in question.[15] When superimposed with other rhythms that are more apparent in their clave direction (such as *partido–alto*), the 3–2 *bossa* clave produces a tangible sense of *resistance* for experienced musicians when played over a 2–3 pattern, but fits comfortably over a 3–2 pattern; hence, it is a 3–2 pattern.

c. A Graphical Analogy for Clave Direction

Before moving on to other patterns, a graphical analogy is provided below to present the idea in an alternative manner. Imagine a fictional culture in which visual decorations, no matter how elaborate, are generally arranged in a pattern of alternating round and pointy designs. Assume for the sake of argument that stars and circles have traditionally been used to provide the alternating pattern, and that the arrangement in Figure 5, line one, is
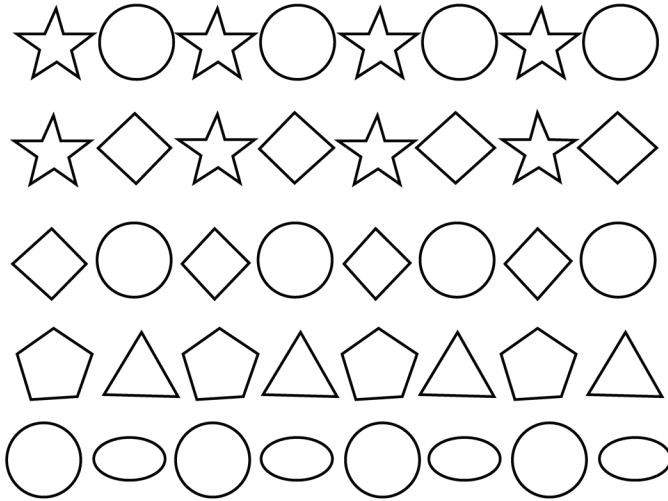
Figure 5: Line one: A pattern of stars and circles, representing alternating pointy and round figures in a decorative pattern. (Let's call this order of elements 'forward'.) Line two: A 'forward' pattern incorporating the new rhombus design. Line three: Another forward pattern where the rhombus (previously relatively round) now serves the role of relatively pointy. Line four: A 'reverse' pattern with two new elements. Line five: Another novel "reverse" pattern in keeping with "tradition."

called the "forward" pattern. A pattern with circles first and then stars would be "reverse."

Now imagine that an artisan wishes to expand his or her options beyond stars and circles, and introduces a rhombus. However, in order to remain true to tradition, he or she must consider whether a rhombus is more or less pointy than a star or a circle. The artisan concludes that a rhombus is less pointy than a star (Figure 5, line two), but more pointy than a circle (Figure 5, line three). The artisan has managed to stay within the tradition while introducing new elements. If other shapes are introduced, the keepers of the tradition who have internalized the rules of the design idiom would intuitively recognize the direction of a new example such as those in Figure 5, lines four and five.

This analogy is limited in its power to portray the workings of music, which must unfold over time and harmonize vertically. Nonetheless, it may help illustrate the clave principle which governs the vertical interactions of simultaneous patterns as well as the horizontal unfolding of the rhythms over time.

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
	Δ		Δ			O				O			Δ		Δ

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
	O		Δ		Δ		Δ		Δ					O	

Figure 6: The 3-2 (top) and 2-3 (bottom) prototypes of samba, with circles for onbeats, and triangles for offbeats.

d. The Clave Prototypes: Fundamental Rhythms for Clave Direction

Most studies on the role of clave in Afro–Latin musics limit the exposition of clave to a few fundamental patterns, and neglect to elaborate the mechanism by which *all* possible rhythmic sequences may be perceived to be in or out of concord (harmony). Rather than rely solely on these standard patterns—which sometimes lack an obvious link to the arrangement of relative offbeatness in other rhythms—the following examples utilize rhythms like the *partido–alto* and *gã* from Brazil, and the *son montuno* of salsa piano, which better illuminate the distribution of offbeatness as governed by these patterns as well as the clave proper. In these rhythms (Figure 6), the switch between more and less offbeat sections is more apparent than in the *son*, *rumba*, and *bossa* claves.[16] These are clave prototypes because they embody the sense of clave more clearly than the clave proper.

