A Short History of Rhythm

4

David Hildebrandt

4.1 Rhythms around us

Beat beat beat beat … the fundamental pulse of all life. Pulse is essential to life. Whether it's from the heart or the breath. Pulse is inside us, but also all around us. In addition to life itself, pulse gives us regularity and periodicity, which is the mother of any kind of rhythmic evolution. No matter what we do as humans, it's influenced by the phenomenon of rhythm. Whether we breathe, walk, or talk, rhythm is an integral part of life. For humans the most fundamental rhythm, however, must be the rhythm of cosmos, as it is the cause of rhythm here on Earth. The rotation of the Earth gives us the alternation of light and dark. Day and night. This is one of the most striking examples of global rhythms. We group days into months by the orbital period of the Moon around Earth, and into years by the Earth's orbit around the Sun. These cycles, or rhythms, have a tremendous impact on earthly life, affecting virtually everything including human, plant, and animal life. The rhythm of day and night causes the periodicity of sleeping and awakening, which applies for all creatures on planet Earth. As humans, we have a need for rhythm. Regularity and repeating. Seconds are grouped in minutes, minutes are grouped in hours, and hours are grouped in days and weeks. Daily routines are repeated week after week. Month after month. Year after year. A human life is one long cycle of pure rhythm.

4.2 Connecting Through Pulse

Even though we are dealing with rhythm every day, most people mistakenly think that they have a weak sense of rhythm when it comes to music. But rhythm is such an essential part of life that most of us are actually pretty good at it, without

D. Hildebrandt (✉)
The Royal Danish Academy of Music Percussion, Copenhagen, Denmark

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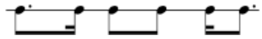
knowing. Think of this phenomenon: A show is over and it was great. Therefore, we must pay tribute to the artists by clapping. At first it's a mess. Everyone is clapping at their own pace and it creates a so-called white noise. But then the audience is gradually finding a common beat. A little slower than before, but rhythmic and persistent. How is this possible? How are hundreds of people locking into the same tempo as one big organism? Well, first of all, it comes from a collective wish to express cohesion with each other and recognition of the artists on stage. If we synchronize the applause, it actually becomes remarkably louder than the white noise produced by several individual tempos. This makes it also a social statement. If we as a crowd want to communicate that the show was a blast, it becomes more significant in the ears of the performers on stage when we synchronize our claps. And as humans we are extremely good at synchronizing. Although in theory it is more than difficult to turn white noise into one single rhythm, it happens easily when we agree on it. Basically, we are affected by the clapping of others so fast that we don't even notice. If the guy next to you at the audience is clapping at a slightly slower tempo, you may adjust to his tempo without noticing. Now the two of you are interlocked. And if the two more people join in, you have a unison group. This group may lock in with another group etc., and suddenly 1000 people may agree to clap at exactly the same speed! It is simply quite natural for humans to adjust to surroundings by using pulse as a sophisticated socio-cognitive form of communication.

4.3 Meter

Although clapping together is a rather primitive form of rhythm, it is nonetheless the concept of steadiness; that's the fundament in more sophisticated rhythms. In music, a steady pulse, or simply a tempo, is measured in beats per minute (bpm). A steady pulse alone is so simple that we may even not regard it as rhythm, but just as a series of beats equally spaced in time: 1 – 1 – 1 – 1 – 1 – 1 – 1 – 1… An endless series of undifferentiated beats. But how does such an elemental thing as pulse become so sophisticated an art as a musical rhythm? If we systematically mark a series of beats into regular groups of (e.g.) 4 and accentuate every first beat of each group, a pattern will emerge: ***1*** – 1 – 1 – 1 – ***1*** – 1 – 1 – 1 – ***1*** – 1 – 1 – 1. Because the beats appear in groups of 4, they could also be counted: 1 – 2 – 3 – 4 – 1 – 2 – 3 – 4. Suddenly, pulse has become meter. We have now taken the first step toward rhythmic art, by measuring and controlling pure pulse and putting it into bars, as the strong and accentuated beat defines the first beat of each bar. The downbeat. Meter (the doctrine of bars and beats) is the groundwork of rhythm. Still meter alone is quite far away from rhythm as a form of art. But what happens if we hear two different tempos at the same time? Like 40 and 30 bpm played simultaneously. One may think that our ears will just perceive two different speeds, which is right and wrong at the same time. When played simultaneously, the two tempos merge into *one* single rhythm consisting of strong and weak beats. A real rhythm is created – a rhythm that is much more than just a monotonous series of beats, but a playful phrase with twists and surprises.

