



Rhythm – A perspective view on multi discipline

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Abstract

Rhythm pervades nature manifesting in various forms across the Eco system. Sound is one of the main components of earth which penetrate in the world in the form of Pancha bhootham. Almost all the movements of the earth are guided by rhythm. Rhythm is a fundamental element of music providing its pulse and structure. Rhythm is the basic element that connects music and movements through which it creates a dynamic and expressive Art form Dance. Rhythm can be perceived through everything in the universe with some kind of motion in a regular or periodical patterns. The movement of universe can be explained through the laws of mathematics. Rhythm is a combination of several factors, meters, sentence length, diction, musicality, alliteration, consonance and pacing in linguistic rhythm. Rhythmic patterns are prevalent in environmental system of earth including seasonal cycles, tides, weather patterns and climate oscillations. Nature itself is made up of many things from Sun, moon, earth, planets which follow the rhythm of their own. Our body also follows rhythm according to our biological clock. The Auditory and motor system of brain distribute electrical signals which creates harmonized rhythm. As part of communication all the animals, birds, insects show systematic movements or sounds of rhythm.

Keywords: Sound, Natural rhythm, Music, Dance, Universe, Human, non human.

INTRODUCTION

Rhythm is mainly formed by repetition with perfect time gap or silence in between. Rhythm by repetition makes us energetic. Rhythm in music is nothing but a calculated time which is measured in terms of beats. The rhythmical concept Isochrony is beats with silence in a repetitive manner. "The whole universe is comprehended of rhythmic movement. In daily life (men, animals and birds, static and dynamic beings) all perform their activities with a particular routine which is rhythm. Though time itself is a whole, it is divided into hours, divisions of the day, days, months and years."

Rhythm and Nature:

Rhythm pervades nature manifesting in various forms across the Eco system. Sound is one of the main components of earth which penetrate in the world in the form of Pancha bhootham (water, fire, air, land, space). Almost all the movements of the earth are guided by rhythm. Some foremost examples are our heart beat, sound of falls, sound of waves, planting harvests, cycles of moon and sun all these have inbuilt rhythm in them. Starting of day and night with respect to Sun rising and Sun setting is also rhythm based. Seasonal cycles summer, winter, autumn, rainy seasons follow Rhythmic patterns which in turn influence migration patterns, plant growth and animal behavior. The tides follow rhythmic patterns influenced by gravitational pull of the moon and Sun. Coastal Ecosystem is shaped by the rhythmic ebb and flow of the tides.

Music and Rhythm:

Music and rhythm are deeply intertwined. Rhythm is a fundamental element of music providing its pulse and structure. Different music styles and genres utilize rhythm in unique ways from steady beat of pop music to complex polyrhythm of

Jazz or African drumming or Karnatic music. In Karnatic music the rhythm is called Gati. Gati is the time taken for a single beat. There are five types of gatis seen in Karnatic music.

Gati varieties: They are

1. Tisra Gati (a beat with three syllables) - 3 letters - ta ki ta)
2. Chatusra Gati (a beat with four syllables) - 4 letters - ta ka di mi)
3. Kanta Gati (a beat with five syllables) - 5 letters - ta ka ta ki ta)
4. Misra Gati (a beat with seven syllables) - 7 letters - ta ki ta - ta ka di mi)
5. Sangirna Gati (a beat with nine syllables) - 9 letters - ta ka di mi - ta ka ta ki ta)

Mastery of rhythm in Karnatic music adds depth, complexity and expression to their performance. Rhythm holds an immense significance in music. Thirupugazh is one of the best examples where rhythm is intricately woven into the fabric of compositions.

Rhythm and Western music:

In Western music vertical and horizontal elements create the music where vertical element form the pitch and the horizontal element form the beat (rhythm). Clapping is often used to help people recognize the Rhythm in Sounds. Clapping or Beating is the best way of showing Rhythm patterns. Rhythm represents the calculative time which is measured in terms of beat.

Linguistic Rhythm

Rhythm is a combination of several factors, meters, sentence length, diction, musicality, alliteration, consonance and pacing. Rhythm in poetry is a mathematical construction. The rhythmic songs are coined with definite number of syllables or letters, which has a meter or chandam. They are the back bones and they give life to that poem or song. Music is secondary to that type of rhythmic poems. They by observation show rhythmic patterns. The best example for rhythmic poem is Thirupugazh, a Tamil text which belongs to 15th century written by Saint Arunagirinadar. One example from that Thirupugazh.