Partido–Alto: Balanço is the Essence of Samba Carioca

Though not called a clave, *partido–alto* (Figure 7) serves the same temporal–organizational purpose, and does so in a more informative manner for samba, so much so that being in clave in samba is perhaps best called "being in *partido–alto*." The patterns of Figure 7 are 3–2 because the four on–beats (circles) are on the inside, while the three offbeats (triangles) are

	1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
top	H	L	L	L		L		L	H	H	L	L		L		L
bottom	Δ				O		O		O		O			Δ		Δ
3-2	X			X			X				X			X		
2-3			X			X			X			X			X	

Figure 7: The 3-2 partido-alto for cuíca and agogô (top), and stripped down to its essence (bottom). (The pitches are approximate and can vary with cuíca intonation and the agogô manufacturer's accuracy.) Bossa clave in 3-2 and 2-3 are added to the TUBS notation. Mismatches with 2-3 clave are on the e of two and the and of four. The only significant mismatch with the 3-2 clave is on the one, which is addressed in endnote 9.

on the outside. *Balanço* means *swing*, as in a playground. The countour of offbeatness resembles that followed by a swing: high at the ends, and low in the middle (for details, see Vurkaç 2012, 329–336). Furthermore, the greater degree of correspondence with the 3–2 *bossa* clave is apparent in the TUBS notation.

Son Montuno: The Harmonic Backbone

The *son montuno* pattern is the ubiquitous piano riff heard in salsa music. Figure 8 shows a rhythmic approximation of note attacks (for one of its many forms); the chords that would normally be played have been stripped away. Starting out with two onbeats gives a strong indication that this rhythm will be in the 2–3 clave direction. The introduction of the first offbeat on the *a* of *two*, along with the maintenance of an eighth–note inter–onset interval until the end of the pattern ensures that the inner part of the phrase is exclusively offbeat. This dominance of offbeatness does not let up until the sixteenth–note interval between the very last note and the downbeat at the start of the next repetition. The continuation of offbeatness through the outer part of the pattern at the end raises the question of whether it is valid to call this pattern 2–3. Again, standard musical practice has this pattern accompanying 2–3 *son* clave in a broad range of salsa pieces throughout the
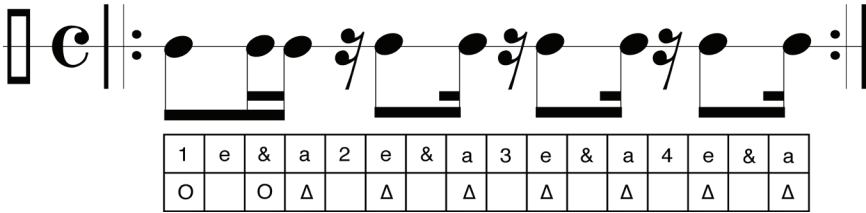
Figure 8: The 2-3 son montuno of salsa piano stripped of pitch. The circles represent the only two onbeats (in the outer part of the phrase) and the triangles represent the offbeats which appear in both parts, but only dominate the inner part.

Americas, and the *relativity* of offbeatness in the wide–sense clave method reconciles this issue decisively: the inner part has higher offbeatness than the outer part since the only cases of onbeat onsets occur in the outer part. (That any positive number is greater than zero ensures this pattern's 2–3 status.)

II. Wide–Sense Clave Consciousness

a. Implied Clave: Beyond the Clave Proper

Thinking of *clave* as a mere collection of traditional patterns rather than the meaning conveyed by these patterns downplays the cognitive role of clave "within which all the other instruments and voices must fit" (Spiro and Ryan 2006:14). Almost any pattern in a given clave direction can imply clave sense through the distribution of accents in a percussive or melodic line.[17] Thus, the significance of clave is more extensive than typically thought: it is not solely a matter of drums; it holds the melodic and percussive parts together. Simple percussive parts that indicate clave direction, such as the clave proper, are like coded messages that communicate to singers where to start the song, or to pianists, horn players, other instrumentalists—and, of course, composers and arrangers—when to start, stop, and punctuate phrases. Likewise, when singers, pianists, or *cavaco* players start a song in Afro–Latin music, their rhythm sets the clave direction and determines how the drums will play. Consequently, the central recognition task regarding clave is not detecting whether a particular pattern is found in the music, but recognizing relationships between the patterns being played and others one may choose from. Musicians who understand clave can identify the implied direction in any pattern, and play their part accordingly; those who *feel* clave can do so immediately.

In the earlier stages of developing clave consciousness, if the reduction of clave to a small set of patterns (the clave proper) is taken literally, the subtleties of wide–sense clave might remain hidden. The most common explanation for the organizational role of clave (involving the first and second halves of the phrase) falls short of elucidating the workings of clave in many of its manifestations. As a result, students or analysts of clave who follow the standard approach (or use the claver proper as a template) may find themselves having to invent special cases to explain the perceived inconsistencies in rhythms that commonly occur together (see Section III.d). One may ask why this is a problem—musicians are capable of handling exceptions to rules. A theory of music, however, is intended solve problems of musical understanding and clarify musical practices, not just catalog them. In attempting to explain a phenomenon (i.e., putting forth a theory), given two explanations that work, the simpler one (requiring fewer exceptions, if any) is superior. This is the fundamental philosophical and scientific principle of parsimony, popularly known as Occam's razor.[18]

b. Wide–Sense Clave: Beyond Percussion

Identifying clave direction is a challenging task for anyone who has not been raised with clave–based music, and sometimes even for those who have. Moreover, those who have been "raised with clave" often find it difficult to explain *why* clave works the way it does. It is not uncommon to hear that "it's in the blood." However, given the current scientific understanding of the interaction of nature and nurture, it is far more likely that clave is a rational principle that can be described in a quantitative manner.

