The Biology of Rhythm

By 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 (in), right (out), left (in), left (out) to establish a 2/4 cycle on both the right side and left side. Next, clap four times per cycle (two claps per step). Finally, count numbers from 1 to 8. These numbers comprise the individual *cells* that we will grow further. What results are three different layers of "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 Example 1 is a composite of layers. (X = clap/stick pattern, R = right foot, L = left foot).

Example 1

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, 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**. You will discover added syncopation and challenge to the three-tiered exercise.

Example 2

numbers	**1**	2	3	**1** /	2	3	**1**	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 (Examples 3 and 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."

Example 3
323:

numbers	**1**	2	3	**1** /	2	**1**	2	3
clap/stick	X		X		X		X	
step RR LL	R				R			

Example 4
233:

numbers	**1**	2	**1**	2 /	3	**1**	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 minds 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 (Examples 5–7).

Example 5

scale	**TA**	KI	TA	**TA** /	KI	TA	**TA**	KA
clap	X		X		X		X	
step	R				R			

Example 6
323

scale	**TA**	KI	TA	**TA** /	KA	**TA**	KI	TA
clap	X		X		X		X	
step	R				R			

Example 7
233

scale	**TA**	KA	**TA**	KI /	TA	**TA**	KI	TA
clap	X		X		X		X	
step	R				R			

SYNCOPATED CLAPPING/STICKING

Now accent the stick with the voice, as shown in Examples 8–10).

Example 8
332

scale	**TA**	KI	TA	**TA** /	KI	TA	**TA**	KA
clap	X	–	–	X	–	–	X	–
step	R				R			

Example 9
323

scale	**TA**	KI	TA	**TA** /	KA	**TA**	KI	TA
clap	X	–	–	X	–	X	–	–
step	R				R			

Example 10
233

scale	**TA**	KA	**TA**	KI /	TA	**TA**	KI	TA
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 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.

Example 11

332								
tabla bols	**tun**	na	na	**tun** /	na	na	**tun**	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 "timeline" 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 second beat ("TI"), as shown in Examples 12–14.

Example 12

332								
shaker	**PA**	–	–	**PA** /	**TI**	–	**PA**	–
clap		X	–	–	X	–	–X	–
step		R		R				

Example 13

323								
shaker	**PA**	–	–	**PA** /	**TI**	**PA**	–	–
clap	X	–	–	X	–	X	–	–
step	R		R					

Example 14

233									
shaker	**PA**	–	**PA**	– /	**TI**	**PA**	–	–	
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 outline *only* the implied shape: dum = 3, tek = 2, with empty beat "2" now fully exposed.

Example 15

332									
arabic drum	**dum**	–	–	**dum**	–	–	**tek**	–	
clap	X	–	–	X	–	–	X	–	
step	R				R				

Example 16

323									
arabic drum	**dum**	–	–	**tek**	–	**dum**	–	–	
clap	X	–	–	X	–	X	–	–	
step	R				R				

Example 17

233									
arabic drum	**tek**	–	**dum**	–	–	**dum**	–	–	
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 in Examples 18 and 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.

Example 18

332:								
Long/Short	**L**	–	–	**L** /	–	–	**S**	–
clap/stick	X	–	–	X	–	–	X	–
step	R				R			

Example 19

332:								
Sang/Si	**SG**	–	–	**SG** /	–	–	**SI**	–
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, accent both 1 and 2 of each "long" cell (3). Apply this approach to all rotations. Also speak "ta ka – ta ka – ta –" to align with the stick.

Example 20

332								
numbers	**1**	**2**	3	**1** /	**2**	3	**1**	2
clap/stick	X	X	–	X	X	–	X	–
step	R				R			

Example 21

323								
numbers	**1**	**2**	3	**1** /	2	**1**	**2**	3
clap/stick	X	X	–	X	–	X	X	–
step	R				R			

Example 22

233								
numbers	**1**	2	**1**	**2** /	3	**1**	**2**	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 and 3 of the long cells (3), and the 2 of the short cell. Example 24 accents the 1 and 3 of each long cell. Mix up all combinations with 323, 233, etc.

Example 23

332								
numbers	1	**2**	**3**	1 /	**2**	**3**	1	2
clap/stick	–	X	X	–	X	X	–	X
step	R				R			

Example 24

332								
numbers	**1**	2	**3**	**1** /	2	**3**	**1**	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 introduce an offbeat eighth note ("Gospel clap") stick pattern to 332. Also explore 332 and 233 rotations.