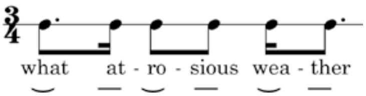
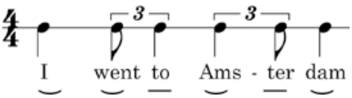
<table>
<tr><td>tempo 30
tempo 40</td><td></td><td>=</td><td></td></tr>
<tr><td></td><td>Tempo 30 in the top layer and tempo 40 in the bottom layer.</td><td></td><td>The same product, but the layers are merged together into one single rhythm</td></tr>
</table>

The product of the two tempo layers – the composite – is also known as a polyrhythm. Polyrhythms exist in all cultures and are one of the oldest types of rhythms that we know of. Simple ratios are used to describe polyrhythms. Like 4:3 (tempo 40 and 30) – pronounced four over/against three. In 4:3, 4 refers to the number of units in the fastest layer, and 3 refers to the number of beats in the bar (the meter).

An interesting aspect about this is that a polyrhythm can be heard and perceived in multiple ways. When the human ear is exposed to more than one tempo (a polyrhythm), it will automatically select one of them as the main tempo. If tempos 40 and 30 are played at the same time, and the ear chooses tempo 40 as the main tempo (3:4), the composite of the two tempos will sound completely different than the rhythm that occurs if tempo 30 is selected as the main tempo (4:3). Even though the rhythmic products of 3:4 and 4:3 technically speaking are exactly the same, they are extremely different when it comes to sound and feel. This phenomenon can be seen as rhythmic ambiguity and is a sonic counterpart to the famous picture with the faces and the vases.

4.4 Speech

Language can be used to illustrate the difference between rhythms that technically speaking are the same – like the composites of tempo 40 and 30. In language, we have a natural way of phrasing strong and weak beats. And that is what rhythm basically is – a combination of strong and weak beats. Strong beats are directly connected to a pulse, and weak beats live around this main pulse. See the two sentences below. Both consist of 6 syllables. But the first has 3 strong beats and 3 weak. The second has 4 strong and 2 weak.

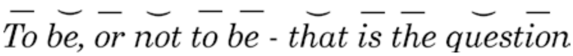
<table>
<tr><td>Tempo 30 as the primary tempo</td><td>Tempo 40 as the primary tempo</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>The composite of tempo 40 and 30, with tempo 30 as the primary tempo.</td><td>The composite of tempo 30 and 40, with tempo 40 as the primary tempo.</td></tr>
</table>

So even though the rhythmic product of the two examples above technically is exactly the same, as the time intervals between each syllable are identical in both bars, language shows us how different they feel depending on which of the two tempos our ears choose as the primary.

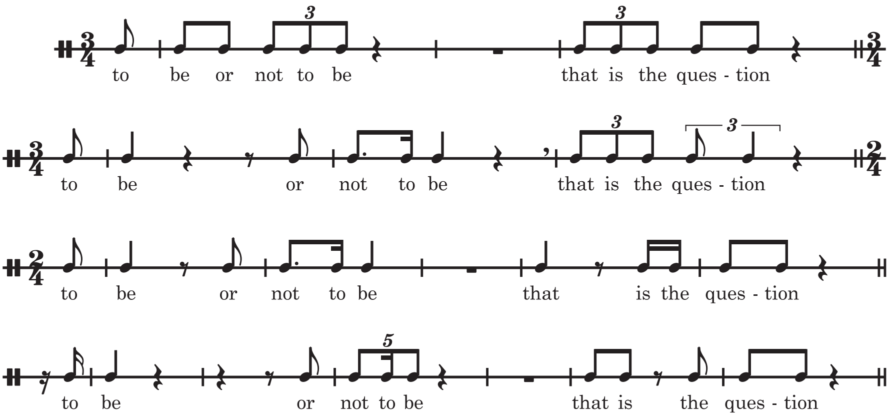
Through the language we are all in contact with rhythm on a daily basis. And quite sophisticated rhythms actually. Speech becomes rhythmical not only because it consists of sounds and pauses, but also because every word that contains more than one syllable consists of a combination of strong and weak syllables like the two examples above. Furthermore, we have the interaction between vowels and consonants. And of course the aspect of timing and phrasing. Let’s have a look at the famous line from Shakespeare’s Hamlet:

To be, or not to be, that is the question

This phrase takes its departure from the standard iambic parameter (weak – strong), but from here the relations between strong and weak syllables are varied a great deal.