Tamaru mamaru manayu miniya tanavu marasu mayala ga - verses

Tanana tanana tanana tanana tanana tanana tanana na - chandam (rhythmic syllables)

This is a tisra gati chandam where it is coined of three letter syllables ta,na, na

Rhythm and Dance:

Rhythm is the heart beat of dance. It is the underlying pulse which creates movements and gives dance best energy and flow. Rhythm is the basic element that connects music and movements through which it creates a dynamic and expressive Art form. The measured movement qualities through time are Rhythm. Usually, Rhythm in dance consists of stipulated steps, turns, repeated strong movements in order makes the dance elegant and energetic. Rhythm often determines the movement whether it appears joyful, calm or anguished. Rhythm is used in dance as tempo, metered time, repeated rhythmic pattern. Tap dancing is an element of time. Pulse, tempo and syncopation are the elements of time. Rhythm increases the aesthetic value of the performance in dance.

Rhythm and Astrophysics:

Rhythm can be perceived through everything in the universe with some kind of motion in a regular or periodical patterns. This indicates the existence of Rhythm all over the world. Physics and rhythm involve patterns and movement albeit in different context. In physics we explore the natural laws that governs the universe often through mathematical equations and experiments. The movement of universe can be explained through the laws of mathematics. The universe is built on patterns of nature which allow us to figure it out quantify in mathematically. The celestial bodies exhibit rhythmic movements and patterns in their orbits and rotations. Planetary orbits follow predictable rhythms governed by Kepler's Law of planetary motion while stars undergo rhythmic pulsation or rotations. The universe is believed to exhibit fractal patterns on large scale. The distribution of galaxies in the universe is not random but it shows Fractal patterns. The spiral rhythmic pattern seen in Galaxies are now understood that it is the result of gravitational forces between the stars.

Rhythmic Patterns:

Rhythmic patterns are repeated designs gives decorative and aesthetic look to that matter. Some shows uniformity like tessellation and some shows total effect like galaxy. The spiral rhythmic pattern seen in Galaxies are also one of the rhythmic patterns. Spider web is one of the examples for rhythmic patterns executed naturally by the spider. The tree rings which are formed due to growth have perfect designs. The stripes in the sea shells are indication of rhythmic growth through calcium deposits. In this case the rhythmic deposition of materials forms the rhythmic pattern.

Fractal Pattern:

Fractal pattern is a kind of pattern that we observe often in nature and in art. The distribution of Galaxies in the universe exhibits a fractal pattern. Mathematical and highly complex designs, infinite type of designs can be called as Fractal patterns. It is a pattern repeated forever without end. Fractals are present surrounding us in so many different aspects of life. The best examples are Sea shells, spiral galaxies, structure of lungs. Branching fractals include trees, Ferns, the neurons in our brain, the blood vessels in lungs, lightning bolts, river branches. Fractals are images of dynamic systems- the picture of chaos.

Rhythm and Earth:

Rhythmic patterns can be observed in geological processes such as the cyclic deposition of sedimentary layers, the alteration of glaciations and interglacial periods and periodicity of earth quakes and volcanic eruptions. Rhythmic patterns are prevalent in environmental system including seasonal cycles, tides and atmospheric phenomena like weather patterns and climate oscillations. The earth itself exhibits rhythmic patterns like pulsations of its magnetic field and the cyclical movements of tectonic plates. These rhythms of earth contribute to many phenomena like Geomagnetic storms and Seismic activity.

Rhythm and Therapy:

Rhythm is used as a teaching tool to engage students across different subjects like maths, language, arts and Physical education fostering creativity and critical thinking. In Therapy, rhythm often utilized as many form of therapy like music therapy, dance therapy and other forms of expressive art therapy to promote healing, self expression and emotional well being.

Natural body Rhythm:

Nature itself is made up of many things from Sun, moon, earth, planets which follow the rhythm of their own. The entire cosmos and its components are having their own rhythm. We also follow rhythm according to our biological clock. All our bodily functions are governed by our internal clock.

Biological Rhythms:

Biological rhythm refers to natural recurring cycles in biological processes. These rhythms occur in various levels from very small cellular to big organism level which are influenced by internal biological clocks. There are the series of bodily functions regulated by our internal clock. There are four types of biological rhythms. They are Circadian rhythm, Diurnal rhythm, Ultradian rhythm and Infradian rhythm.

Circadian rhythm: A regularly recurrent quantitative physical, mental and behavioral changes in a variable biological process over 24 hours is a circadian rhythm. Light and Dark have the biggest influence on circadian rhythms.