This clave sense is not solely a matter of the percussive realm, but manifests itself in salsa piano, reggae vocals, bossa nova guitar, *axé* horn arrangements, and in many other ways. It is a rhythmic type of harmony, beyond the claver proper.[19] This aural tradition of temporal harmony has some similarities to the concept of tonal harmony of the European tradition. Clave addresses both static and dynamic relationships (just as tonal harmony does), but these relationships are primarily of note onsets and durations, not pitches. Sublette calls this principle "a key concept of West African music" and a "fundamental structural principle." He adds that "just as the hardwood claves (the wooden pegs called *clavijas*) once held ships together, when they are clicked together as instruments, the rhythm they play holds the melody line and percussion parts together" (2004:36). This function of holding the melodic and percussive parts together in terms of their timing makes clave a regulating principle.

c. Clave Consciousness: Functioning Within the Idiom

In the standard terminology, clave is said to be in 3–2 or 2–3 direction, also called "forward" and "reverse" direction. Most patterns in a duple or quadruple simple meter can be associated with one of these directions. (For a discussion of unassociable patterns, see end note xiii and Vurkaç 2011, 188–190, 419–422, 428–429.) In practice, the classification of arbitrary patterns can be a bewildering task. I have observed above that clave gives an indication of relative offbeatness, as opposed to being an absolute metric. It follows that the degree of offbeatness in any portion of a pattern is consequential only with respect to the rest of that pattern.

Musicians who are clave–conscious do not necessarily need to hear the claver proper. Clave direction is implied even when the clave is not explicitly voiced. Musicians are informed by the clave, and play *around* it, and it is understood that there are "correct" and "incorrect" ways of doing this. In his piano book, Herder calls clave a "demanding and inflexible rule" and refers to it as "the law of clave" (1972:5). One can, however, choose to break this law, especially when functioning outside the idiom. When executed and resolved skillfully, crossing clave is a way to add "spice" to the music, as is common in *third–surdo* improvisation in *samba batucada*. Outside of such mindful artistic use, crossing clave is frowned upon. It is not unusual for musicians—not only drummers—to be asked to leave a session if one unwittingly crosses clave.[20]

Like Herder, Mauleón–Santana, author of some of the clearest explanations of clave and its function, differentiates the *instrument*, the *pattern*, and the *concept* of clave (2005:1). She argues that clave is a rhythmic, melodic, and harmonic rule (2005:7–9), "albeit a very vague one" (2005:9). She stresses that clave is omnipresent even when it is not explicitly played (2005:16), and adds that it is subject to interpretation as well as artistically justified violation (2005:8–9). I intend to remove this alleged ambiguity of clave to a great extent in the following sections by showing how clave direction can be established or maintained by a variety of patterns, not only by the claver proper.

d. The Relative Nature of Clave: Subtlety of an Art Form

An important step in demystifying and analyzing clave is to recognize that only a complete cycle establishes clave direction. The extent of offbeatness in one section of a phrase is useless for determining clave direction if the rest of the pattern is not known. The crux of understanding wide–sense clave is *relative offbeatness*, which is in direct contrast to the way clave is typically taught (with two discrete halves, one of which is absolutely syncopated, and

Figure 9: The 2-3 Cuban son clave (top), a 3-2 repique ride typical of samba-reggae (center), and the clave-neutral tresillo (bottom—a Cuban name for a rhythm found in Haitian konpa, Jamaican dancehall, and Brazilian pagode and xaxado).

one of which is absolutely straight). The two sides of clave are not discretely separable. They overlap, sharing inter–onset intervals between them. In light of the greater traditional corpus, and not just of a few basic patterns, we abandon the notion of *absolute* rhythmic tension and release in the first and second halves. The offbeat side of 3–2 clave is not the first half; it is a fuzzy temporal region surrounding the first downbeat (the outer part). The onbeat side is a similar region of time surrounding the third downbeat (the inner part).

