

## The Biology of Rhythm

Jerry Leake

This article examines what I term the *biology of rhythm*: individual rhythm cells combine to form complex groupings that evolve into living, breathing musical phrases. Just as human life can be classified from the cellular level on up, rhythm can also be broken down into categories defined by numeric value (cells), scale value (skeleton), and drum syllables (flesh).

### Individual Cells/Numbers

Our focus will be on a binary phrase of 8 pulses. Begin by stepping in pairs: right, right, left, left to establish a 2/4 outline. Next, clap four times per 2/4 cycle (2 claps per step). Finally, count numbers from 1–8. These numbers comprise the individual **cells** that we will grow further. What results are three different layers of what I call “harmonic time”: slow (feet), medium (clap), and fast (numbers). Focusing the mind on each time layer should be fairly easy: slow, medium and fast speeds are ratios of each other. Shown below in Ex. 1 is a composite of layers. (X = clap/stick pattern, R = right foot, L = left foot)

numbers	1	2	3	4	/	5	6	7	8
clap/stick	X		X			X		X	
step RR LL	R					R			
	L					L (etc.)			

### Complex Groupings

For example 2 below break down the 8 numbers into three smaller groupings of 3+3+2 (the world’s most famous rhythm structure). Repeat the previous exercise this time counting **1**23 **1**23 **1**2, always accenting the number **1** in bold print. You will discover added syncopation and challenge to the three-tiered exercise.

numbers	<b>1</b>	2	3	<b>1</b>	/	2	3	<b>1</b>	2
clap/stick	X		X			X		X	
step RR LL	R					R			

We can change the pattern GNA (Groove Nucleus Accents) by rotating the three groups to create two new “siblings”: 323 and 233 (ex. 3, 4). Each rotation contains unique personality and syncopation. In all three examples, notice that the second step (beat 2) never aligns with an accented “1.”

323:

numbers	<b>1</b>	2	3	<b>1</b> / 2	<b>1</b>	2	3
clap/stick	X		X		X	X	
step RR LL	R				R		

233:

numbers	<b>1</b>	2	<b>1</b>	2 / 3	<b>1</b>	2	3
clap/stick	X		X		X	X	
step RR LL	R				R		

### Skeletal Evolution

Numbers are a useful entry point into understanding how a phrase is built and grouped. However, numbers can be distracting to think about while in the process of making music, or developing an exercise pattern. Some students attach significance to numbers in ways that cause their mind to intensely focus, preventing a relaxed and fluid execution. The remedy is to convert numbers to what I call “rhythm scales” using abstract syllables from Indian drumming. Abstract syllables do not cloud the mind with unnecessary distractions.

The rhythm scale for “1 2” is TA KA, and for “1 2 3” is TA KI TA (pronounced ta ki tuh). Shown below are the three rotations rendered using Indian rhythm scales. Bold print identifies accent/anchor points. Maintain the steady “4” stick pattern in these treatments (ex. 5–7)

scale	<b>TA</b>	KI	TA	<b>TA</b> / KI	TA	<b>TA</b>	KA
clap	X		X		X	X	
step	R				R		

323

scale	<b>TA</b>	KI	TA	<b>TA</b> / KA	<b>TA</b>	KI	TA
clap	X		X		X	X	
step	R				R		

233

scale	<b>TA</b>	KA	<b>TA</b>	KI / TA	<b>TA</b>	KI	TA
clap	X		X		X	X	
step	R				R		

### Syncopated Clapping/Sticking

Now accent the stick with the voice, as shown below (Ex. 8–10)

332

scale	<b>TA</b>	<b>KI</b>	<b>TA</b>	<b>TA /</b>	<b>KI</b>	<b>TA</b>	<b>TA</b>	<b>KA</b>
clap	X	–	–	X	–	–	X	–
step	R				R			

323

scale	<b>TA</b>	<b>KI</b>	<b>TA</b>	<b>TA /</b>	<b>KA</b>	<b>TA</b>	<b>KI</b>	<b>TA</b>
clap	X	–	–	X	–	X	–	–
step	R				R			