Ultradian Rhythm: It is one of the biological Rhythm. The examples of ultradian Rhythms are sleep stages, blood circulation, pulse, heart rate, thermo regulation, blinking, micturition, appetite etc.

Diurnal Rhythm: These are the rhythmic cycles belongs to one day (once a day). They are frequently observed in endocrinology and this includes reproductive system. This rhythm is regulated in our body by the hormone melatonin.

Infradian rhythm: It is otherwise called Women's rhythm. It is a 28 days clock that starts with the first menstruation at puberty and ends with the last menstruation before menopause. Cycles of reproductive endocrine activity such as menstrual cycles in human and estrous cycle in non human animals are examples of this rhythm.

Rhythm unique to human:

Only Human being has the ability to coordinate and guide the impulses of the (brain) auditory input to motor output. The human behavior on hearing a rhythmic music is rare and incomparable and unique. The reciprocation for which is extremely rare and distinct. When we hear rhythms in music our neurons begin to fire in time with the music. When those neurons start pulsing, our body automatically follow along and shows movement.

Brain Rhythm:

The Auditory and motor system of brain distribute electrical signals which creates harmonized rhythm otherwise called oscillation. It is a coordinated activity of billions of brain cells. Many of the regions within the basal ganglia in Brain appears to play a major role in the processing of rhythms which is called Putamen.

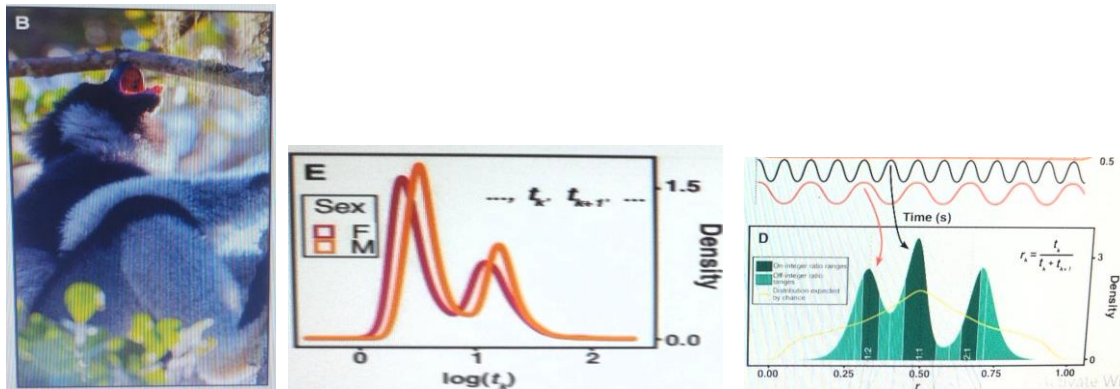
Animals and Rhythm:

Animal research from the early period shows that they are time conscious. As a part of communication many animals confirms systematic creation of sounds or movements. but most of the behavior slack genuine rhythm. Rhythm in animal

kingdom plays a vital role in communication, mating attraction, territoriality and social behavior. Best example for mammals which has sense of rhythm is Indri Lemur of Madagascar.

Indri Lemur of Madagascar

An investigation showing results from 20 Indri groups (39 animals) living in Madagascar.



1. B - Showing an adult male- Indri Lemur singing in Madagascar.
2. E - Sexual Dimorphism – showing male, female sex difference.
3. F - On integer (dark green) and Off integer (light green) showing the ratio ranges. (categorical rhythm in a singing primate- Current Biology magazine –Cell Press)

The investigators recorded songs from 20 Indri groups (39 animals) living in their natural habitats. The members of the Indri family tend to sing together in harmonized choruses and duets. The research team found that Indri songs had the classic rhythmic categories (1:1 and 1:2) as well as the ritardando (a gradual slackening in tempo). Male and female Lemur songs had different tempos but shared the same rhythm (A sense of rhythm – Candice Gaukel - Nature& Wild life – Study of few singing primates – Lemur Indri indri.)

Elephants and Rhythm:

As part of communication all the animals shows systematic movements or sounds. Elephants had an innate talent of recognizing and replicating auditory rhythms. The temple elephants especially in South India while walking on the streets shows a rhythmic pattern of bell sound which was tied around its (belly)body. The sound ding, dong will be in perfect rhythm which was created according to its walking. There is a old saying in Tamil “The sound of the bells comes first and the elephant comes next” “Yānai varum munne mani osai varum pinne” Like that the walking or running of horse shows a perfect rhythmic pattern. The sound produced by its leg shoes on the floor or ground gives rhythmic sound. Sangam literature shows the rhythmic walk of the horse in Patthu pattu.