Consider the *repique* rhythm of Figure 9, middle. In authentic practice, this rhythm is matched with 3–2 patterns in *samba–reggae* and *samba de roda*. In fact, since the *repique* may be freely switched from one ostinato to another, this rhythm is interchangeable with any of the 3–2 claves. Now note that the latter halves of all three rhythms in Figure 9 are identical, but

the difference in clave direction resulting from the missing downbeat in the middle pattern is obvious to the enculturated player or listener.

It is possible for the clave direction of a pattern to be determined by just one semiquaver, as this example shows. These three patterns belong to three different clave classes, which poses a challenge to the methods of group–counting and template–matching for identifying clave direction. The crucial question is how identical rhythmic cells (the latter halves of Figure 9) can be associated with "threeness" in one case, "twoness" in another, and with neither in a third—just as the rhombus in the graphical analogy of Figure 5 was relatively more pointy in one setting and relatively less pointy in another. It is tempting to answer that such an exact match with the latter portion of the 2–3 *son* clave makes each of these 2–3 (without regard to the rest of the pattern). This is what I have called "template–matching" and "first half/second half," which together constitute the standard approach. However, traditional practice indicates otherwise, and the present analysis resolves this dilemma decisively.

Take the rhythmic cell that is called *tresillo* or *habanera* (Figure 9, bottom). In Brazilian music, this pattern is routinely clapped over *both* halves of any rhythmic cycle. In the modern Matanzas style of *rumba guaguancó* the superimposition of the *tumba* and the *claves* results in the same pattern across both sides of *rumba* clave. The repeated *tresillo* is clave–neutral. However, the 3–2 *son* clave, which prominently features *tresillo*, is not neutral because of relative offbeatness: the *tresillo* call in *son* clave is *more* offbeat than the two–note response, while simultaneously *less* offbeat than the start of the *repique* rhythm (Figure 9, center). The *tresillo* cell, then, is capable of playing the more–offbeat or less–offbeat role depending on how the rest of the pattern is populated. Since the degree of offbeatness in part of a phrase is meaningful only with respect to the rest of that phrase, no partial section of the cycle can be conceived as constituting absolute tension (offbeatness) or resolution. The pattern must be considered as a whole.

III. Relative Nature of Clave Direction in Other Diasporan Cultures

My analysis applies to music from many other cultures in the African diaspora: below, I offer examples from Haiti, Belize, Brazil and the United States, and highlight a key problem in clave direction which I resolve in Section III.d. In addition, my approach to clave direction is in concordance with the way some Ghanaian rhythms in vocal and percussion parts line up with respect to each other. This can be seen in Kauffman's transcription of the Ewe dance *Sohu*, (1980, 411), and Kwabena Nketia's transcriptions of the Akan songs *Kwasi Dñntñ* (1970, 132) and *Akatapefoō* (145), and the Mamprusi song *Darbōrga* (141).

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X	T			X	X					X		X		X	T	T	T

Figure 10: Common konpa patterns in 3-2, cowbell (top) and tanbou/conga (bottom; 'T' represents an open tone; 'X' represents a bell strike.)

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
K				S				K			K	S			

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
K				S		K				K		S	K		

Figure 11: top: 2-3 funk; bottom: 3-2 funk. 'K' stands for "kick" (bass drum of the drum set); 'S' stands for "snare."

a. Haitian Konpa

Figure 10 shows a selection of percussion parts that may occur simultaneously in *konpa*. The cowbell (top line) is reminiscent of the 3–2 *son* clave, and plays a similar role, reflected in the accompanying hand drum part (bottom line) which establishes the outer offbeatness that is characteristic of 3–2 clave direction. Among the many variations of this pattern are versions that place open tones on the & of *two* and *three*, just as in *partido–alto*.

b. Funk: Clave in African–American rhythm

In the classic funk beat of Figure 11 (top) the prominent "kick" accent on the sixteenth note preceding the omitted downbeat of *three* establishes this pattern as 2–3. Another popular funk beat (bottom) is seemingly alike, but in the opposite clave direction. The kick pattern is 3–2 *bossa* clave, with the second note missing, which leaves only one offbeat (the *e* of the *four*). This 3–2 sense is reinforced by the "kicks" on the &'s of *two* and *three* (onbeats), just as in the *konpa* hand drum variation and the *partido–alto*.

c. Clave in the Carnaval Music of Belize

The top line in Figure 12 is a bell pattern from Belize. It functions in the same way as the 3–2 *son* clave, and indeed sounds similar. Yet, this bell pattern contains two notes in its so–called "3–side" and three notes in its "2–side." Once again, clave sense is not captured by the standard method of counting onsets in each of the first and second halves of a cycle.