233

scale	<b>TA</b>	<b>KA</b>	<b>TA</b>	<b>KI /</b>	<b>TA</b>	<b>TA</b>	<b>KI</b>	<b>TA</b>
clap	X	–	X	–	–	X	–	–
step	R				R			

### Flesh and Personality

The third step to our rhythm evolution is to add “flesh” to the skeleton. Example 11 below incorporates drum syllables called “bols” from North Indian tabla. As with the numbers and scales, this pattern is a literal adaptation of 123 123 12. The two rotations—323 and 233—should be relatively easy to explore on your own.

332

tabla bols	<b>tun</b>	na	na	<b>tun /</b>	na	na	<b>tun</b>	na
clap	X	–	–	X	–	–	X	–
step	R				R			
	L				L			

### Implied vs. Implicit: A Musical Context

So far we have examined three implicit stages of 332 using numbers, scales, and drum syllables. However, a bass player would most likely imply the shape of the groupings that we have been marking with accents.

In the Ewe music of Coastal Ghana, iron bells and gourd rattles are used to establish “time-line” patterns to support a variety of drums. Borrowing from the shaker pattern for a 2/4 social dance called “Gahu” we

can realize both the implied shape of 332 (“PA”) and the empty 2<sup>nd</sup> beat (“TI”), as shown below in examples 12–14.

332							
shaker	<b>PA</b>	–	–	<b>PA / TI</b>	–	<b>PA</b>	–
clap	X	–	–	X	–	X	–
step	R			R			

323							
shaker	<b>PA</b>	–	–	<b>PA / TI</b>	<b>PA</b>	–	–
clap	X	–	–	X	–	X	–
step	R			R			

233							
shaker	<b>PA</b>	–	<b>PA</b>	– / <b>TI</b>	<b>PA</b>	–	–
clap	X	–	X	–	X	–	–
step	R			R			

In Arabic music the drum syllables Dum and Tek define open and slap tones played on the dumbek, darbuka, and frame drums. Using this language examples 15–17 below outline only the implied shape: dum = 3, tek = 2, with empty beat “2” now full exposed.

332								
arabic drum	<b>dum</b>	–	–	<b>dum</b>	–	–	<b>tek</b>	–
clap	X	–	–	X	–	–	X	–
step	R			R				

323								
arabic drum	<b>dum</b>	–	–	<b>tek</b>	–	<b>dum</b>	–	–
clap	X	–	–	X	–	X	–	–
step	R			R				

233								
arabic drum	<b>tek</b>	–	<b>dum</b>	–	–	<b>dum</b>	–	–
clap	X	–	X	–	–	X	–	–
step	R			R				

## Academic Analysis

Using a more academic model for analyzing rhythm we can see/hear two types of strokes present in each phrase: long strokes (3) and short strokes (2). Long strokes corresponded with takita, dum, and pa syllables, short strokes with taka and tek. Shown below (ex. 18, 19) are Long (L) and Short (S) applications, and a useful treatment using Sang (SG) and Si (SI) abstract syllables (developed by James Koetting). Apply this to 323 and 233 phrases.

332:

Long/Short	<b>L</b>	–	–	<b>L /</b>	–	–	<b>S</b>	–
clap/stick	X	–	–	X	–	–	X	–
step	R				R			

332:

Sang/Si	<b>SG</b>	–	–	<b>SG /</b>	–	–	<b>SI</b>	–
stick	X	–	–	X	–	–	X	–
step	R				R			

## Expanded Variations

With a solid foundation we can explore more musical and syncopated variations. Let's revisit the earlier examples using numbers. Previously, the stick fell on each number "1" to outline the 332 shape. In examples 20–22 below accent both 1 & 2 of each "long" cell (3). Apply this approach to all rotations. Also speak "ta ka – ta ka – ta –" to align with the stick.