In order to exhibit the similarities in language and rhythm, I found four famous recordings of the scene and transcribed each interpretation into rhythm.



There are endless ways to phrase the line that all would emphasize the meaning of the words differently. But as you can see above, one thing applies to all examples; all strong syllables lie directly on a pulse-beat, and all weak syllables live around the beats. This illustrates the hierarchy in the rhythms clearly. The strong beats define the fundamental structure of the line, while the weak beats add the life, twists, syncopations, and surprises. There are of course exceptions to the idea of strong and weak beats. Offbeats, for example, are often quite accentuated, even though they are “off beat.”

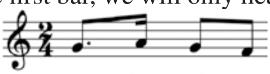
Furthermore, it must be mentioned that none of the four examples above were performed with a strict metronomic precision. If read in strict musical time, the output would seem somewhat forced and mechanical. However, this fact doesn’t make the comparison between language and music less relevant, as we in many musical genres often tend to avoid a mechanical and strict approach to rhythm and phrasing, in order to make music appear more free, alive, and "speaking."

4.5 Structure

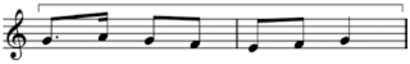
As you can see from the examples above, different meters are used to define the line. Both 3/4 and 2/4 are used here. These meters primarily tell us something about the spacing and distance between the downbeats; the strongest and most stressed words in the phrase. Here, and in most other cases, meter on its own is a pretty doll subject. Whether music is in 2/4, 4/4, or 9/8, it's not fascinating information. It's more a technicality, and it doesn't contain much musical value alone. The subject, however, becomes quite fascinating when we look at the larger aspects of music. By tracing how meters grow into rhythmic phrases, and how these phrases build into larger periods and again into whole movements, we can understand the essence of musical structure much better.

In order to understand this process of rhythmic growth, we must first understand the principle of doubleness; the concept of two. Almost all music is somehow built on a double concept. Why do we need this duplicity so badly? Earlier I described how all rhythm derives from the steady pulse. Pulse is essential to man since our heart pumps blood around in our system and keeps us alive. But there are two phases to every heartbeat. Expand and contract. Physical life is double. We inhale – we exhale. There are no third steps in this process. This is the symmetry our bodies are based on. And (as Leonard Bernstein puts it), *as two-legged creatures we walk left, right, left, and right into the heart of music*. It somehow feels natural that most music has a double meter – two beats per bar. Or some multiples of two beats per bar like 4/4, 6/4, or 8/4. Our biological need for duplicity is so great that we even tend to group bars dualistically.

Let's have a look at the children's song: *London Bridge is Falling Down*. The entire melodic phrase looks like this:

If we listen to the melody in the first bar, we will only hear a group of notes with no musical meaning on their own. 

This bar obviously has to be paired with a complementary bar, to achieve even the most elementary musical sense.

Still these two bars alone feel quite unsatisfying.	In order to arrive at a single phrase, we need another pair of bars to balance the first two.
	

Putting together these two pairs of bars, we've now got a phrase consisting of four bars:

Standing alone, the four bars still feel incomplete. Therefore, we supply these four bars with another matching four-bar phrase, to create symmetry and complete the sentence:

The phrase, consisting of 2 × 2 × 2 bars, can easily stand alone with a valuable musical meaning (Leonard Bernstein refers to this kind of rounded phrase as a *sentence*). The example above is of course rather short, but if we analyzed a song or a piece consisting of 16 bars, we would discover that an 8-bar group most likely would be paired with another 8 bars. The second group of 8 bars would balance up the first 8 bars creating a total of 16 bars (2 × 2 × 2 × 2) and so on. The geometric progression is clear, and it all derives from the metrical unit of two.