In contrast, comparing the number of offbeat onsets on the outside and inside of the phrase, we find the sole offbeat onset on the outside (the *a* of *one*), with equal numbers of onbeat onsets (two and two) on the inside and outside, establishing a relative prominence of offbeatness on the outside, and no additional information from the onbeats. It follows that we must necessarily label the clave direction *3–2* for this pattern of *two* onsets in the first half, followed by three in the second.

d. An Exception? Surdo de Tercera in Samba Batucada

The *third surdo* as played by the samba schools Beija–Flor, Imperatriz Leopoldinense, Caprichosos de Pilares and Mocidade Independente de Padre Miguel is shown in Figure 13 (Gonçalves and Costa 2000:48, 49, 52, 54). When analyzed with the standard method, this would clearly appear to be 2–3, and this is frequently cited as an argument for the absence of the clave concept in Brazilian music. After all, there are two on–beat attacks in the first half, and two offbeat ones in the second. However, this is a well–known 3–2 pattern, in that it is played when 3–2 bossa clave is played on the *caixas*, and because native *sambistas* will consider this pattern crossed when the music is in 2–3.

Furthermore, the *surdo de tercera* is a direct descendent of the *partido–alto* (Figure 13, bottom), derived by omitting the first and third quarters of the *partido–alto* cycle. Indeed, the offbeat section of the rhythm falls on the "outer part" of the phrase, and the onbeat section on the "inner part" of the phrase (see Figure 2). For both these reasons, the pattern of Figure 13, bottom, is in the 3–2 clave direction.

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X				X								X	X		X
X				X				X				X	X		

Figure 12: Top: "3-2" clave for Belizean carnival music. Bottom: the usual "3-2" son clave.

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
		L		L								L	L		L

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
H	L	L	L		L		L	H	H	L	L				L

Figure 13: Top: Surdo de tercera. Bottom: The 3-2 partido-alto for cuíca and agogô. Note that playing the partido-alto omitting the first and third crotchet's worth of onsets results in the tercera.

e. Subtle Examples from Batucada and Samba de Roda

Two final examples are included to further demonstrate *relative* offbeatness, and to emphasize the close connection between the Afro–Latin rhythm patterns of different cultures. The top pattern (Figure 14) shows only one onset at the very end of the cycle breaking the eighth–note accent pattern. An examination of what the other drums in the Tijuca and Viradouro samba schools play will reveal this pattern to be in the 3–2 direction. The standard approach would place this rhythm in the 2–3 category because the only accent of interest is in the second half of the phrase. The present approach, however, elegantly explains traditional practice where the standard approach fails.

The bottom pattern from the gã (bell) in traditional *samba de roda* is almost exactly the same as the *son montuno* of salsa (Figure 8), except that it resolves back to onbeats an eighth note sooner, establishing even higher onbeatness in the outer part of the pattern to contrast with the relentless offbeatness of the inner part. Hence, this pattern is almost the same as the 2–3 *son montuno*, but even more clearly in the 2–3 direction. Stripping the notes of their pitches thus reveals the cross–cultural links among Afro–Latin forms.

f. The Rumba Clave: A Challenge and an Opportunity

A similar conceptual challenge is posed by the *rumba* clave (Figure 15), a pattern which is obtained by delaying the third attack of the *son* clave. Traditional *guaguancó* and the modern *songo* and *timba* rely on this pattern for their temporal organization. The present framework initially appears ambiguous with respect to this pattern because of the timing of the *ponche* (the third onset of Cuban claves, cf. Figure 15):

- This pattern is typically spoken of as 3–2.

- The *ponche* immediately precedes the unexpressed (missing) downbeat of *three*, hence this pattern should perhaps be considered 2–3.

- The offbeats on the outside and the inside are each on a weak/leading offbeat (Figure 3), and when they are canceled out, the pattern that results does not establish any clave direction (Figure 16).

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
O		O		O		O		O		O		O			Δ

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
O		O	Δ		Δ		Δ		Δ		Δ		Δ	O	

Figure 14: Top: The accents for the caixa pattern of samba schools Unidos Da Tijuca and Unidos Do Viradouro (Gonçalves and Costa 2000, 59, 61). Since the only note breaking the steady pattern of onbeats is the last one, the pattern is in 3-2. This is an excellent authentic example of clave direction as relative offbeatness. Bottom: The 2-3 gã (bell) in samba de roda, an example of how offbeatness can threaten to destroy the underlying pulse and establish a new one (Merriam 1959, 16), and how the re-establishment of the original tactus generates the clave feel.

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X			X				Δ		X			X			

Figure 15: The 3-2 rumba clave, with the delayed third onset (ponche) indicated in TUBS notation with a triangle.

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X										**X**		**X**			

Figure 16: The 3-2 rumba clave, with "algebraic cancellation" (The remaining onsets do not maintain a sense of clave.)