Example 25
Offbeat eighth note
332

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

Example 26

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

Example 27

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

Examples 28–30 introduce offbeat sixteenth notes, in essence adding a second stroke (Ewe Kagan pattern) to the previous eighth note.

Example 28
Offbeat sixteenth notes
332

voice 1 (ta)	TA	KI	TA	TA /	KI	TA	TA	KA
off-beat clap	–	–	X	X	–	–	X	X
step	R				R			

Example 29

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

Example 30

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

Examples 31–33 take the previous off-beat sixteenth-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.

Example 31
"bongo bell"
332

voice 1 (ta)	**TA**	KI	TA	**TA** /	KI	TA	**TA**	KA
bongo bell	X	–	X	X	X	–	X	X
step	R				R			

Example 32

voice 2 (pa)	**PA**	–	–	**PA** /	**TI**	–	**PA**	–
bongo bell	X	–	X	X	X	–	X	X
step	R				R			

Example 33

voice 3 (dum)	**DM**	–	–	**DM** /	–	–	**TK**	–	
bongo bell		X	–	X	X	X	–	X	X
step		R				R			

Examples 34–36 take the previous pattern and removes the second stroke to create a sixteenth-note shuffle pattern (Brazilian pandeiro). Avoid rushing the sixteenth note to feel breath and air in the phrase.

Example 34
Shuffle
332

voice 1 (ta)		**TA**	KI	TA	**TA** /	KI	TA	**TA**	KA
shuffle	X	–	–	X	X	–	–	X	
step		R				R			

Example 35

voice 2 (pa)		**PA**	–	–	**PA** /	**TI**	–	**PA**	–
shuffle	X	–	–	X	X	–	–	X	
step		R				R			

Example 36

voice 3 (dum)	**DM**	–	–	**DM** /	–	–	**TK**	–	
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 compositional and improvisational possibilities. For example, a stick pattern in a dotted eighth-note "3-feel" would create unusual phrase rotation, requiring the phrase to be rendered three times before landing back onto the beat, as shown in Example 37. In example 37 the underlined "ta" indicates the beginning of each 332 sequence. Incorporate both PA and DUM drum languages into the same shape.

Example 37

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	–	–	–

Example 38

3		3				2		3			2		3			2		3			3		
ta	ka	**ta**	ta	ki	ta	**ta**	ka	**ta**	ka	ta	**ta**	ka	**ta**	ki	ta	**ta**	ka	**ta**	ka	ta	**ta**	ki	ta
X	–	–	X	–	–	X	–	X	–	–	X	–	X	–	–	X	–	X	–	–	X	–	–
R	–	–	–	R	–	–	–	L	–	–	–	L	–	–	–	R	–	–	–	R	–	–	–

Example 39

3			3			2		3			2		3			2		3			3		
pa	–	–	**pa**	**ti**	–	**pa**	–	**pa**	–	–	**pa**	**ti**	**pa**	–	–	**pa**	–	**pa**	–	**ti**	**pa**	–	–
X	–	–	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 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.

CONCLUSION

There are endless ways to imagine and realize rhythm; this article focused on the metaphorical biology of a 332 rhythm cell, its 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 can be uncovered when examining the profound relationship of music and life, sound and time.

Jerry Leake is an Associate Professor of Percussion at Berklee College of Music and the New England Conservatory of Music. He is leader of the world-rock-fusion octet Cubist that has released an acclaimed studio and live CD. He is also co-founder of the world-music ensemble Natraj, and the dub/trance groove collective *Club d'Elf* . Jerry performs regularly with R.A.R.E, C-Jammers, Another Realm, and the Agbekor Drum and Dance Society. On tabla, he has accompanied Ali Akbar Khan, Steve Gorn, Sharafat Ali Khan, Nandkishor Muley, Kumkum Sanyal, Chitravena Ravikiran, Purnima Sen, and Shyamdas. Jerry graduated from Berklee College, where he studied jazz vibraphone with Gary Burton and hand percussion with Pablo Landrum. He studied tabla in Pune, India with Rajiv Devasthali and Carnatic rhythm theory and mridangam with T. K. Ramakrishnan. He has learned African music for 20 years with Dolsi-Naa Abubakari Luna of the Dagomba tradition, Ewe music with Godwin Agbeli and David Locke, and balafon/djembe with the Coulibaly family in Burkina Faso. Jerry has written eight widely used texts on North Indian, West African, Latin American percussion, and rhythm theory; manuals for playing world rhythms on drumset; and articles published in *Percussive Notes*. Jerry is former president of the Massachusetts PAS Chapter and has been a composer and member of the Portland Symphony Kinder Koncert percussion ensemble since 1984. PN