Now, many of you might be thinking: What about all the music with a meter consisting of 3 beats per measure? Like the theme from Bach's Goldberg Variations. Or all the waltzes by Strauss. Or Beatles' evergreen Norwegian Wood. Isn't music in 3 almost as fundamental as music in 2? It is. But just almost. The number 3 is not bounded in our biological nature. We just don't breathe in 3. Nor does the heart beat in 3. Yet music in 3 feels just as valuable as music in 2. The answer to this paradox lies partly in the concept of contrast. As we know from the melodic phrase above, the form is somehow reducible to 2. But let's have a closer look at 2. According to the theory of duplication, 2 is created by 1, which therefore must be the almighty mother of 2.

$$1+1=2$$

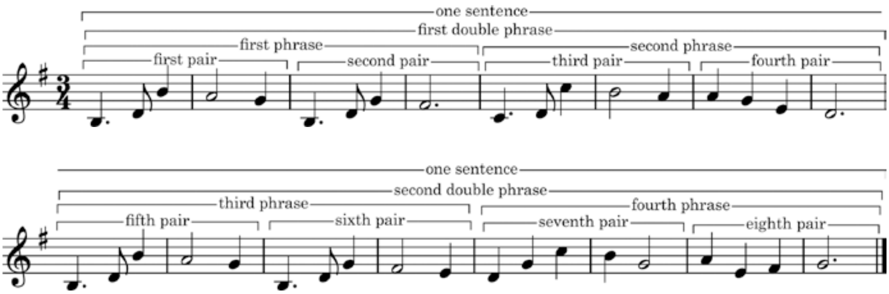
Now, if we go the Fibonacci path and pair 1 with itself, we get 2. And if we again pair 2 with its creator, 1, we get the golden number of 3.

$$1+1=2, 1+2=3$$

3 is a contrast to 2. It's the first and finest exception to our natural instinct of left – right. 1, 2, and 3 are without a doubt the most important numbers in rhythm

and in music generally speaking. One might say that a meter of 3 beats per bar is an intellectual or constructed meter, as it is primarily an unphysical concept.

We've now reached an important point in our understanding of rhythm. Having investigated what pulse is and how it becomes a meter of either a double or triple kind, we are now in possession of all the elements needed to understand any rhythm. All rhythms are in one way or another a result of the interaction of physical 2 and intellectual 3. It could be 2 + 2 (resulting in a meter of 4/4). Or 3 + 2 or 3 + 2 + 2 or 3 and 2 simultaneously that would create a polyrhythm. Somehow all rhythms are reducible to the cells of 2 and/or 3. Even in music that is composed in a meter of 3, the concept of 2 lies just beyond the surface. Just take a look at the lullaby below: *Rock-a-Bye-Baby.* Even though the meter is in 3, the line is subject to the same rules of duplexity and multiplication as described in the previous example.



Even though this example is in 3, it turns out to be just as much a slave to doubleness as the previous example in 2. This is most likely because our biological 2 lies just beneath the surface. The 3/4 bar is not just *one two three, one two three,* etc., but more ***left*** *two three,* ***right*** *two three,* ***left*** *two three,* ***right*** *two three.* And so the overall structure in triple metered music turns out to be just as much double as a polka.

In music, our biological demand for doubleness also becomes an aesthetic demand, and that is why symmetry and balance are keywords when it comes to musical structure. Beats combine symmetrically into bars, bars combine symmetrically into phrases, phrases combine symmetrically into larger formal sections, and sections combine symmetrically into whole movements. This has been the spine in western music up to the twentieth century (but also in many other art forms). In the beginning of the twentieth century, many composers started to play around with 5 and 7 bar periods, but these unsymmetrical periods were mostly paired with other groups of 5 or 7 bars and therefore still bound to duplexity.

However, in modern western music, a rhythmic "revolution" led by composers such as Aaron Copland and Igor Stravinsky finally turned the symmetrical tyranny upside down, creating music of wild, unpredictable, and irregular structure and rhythm. Music with contrasting meters and rhythms combined with unsymmetrical bar periods became a new reality. This kind of savage and wild rhythm was never heard before in western classical music. The rhythms seemed somehow new, somehow raw, and somehow authentic. Maybe the concept of rhythm was just taken back to origins? The context in which these rhythms were used was brand new, but maybe the rhythms themselves were not so new after all?