A review of the instructional literature on Afro–Cuban percussion helps clear up this ambiguity. This pattern is associated (i.e., played in conjunction with) a number of bell patterns known as *campana*, *campaneo*, *contracampaneo*, etc. (Rendón 2001:47–51; Moore and Oviedo 2010:56–58). The majority of the patterns given by Rendón with a stated clave direction conform to the 3–2 clave direction according to the framework presented in this article. Among the most poignant of these are the "bell patterns with 3–2 rumba clave" (Rendón 2001:51) and the first bar of the *son* chart for track 44 (Rendón 2001:37). These examples not only conform to the present framework, but at first glance seem to conflict with the most typical *cáscara* pattern that accompanies *rumba* clave (albeit in what we see in the following paragraphs to be a constructive manner) in terms of the position of the schema that contains maximal offbeatness. This *cáscara* pattern (Mauleón 1993:76–78; Rendón 2001:49) has its most offbeat schema on the inside for 3–2 *rumba* clave (Figure 17), which, according to the discussion so far, would suggest that it is 2–3.

It is crucial to determine if the present framework can resolve this apparent incongruity in such a way that there is no discrepancy (the framework remains consistent). One promising clue is the placement of strong accents in the *cáscara*. Stripping the 3–2 *rumba cáscara* down to its strongest accents, we find that it fits with the notion of relative offbeatness in the clave–direction framework (Figure 18). When only the strongest accents are taken into account, the resulting pattern is unmistakably 3–2.

Nonetheless, one may continue to question the classification of what is typically called "3–2 *rumba* clave" as a 3–2 pattern (or rather, question the framework presented here) because of the delayed *ponche* and the missing downbeat of 3. This dilemma is included here to acknowledge early criticism of the wide–sense clave framework, as well as to introduce the reader to further work (both completed and planned) towards achieving culturally informed consistency in the proposed grammar of clave for all musics of the African diaspora. The results of my studies to date (participant–observation and double–blinded studies) were distilled into nine hierarchical criteria of clave–direction recognition (Vurkaç 2011:128–130 and 188–191).[21] The problem of the *rumba* clave can be resolved by exchanging the priority order of criteria 2 and 3, but since the criteria and their interaction were developed

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X		X	X		X		X	X		X		X	X		X

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X			X				X			X		X			

Figure 17: The 3-2 rumba cáscara showing the accented strikes and the 3-2 rumba clave in relation.

1	e	&	a	2	e	&	a	3	e	&	a	4	e	&	a
X		X						X				X			

Figure 18: Only the accents of 3-2 rumba cáscara, revealing the 3-2 direction underneath what appears to be 2-3 when all strikes are taken into account, another example of the subtlety of the clave art form.

through listening tests with experts, such an alteration ought not to be made without justification from further ethnographic study.

Specifically for the *rumba* clave, further focused study and comparison of all bell patterns in *rumba*, *songo*, and *timba* may be required to settle this question of whether the framework presented here is fully consistent with Afro–Cuban music.[22] With the framework shown to be consistent in a wide range of other examples (including from the genres of *rumba* and *timba*) and the possibility of simple solution to the problem of the *rumba* clave, the wide–sense framework is presented here for the scrutiny of the music theory community.

Conclusion

Clave need not be as elusive, vague (Mauleón–Santana 2005:v, 9), unforgiving (Herder 1972:5, 12), or seemingly replete with inconsistencies as many have suggested. I hope that this exposition may help lead to a consistent, parsimonious theory of clave in particular and Afro–Latin rhythm in general, and that the process of internalizing clave (for listeners, as well as performers, teachers, students and musicologists) may proceed more smoothly than it might otherwise.

I have discussed the following points: 1) The absolute onset count should be abandoned; 2) Upbeats and downbeats are *on*beats as far as clave sense is concerned; 3) The inner/outer demarcation suggested in Figure 2 should be preferred over the standard approach of the first and second halves of the phrase; 4) It is the *relative* offbeatness of sections that determine the sense of clave, not counting onsets or template–matching against well–known patterns. Armed with these introductory concepts, the interested reader can broaden his or her understanding of the manifestations of clave in other cultural idioms of the African diaspora. While the more specific ideas in this article are primarily discussed through Cuban, Brazilian and a few other examples, the principles of the wide–sense framework may be applied to the musical systems of many Afro–Latin styles, something I have attempted to show through brief analyses of Haitian, Belizean, Ghanaian, and North American musics.