332

numbers	<b>1</b>	<b>2</b>	3	<b>1 / 2</b>	3	<b>1</b>	<b>2</b>
clap/stick	X	X	–	X	X	–	X
step	R				R		

323

numbers	<b>1</b>	<b>2</b>	3	<b>1 / 2</b>	<b>1</b>	<b>2</b>	3
clap/stick	X	X	–	X	–	X	X
step	R				R		

233

numbers	<b>1</b>	2	<b>1</b>	<b>2 / 3</b>	<b>1</b>	<b>2</b>	3
clap/stick	X	–	X	X	–	X	X
step	R				R		

### Syncopated Clap/Stick Patterns of 332

For example 23, leave out the “1” and stick on each 2 & 3 of the long cells (3), and the 2 of the short cell. Example 24 accents the 1 & 3 of each long cell. Mix up all combinations with 323, 233, etc.

332

numbers	1	<b>2</b>	<b>3</b>	1 /	<b>2</b>	<b>3</b>	1	<b>2</b>
clap/stick	–	X	X	–	X	X	–	X
step	R				R			

332

numbers	<b>1</b>	2	<b>3</b>	<b>1</b> /	2	<b>3</b>	<b>1</b>	2
clap/stick	X	–	X	X	–	X	X	–
step	R				R			

### Independent Clap/Stick Patterns

Now we can introduce independent (counter) clap/stick patterns to any of the phrase rotations. In this application speak takita, pa pa ti pa, and dum tek languages to: 1) outline the entire pattern (takita), 2) outline the implied pattern plus the beat (pa ti), and 3) outline just the implied pattern (dum tek, spelled DM, TK). Examples 25–27 below introduce an off-beat 8<sup>th</sup> note stick pattern to 332. Also explore 332 and 233 rotations.

off-beat 8<sup>th</sup> note

332

voice 1 (ta)	<b>TA</b>	KI	TA	<b>TA /</b>	KI	TA	<b>TA</b>	KA
off-beat clap	–	–	X	–	–	–	X	–
step	R				R			
	L				L (etc.)			

voice 2 (pa)	<b>PA</b>	–	–	<b>PA /</b>	<b>TI</b>	–	<b>PA</b>	–
off-beat clap	–	–	X	–	–	–	X	–
step	R				R			

voice 3 (dum)	<b>DM</b>	–	–	<b>DM /</b>	–	–	<b>TK</b>	–
off-beat clap	–	–	X	–	–	–	X	–
step	R				R			

Examples 28–30 below introduce off-beat 16<sup>th</sup> notes, in essence adding a second stroke to the previous 8<sup>th</sup> note.

off-beat 16<sup>th</sup> notes

332

voice 1 (ta)	<b>TA</b>	<b>KI</b>	<b>TA</b>	<b>TA / KI</b>	<b>TA</b>	<b>TA</b>	<b>KA</b>
off-beat clap	–	–	X	X	–	–	X
step	R			R			
voice 2 (pa)	<b>PA</b>	–	–	<b>PA / TI</b>	–	<b>PA</b>	–
off-beat clap	–	–	X	X	–	–	X
step	R			R			
voice 3 (dum)	<b>DM</b>	–	–	<b>DM / –</b>	–	<b>TK</b>	–
off-beat clap	–	–	X	X	–	–	X
step	R			R			

Examples 31–33 below take the previous off-beat 16<sup>th</sup> note pattern and adds a stroke landing onto each beat. This is also known as the “bongo bell” pattern of Latin music. Begin slowly to smooth out any tension.

“bongo bell”

332

voice 1 (ta)	<b>TA</b>	<b>KI</b>	<b>TA</b>	<b>TA / KI</b>	<b>TA</b>	<b>TA</b>	<b>KA</b>
bongo bell	X	–	X	X	X	–	X
step	R			R			
voice 2 (pa)	<b>PA</b>	–	–	<b>PA / TI</b>	–	<b>PA</b>	–
bongo bell	X	–	X	X	X	–	X
step	R			R			
voice 3 (dum)	<b>DM</b>	–	–	<b>DM / –</b>	–	<b>TK</b>	–
bongo bell	X	–	X	X	X	–	X
step	R			R			

Examples 34–36 below take the previous pattern and removes the second stroke to create a 16<sup>th</sup> note shuffle pattern. Avoid rushing the 16<sup>th</sup> note to feel breath and air in the phrase.