4.6 Origins

The wild rhythms (and musical material in general) that Igor Stravinsky created in his revolutionary *Le Sacre du Printemps* (premiered 1913) were extremely advanced according to Western standards. The work was so controversial at the time that the premiere ended in tumult and fistfights. Although the rhythms sounded modern, they also had a primitive and ritual quality that added a whole new dimension to "classical" music. As a composer, Stravinsky was a product of the western "cultivated" tradition, and in that sense, his music was "art music." But ironically, the rhythms he used were "borrowed" from ancient African music, where aesthetics is a secondary question and is not a goal in itself. The European notion "art for art's sake" doesn't make sense in the African tradition. Traditional African music exists to serve something more than itself. It has some kind of a purpose beyond its own existence – whether ritual, ceremonial, or simply for entertainment.

In western music, there is a radical division between the *active* musicians and the *passive* audience that just doesn't exist in the same way in African traditional music. African music is a collective matter, and every member of a society would somehow participate, although not necessarily in the same degree. The concept of going out to "listening to music" is not a thing. Making music together is. Some play, others sing or dance, but everyone participates one way or another. The social aspect is a fully integrated part of traditional African music.

Even though African music in many ways is rather understandable and "easy to listen to" for most people around the globe, it also has a high level of rhythmic complexity. It has a circular character with a less "mathematical" approach to meter than European music. It contains a great amount of polyrhythms (multiple simultaneous tempo layers) and polymeters (multiple simultaneous meters).

It was exactly these kinds of rhythmical elements that Stravinsky used in *Le Sacre du Printemps;* rhythms that, despite their complexity, somehow felt natural and appealing (and tremendously provocative at the time). How come that complexity in this case feels so natural and organic? Could it have something to do with the social aspects that somehow are integrated into the DNA of African traditional music? Or is it due to pure musical reasons detached from any social aspects? If this is the case, why does the human ear find some types of complex rhythms highly organic and others awfully constructed and lifeless?

These questions are not easy to answer. However, we might be wiser on the social aspects of rhythm by tracing down rhythm to its origins. African music culture is one of the oldest that we know of, and luckily the origins are still very present in traditional African music. Before we go deeper into the subject, I would first like to clear out some exciting technicalities.

4.7 Tempo

Rhythm alone doesn't belong to anyone. It is an independent phenomenon. No instrument has a monopoly on rhythm. Nor does man have the monopoly. Rhythm exists in cosmos, but also inside every living creature on planet Earth. It can be generated by computers as well as woodpeckers. As a human, however, it is rather difficult to separate rhythm from being human. What may be a rhythm to us may be something completely different to extraterrestrial beings and vice versa. As earlier described, rhythm derives from pulsation. So whether we want to play rhythms, listen or dance to them, we would first of all need some kind of relatable tempo as a base. We need a tempo that we can *feel*. Not just hear, but feel. And as humans, we can only perceive tempo within certain frames.

Fastest. If a tempo is extremely fast, it will be hard to distinguish between the events that we hear. Technically, we can register rhythm up to about 600 bpm (beats per minute). If the tempo gets faster than this, it will just sound like a blur of notes rather than any sort of discernible rhythm. And if the tempo goes even higher – up to about 1200 bpm – we will suddenly hear a continuous note with clear pitch and not rhythm at all. A metronome mark at 1200 bpm can be translated into 20 hertz (or 20 cycles per second). Pitch is measured in hertz, and 20 hertz is about the lowest that a human can hear. This means that a steady rhythm and pitch are exactly the same thing – it's just the human ear that perceives them differently when the speed changes.

Slowest. According to musicologist Paul Fraisse, the slowest tempo that humans can feel is about 33 bpm. If a tempo gets much slower than that, we can *hear* the beats, but it gets extremely hard to *connect* them. Again, it might be due to our human body. Try to set a metronome at tempo 25 and walk to it. Simply synchronize your steps to the clicks. Well, you'll experience that it's not so simple at all. Our slowest (natural) walking speed tells a lot about how slowly we can connect two (or more) sonic events without losing the feeling of rhythm. Walking very slowly is just extremely difficult. Not so strange that the Italian language uses the word *andante* (walking) as an indication of a musical tempo. At an extremely slow tempo like, e.g., 25 bpm, your brain might remember the previous beat, but your body would simply not be able to feel the relation of beats as coherent. Raising the tempo, the feeling of pulse becomes present though. At about 33 bpm or more, each beat will spontaneously leave a *time point* in the mind of the listener, and the feeling of pulse will also be projected *forward* in time, creating a row of anticipated time points. This feeling of past beats combined with the expectation of future beats will guide the synchronization of the body movements of anyone who may play or dance.