There is more to clave than discussed in this article. For example, clave has timing and phrasing functions in addition to what is explored here. Furthermore, the existence of *clave–ambiguous* patterns (in terms of clave *function*) have been identified by the author during listening trials with leading experts. The interaction of the schema–type rules (briefly mentioned in Section III.f) as applied to vague patterns goes beyond the basics of clave discussed above. These guidelines may conflict when their characteristic rhythmic cells coexist within one pattern, leading to a case of context–dependence in clave–direction. An example of this was discussed regarding the *cáscara* (Mauleón 1993:76).

Research is also required to extend this system to ternary patterns, the conversion into which appears non–trivial. Future work should also incorporate note releases into a more general theory of clave for instruments capable of sustained tones. Likewise, other Afro–American musics such as ragtime, Uruguayan *Candombe*, and New Orleans second–line also need informed scrutiny to further test the hypothesis presented here. Nonetheless, I hope the present offering will prove a valuable step in the development of an internally consistent, general–purpose theory of clave.

Notes

1. In many other countries, and among scholars worldwide, various other names and descriptions are in use to refer to the same fundamental principle. Alternate names include *clips* (Collins 2004, 31) and *madera* (Machado, Muñoz et al. 2002, 10, 13, 22). Descriptive phrases favored by scholars to describe the duple– and triple–time clave–type patterns include "the principle of mobility and finality" (Anku 1995:172–3), "generative concept" (Spiro & Ryan 2006: 7), "rhythmic key" (Sublette 2004: 168), "standard pattern" (Novotney, 1998:116–121), 'timeline' (Ekwueme 1974:61), 'structural device' (Mauleón–Santana 2005:5), and "key pattern" (Novotney 1998:160–165).

2. Sublette 2004, 95, 166–167, 342–343; Cruz, Moore et al. 2004, 75; Soebbing 1988, 524; Cook 1988, 321–324; Mauleón–Santana 2005, 1, 7–9; Herder 1972, 41.

3. Novotney 1998, 168, 236–238; Machado, Muñoz et al. 2002, 10, 13, 22; Washburne 1997, 59–60, 66–67.

4. Stone references Gerhard Kubik, "The Emics of African Musical Rhythm" unpublished MS (1983): 38, J.H. Kwabena Nketia, "Traditional Music of the Ga People," *African Music* 2 (1) (1958): 21, and Anthony King, "Employments of the 'Standard Pattern' in Yoruba Music," *African Music* 2 (3) (1960): 51–54. As well as being the author of *Music in West Africa: Experiencing Music, Expressing Culture*, Stone is co/advisory editor of the *Africa* volume of the Garland Encyclopedia of World Music, 1998 edition, with Bruno Nettle.

5. See Mauleón's *101 Montunos* for a similar distinction that informed this terminology (2005).

6. There is some debate about whether clave is to be interpreted slightly differently by high–pitch–range and low–pitch–range instruments, but we can overlook this for the moment without loss of generality.

7. This grammar of clave is consistent *and* precise, but *not complete*; certain simplifying assumptions had to be made to get this first–order grammar up and running. Further research is needed to expand what is presented here to a wider, practical coverage of dynamics, expressive timing, and other time signatures.

8. The determination of note onsets (sometimes called note attacks) is a rather complex task, both in human cognition and in machine implementation. (There is even a Ph.D. dissertation focused on the time point of psychological onset perception.) To put it simply, an onset, or attack, means the beginning of a note. Some researchers in the field of Music Information Retrieval have approached onset detection in sound waveforms by seeking an increase in the waveform's energy (related to its amplitude, which in turn is related to momentary loudness) happening in a short enough period of time. If such an increase passes an amplitude threshold (determined psychoacoustically), we say there is an onset (an attack, a note event) at that point.

Quantization comes in when turning a time sequence of such events into a standard, machine– and analysis–friendly form: Any onset that happens within a brief window (the duration of a sixteenth note at a given tempo) is moved to a standard time position within that window. This is the removal of human expressive timing from the music. The present author's dissertation (Vurkaç 2011:153) includes some discussion to the effect that this takes place in the brain to aid in human perception of rhythm in music. Greater detail is given in the author's previous article, Vurkaç 2011.

9. *Relative* offbeatness is a novel concept put forth by the present author (regarding the necessity of considering the entire rhythmic entity in order to establish clave direction), and supported by evidence (see Section II.d). To know whether a given rhythmic cell features offbeatness for purposes of clave–direction identification, one must ask "relative to what

other pattern?" For an excellent hypothesis as to why clave direction exists in the first place, consider Merriam's insight: "Continual use of off–beating without respite would cause a readjustment on the part of the listener, resulting in a loss of the total effect. Thus off–beating [*with* respite] is a device whereby the listeners' orientation to a basic rhythmic pulse is threatened but never quite destroyed" (Merriam 1959:16).