“shuffle”

332

voice 1 (ta)	<b>TA</b>	KI	TA	<b>TA / KI</b>	TA	<b>TA</b>	KA
shuffle	X	–	–	X X	–	–	X
step	R			R			

voice 2 (pa)	<b>PA</b>	–	–	<b>PA / TI</b>	–	<b>PA</b>	–
shuffle	X	–	–	X X	–	–	X
step	R			R			

voice 3 (dum)	<b>DM</b>	–	–	<b>DM / –</b>	–	<b>TK</b>	–
shuffle	X	–	–	X X	–	–	X
step	R			R			

A seemingly endless variety of stick patterns could be incorporated in the phrase, yielding entire orchestrations of groove, mathematics and independence for one player. Imagine the composition and improvisation possibilities. For example, a stick pattern in a dotted 8<sup>th</sup> note “3-feel” would create unusual phrase rotation, requiring the phrase to be rendered three times before landing back onto the beat, as shown below. In example 37 below the underlined “**ta**” indicates the beginning of each 332 sequence. Incorporate both PA and DUM drum languages into the same shape.

ta ki ta **ta** ki ta **ta** ka ta ki ta **ta** ki ta **ta** ka ta ki ta **ta** ki ta **ta** ka  
 X – – X – – X – – X – – X – – X – – X – – X – –  
 R – – – R – – – L – – – L – – – R – – – R – – –

### Combining Groupings 332, 323, 233

We can arrange 332 rotations to work sequentially, creating more spark and energy for better music-making. Shown below in examples 38–39 is a 332, 323, 233 sequence that could be felt in 6/4 meter, as revealed by the 6 steps. Stick with each bold “**ta**” accent. Notice how every other step (even numbers 2, 4, 6) does not land with any stick strokes, creating balanced tension and resolution to the phrase. PA and TI syllables allow one to feel the “TI” resolving to the empty beats 2, 4, and 6. Rather than reading the examples (which can look daunting), try to feel the entire shape of the pattern, relying on your newly trained skills and awareness.

3	3	2	3	2	3	2	3	3
<b><u>ta</u></b> ka ta	<b>ta</b> ki ta	<b>ta</b> ka <b><u>ta</u></b> ka ta	<b>ta</b> ka <b>ta</b> ki ta	<b>ta</b> ka <b><u>ta</u></b> ka ta	<b>ta</b> ki ta	<b>ta</b> ka <b><u>ta</u></b> ka ta	<b>ta</b> ki ta	
X - -	X - -	X - X - -	X - -	X - X - -	X - -	X - X - -	X - -	X - -
<u>R</u> - - -	R - - -	<u>L</u> - - -	L - - -	<u>R</u> - - -	R - - -	<u>R</u> - - -	R - - -	
3	3	2	3	2	3	2	3	3
<b>pa</b> - -	<b>pa ti</b> -	<b>pa</b> -	<b>pa</b> - -	<b>pa ti</b> <b>pa</b> - -	<b>pa</b> - -	<b>pa</b> -	<b>pa</b> - <b>ti</b> <b>pa</b> - -	
X - -	X - -	X - X - -	X - -	X - X - -	X - -	X - X - -	X - -	X - -
<u>R</u> - - -	R - - -	<u>L</u> - - -	L - - -	<u>R</u> - - -	R - - -	<u>R</u> - - -	R - - -	

### Conclusion

There are endless ways to imagine and realize rhythm; this article focused on the metaphorical biology of a 332 rhythm cell, it's sibling rotations, and how such phrases can evolve into potent musical ideas. Throughout my own musical evolution I have become more aware of the "higher aesthetics" of creativity inspired by different life perspectives. Some styles of world music convey geometric shapes and other visual images, while certain cultures inspire "choreography" as if a dancer were moving to the sounds and patterns. There is much more that could be uncovered when examining the profound relationship of music and life, sound and time.