4.8 Chasing the Roots

We've now reached an interesting point: rhythms and body movements. Physical movement is inseparable from playing as well as (of course) dancing. No matter whether we hit a drum or dance to a groove, physical movement is a necessary part of the action. In traditional African music, the dancers often tie bells around their forearms and angels so they will sound in time with their steps and movements (often singing at the same time). In this manner, the barrier between musicians and dancers is drastically minimized. Music becomes physical. And since anyone may participate, one way or another, it also becomes social. According to the ethnomusicologist Simha Arom, there isn't even such a thing as "professional" musicians in (Central) Africa. Music is created by everyone, which means there is no clear distinction between musicians and non-musicians (of course, there are master musicians etc., but that's another matter). Due to the lack of barriers between performers and audiences, music becomes a thing that connects the community on a daily basis. Music, rhythm, and dance are not just for pleasure. It's a *need*. If one imagines the concept of rhythm as an indispensable part of everyday life – as something necessary to maintain physical and social balance, we are most likely approaching something that could be the essence of the origins of rhythm on this planet; a universal force that is projected into human life. And most importantly, that binds us together socially and physically.

Although the origins of rhythm may be of social and physical character, this is not necessarily the ultimate end goal of rhythmic purpose. The human use of rhythm has evolved. Rhythm is now all over the planet and is used in a huge variety of ways with the most incredible outcomes. No doubt that the unifying function still is an important part of rhythm. But there are so many other things that rhythm is capable of.

4.9 Methods and Training

In Africa, musical schools or education systems that guide the way into traditional music are very few. Instead, music is learned the same way as children learn how to speak, and traditions are passed on from one generation to another. Wrapped in carrying clothes, the baby is fixed onto its mother's back and thus participates in daily activities, including ceremonies and dances where the baby is "being danced" by its mother long before it can even walk. In this way, the child absorbs in the most natural manner possible the fundamentals of the music of its community.

From a music pedagogical point of view, this physical and natural way of learning music has incredibly good results, as playing becomes just as natural as walking or speaking. But there are other educational ways to approach rhythm than this. Let's take a look at Indian classical music. Here is the way of understanding and learning rhythms completely different. And with results too amazing to be described in words. In Indian classical music, the system of rhythm is extremely calculated. And the musical education system is remarkably organized. It is common for students to visit their gurus daily to learn music, but it typically takes several years before a student is "skilled" enough to perform in public. This is a complete contradiction to the African way in which the child starts to imitate adults and older kids at about walking age and then joins the musical community shortly after. In India, rhythm training is an obligatory part of music lessons, no matter what instrument the student is playing. The rhythm training is based on a system that is highly methodical. Let me shortly describe how a polyrhythm can be generated using the South Indian system.

In India, rhythm is understood by subdividing the pulse into various units, like slicing up a cake (I'm using western notation and not the Indian notation system).

The notes in the top line indicate the pulse, while the lower line shows subdivisions from 2 to 8. This kind of measured rhythmical system is quite related to the western system, which tends to measure everything mathematically.

Now let's go a little further. If we pick one of the division types above, e.g. 5 units per beat (the quintuplet), but mark every (e.g.) 4th unit, the outcome would look like this:	Or simply notated in this way, this emphasizes the consistent phrasing of 4-groups inside quintuplets (the top layer shows the pulse).
	

If the unaccented beats were removed, the polyrhythm 5:4 would stand alone. Let's take the rhythm a little further out by replacing every 4-group with a 7-group (a septuplet):

The total outcome of the cycle above is a 35:4 polyrhythm (7 × 5 over 4). Already a fairly complex tempo constellation. But still, it feels a little stiff musically, so let's loosen it up by randomly removing some of the units in the septuplet layer.

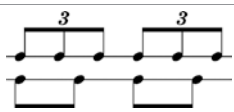
Suddenly the rhythm comes alive. With these omissions, the rhythm becomes much more fun to listen to with its playfulness and syncopations. However, the most notable aspect of this rhythm is the fact that the quite sophisticated texture is played *inside* a polyrhythm. Playing this rhythm, the performer is basically dealing with two simultaneous layers of tempo – something that is perfectly possible, but which usually requires years of specific training.