10. For example, the 3–2 clave from Belize has two of the notes of the Cuban 3–2 *son* clave on its 3–side, and adds a second downbeat to the Cuban clave's 2–side, resulting in two notes during what is obviously (by sound, feel and function) the 3–side, and three notes during the 2–side. Likewise, the typical *third–surdo* ostinato played in most *samba batucada* has two strikes in the first half of the phrase and three in the second half, yet is *always played over 3–2 samba*. For the most part, samba musicians either do not analyze it, or have difficulty reconciling the fact that there are two onsets on the 3–side, and three onsets on the 2–side. Other difficulties in reconciling the naming of patterns versus their function include *partido–alto* with its seven onsets and the Cuban *cáscara* with its ten onsets.

11. This usage arose from research into the cultural aspect of the term syncopation. Syncopation is norm–referenced (subjective), meaning accents fall in non–normal positions (Kauffman 1980:394; Kerman 1987:20; Novotney 1998:104 and 108), while offbeatness is tactus–referenced (objective). Readers not wishing to be nitpicky can use either expression without significant loss of meaning.

12. TUBS can be a helpful abstraction that both beginners and trained musicians can understand. For beginners, it is more easily understood than standard notation, but trained musicians (who can express themselves in standard notation when necessary) may also find it easy to conceive of rhythms in TUBS. Rests, rolls, and sustained tones are mostly irrelevant for the *initial* study of clave. For clarification, see Locke's discussion on dotting, tying, and rests (1987:9–10).

13. This matches Moore's definition of onbeats and offbeats (Oviedo and Moore 2010, 28) which he states is consistent with Mauleón (1993) and other literature.

14. This clave problem was posed to the author by M. Spiro at California Brazil Camp 2005.

15. Of course, this may be difficult to establish. One may query keepers of the tradition, live within the culture, or learn from the masters. Along with the first and last of these options, the analysis presented in this article also stems from listening trials conducted with master drummers.

16. In much the same way that the English horn is neither a horn nor English (Kerman 1987:20), perhaps the *bossa* clave is neither "*bossa*" nor "clave." It is not a Cuban pattern, so the word clave is controversial. Furthermore, it is not specific to *bossa nova*. The typical rhythmic pattern for *bossa nova* guitar is the 2–3 form of *partido alto*. The so–called *bossa* clave is more typically played by the *repiques* in samba–reggae, by the *caixas* (snares) in samba *batucada*, and on *atabaques* in older *carnaval* samba songs.

17. The author's research to date suggests that only on the order of ten percent of all possible rhythmic patterns will fail to establish a sense of clave direction in any musical context.

18. The role and importance of Occam's razor is different for a theory of music than it would be for theories of nature. In evaluating explanations of natural phenomena, Occam's razor is a qualitative statement of the preference for the larger product of conditional probabilities (typically having fewer product terms). For explanations of cultural phenomena, this is not required, but it is, nonetheless, an indicator of the elegance of a theory. For a discussion of the applicability of Occam's razor to various inquiries (and relationship to probability), see Vurkaç (2011:6–8).

19. For a similarly temporal use of the term 'harmony', see "harmonic layers of time" (Leake 2011:26).

20. Naturally, this "law" has no bearing on rock or jazz if a strong link to Afro–Latin tradition is not claimed.

21. These criteria are:

    1. The *Partido–Alto* Form

    2. Isolated Missing Downbeat (on 1 or 3; IMD, also called a "singleton")

    3. Large–Scale Relativeness

    4. The third surdo (*tercero*) pattern from *Mocidade Independente de Padre Miguel* (a partial form of the *partido–alto* pattern)

    5. Fine Relativeness (involving the relative strengths of nibble–length (crotchet–length) schemata, as shown below, and the "algebraic" cancellation of onsets across schema bridges, first to third, and second to fourth)

    6. Local template–matching against the *teleco–teco* and the so–called *bossa* clave

    7. The "African" Clave Sense (antecedent/consequent relationship)

    8. The Partial/Leading IMD: A weak/leading onset preceding a missing downbeat (not a singleton, i.e., not fully isolated)

    9. Direct Template–Matching to the so–called *bossa* clave (only when no other criteria, including "how it feels" lead to an answer, such as in 1111|1111|1111|1100)

In this system, Criterion 1 has top priority. Criterion 2 is the second most powerful. Criteria 3 and 4 are of equal weight, followed by Criterion 5. Criteria 6, 7, and 8 have equal weight, and Criterion 9 is the last resort when none of the others results in an answer. (This can happen either due to those criteria not being relevant, or due to conflicts among them, although the latter typically leads to the "incoherent" category.)

22. The framework of wide–sense clave, relative offbeatness, and *partido–alto*.

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