4.10 The Western Explosion

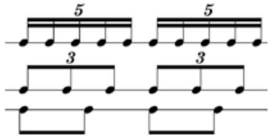
Even though the bar above would be very difficult for almost any western musician, the exact same bar would be played instantly if it was presented to any South Indian musician. This kind of rhythmical texture has been a part of Indian music since approximately 500 BC. Compared with the western music tradition, rhythms with a corresponding level of complexity were not seen until the middle of the twentieth century. But since then, the way of using rhythms in western contemporary music has exploded. Composers like Conlon Nancarrow, Iannis Xenakis, and Brian Ferneyhough have written music with rhythmic textures out of this world. Conlon Nancarrow wrote music for auto-playing pianos because his rhythms were too difficult for anyone to play. Iannis Xenakis used his mathematical background as an architect to generate massively intense rhythm. Brian Ferneyhough uses tools similar to Indian systems in order to create rhythms inside rhythms inside rhythm. Like rhythmic Babushka dolls. Just check out the complexity level of this excerpt from his *Bone Alphabet* for solo percussion:

These three composers, and thousands of others, use the art of rhythm to create music of any conceivable kind. In some works, rhythm is used as a tool to create chaos. In other works, rhythm may produce order and stability. Sometimes rhythm makes the music appear dangerous. Other times pleasant. Sometimes groovy. Other times shady. Sometimes free and jazzy. Other times strict and constant. Sometimes supernatural. Other times natural. Rhythm works in many and mysterious ways.

When it comes to complexity in rhythm, the outcome wouldn't necessarily sound strange and complicated. In my opinion, some extreme rhythms sound very organic and natural. Earlier I described how tempo and tone (pitch) are the same – just experienced differently when speed changes.

Below it's clear how musical intervals can be described by simple ratios. Since the bottom note vibrates at 440 hertz, it relates to the top note by a ratio of 3:2. Simple math.	The ratio 3:2 can, as we know, also be used to describe a polyrhythm. If speeded up to tempo 13,200 bpm, this rhythm would sound exactly like the interval to the left. Simple physics.
 $\frac{660hz}{440hz} = \frac{3}{2}$	

The numbers 2 and 3 are the most fundamental building blocks of music. Let's try to add an extra layer to the interval above. By adding a *contrasting* number to the constellation of 2 and 3, the interval would turn into a harmony. If 4 is added, it wouldn't do any good for the interval since 4 just is a double of 2. But 5 would be miraculous. It's the first and finest exception to 2 and 3.

The vibration speeds 1100 Hz, 660 Hz, and 440 Hz can be described by the ratio 5:3:2. If played simultaneously, a major triad would occur. The major triad is the simplest existing harmony because it's the product of the simplest (contrasting) ratios.	Translated into rhythm, the same ratios would look like this.
$1100hz : 660hz : 440hz = 5 : 3 : 2 =$ 	

It's fascinating that a polyrhythm is a harmony in slow motion. And even more fascinating is that the harmony and rhythm actually *feel* the same. Strong, open, natural, and noble are some of the words that I would use to describe the harmonic and rhythmic product of 2:3:5. Despite its organic flow, the 2:3:5 polyrhythm is still considered a fairly advanced rhythm by most western musicians.

Returning to the question of why Stravinsky's rhythms in *Le Sacre du Printemps* felt outlandish yet so natural, the natural and organic aspect may have to do with the fact that the rhythmical structures are built upon simple ratios like the rhythms above (although they may not look simple). Ratios are found all around us in nature, as well as in the art of painting and architecture. But why did the rhythms provoke as much as they did? Well, simply because they had never been heard before in western music when the work was premiered in Paris in May 1913. However, the very same rhythmic ratios had been part of music from other cultures for millennia.

No matter how extreme a rhythm may appear, it can always be traced down to the simplicity of pulsation. And that might be the reason why rhythm in its nature has a unifying effect on humans. No matter which country or culture one may belong to – or what religious, non-religious, or political belief one may have, the phenomena of pulsation is simply relatable to anyone on the planet, simply because rhythm exists all around us. It's everywhere. It's in cosmos – and it's in the heart of each and every one of us.

Suggested Reading

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