Birds and Rhythm:

Birds show great power and ability in learning vocalization. They can mimic extended range of sounds particularly human speech which is complicated. Best examples are Parrots and Ravens. These birds have well developed brain region that connect auditory and motor neural system. They can identify even complex rhythm patterns. They have such an excellent brain power with high auditory observation which can repeat the same even they are highly complex types. Doves and Pigeons show strong rhythmicity in their vocalization. Insects like crickets, Cicadas produce rhythmic calls by rubbing body parts together particularly during breeding season.

Frog mating calls:

Frog mating calls often follow rhythmic patterns. It can vary significantly between species in terms of duration, frequency and amplitude. Male frog gathered near water bodies forming a chorus. This synchronized calling behaviour contributes to the overall rhythm of the breeding season. Frogs mating calls are highly rhythmic. After male call the female’s reply shows specific time bound.

Flashing of Fireflies:

The rhythmic flashing of firefly is an enchanting display created by bioluminescence, a chemical reaction within the body of Fireflies. Each species has its unique flashing pattern which helps them for identification and attraction. This flashing signal shows a perfect time consciousness between them. The flashes occur between every 5.1 seconds. Synchronized flashing of males of some firefly species can be visually noted. The unique nature of this firefly flashing gives communicative interactions with rhythmic photo signals. Synchronous Fireflies have an internal clock that makes

them to flash at a consistent interval. A solitary firefly will maintain a steady rhythm. If two flashing Fireflies are placed together each has its own clock. (Firefly Rhythm- Living with Insects Blog – Word Press. Com)

Ubiquitous Rhythmic behaviour in both Human and non human:

1. A California sea lion was trained to entertain her head bobbling not only to a metronome but also to real human music. Metronome is a tala meter which will show rhythmic sounds only. A music is a one which has song, back ground music consists of percussion instruments, wind Instruments, stringed Instruments and Idiophones. So, synchronizing all and bobbling head in a perfect manner to music like a human is difficult. but the sea lion was able to bobble in a synchronized manner. This shows the innate rhythmic sense in an animal.

2. Two parrots appeared to be capable of moving with the beat of real music and maintaining synchronizations at varying tempos. If it is a single parrot means synchronization is not needed. Two parrots with only one tempo is also possible, they can manage by following the similar movement for the entire music. but in the tempo change the synchronization is more important and both have to understand the tempo change. These parrots were able to grasp the change in rhythmic tempo and behaved according to that tempo. This shows Parrots have innate rhythmic sense. (Rhythmic abilities in Human and non human animals - Fleur.L.Bouwer, Vivek Nityananda, Andrew A.Rouse and Carel tencate – Aug- 2021)

Conclusion:

Rhythm serves as a Universal language that connects human with each other and with the world around them. Rhythm functions as a versatile and powerful tool in multidisciplinary contexts enriching experiences, facilitating communication and fostering collaboration across diverse fields and disciplines. Rhythm in scientific contexts makes everybody to understand the underlying mechanism, predict future behaviour etc. By recognizing and analysing rhythmic patterns Scientists can gain in-depth knowledge about the interconnectedness and dynamics and beauty of the natural world. Rhythm can be observed in many disciplines like Music, Dance, Arts, Astrophysics, Biological science, Environmental science, Human Physiology, Psychology, Education, Linguistics, Therapeutic science, Animal science, it is one of the best phenomena observed in the Ecosystem worldwide.

Reference

1. Natural Rhythm - Lisa Michaels- Institute of conscious expression- 2008.
2. Rhythm of Nature – Ian Carter - Pelagic Publication – 2022.
3. Circadian Physiology – Rainelle Roberto – Taylor & Francis group - CRC Press-2006.
4. Structural function of Music – Berry Wallace – Dover Publications – New York -1987.
5. The rhythmic Structure of music –Cooper, Grosvenor and Leonard-University of Chicago Press- Chicago – 1960.
6. Meter as Rhythm- Hasty Christopher- Oxford University Press – Oxford- 1997.
7. Music and Rhythm – Peterson, Peter- Peter Lang – New York -2013.
8. The stratification of musical Rhythm –New Haven and London – Yale University – 1976.
9. The rhythm of Tonal music –Lester Joel Pen dragon Press- Hillsdale, New York -1986.
10. Indian Concept of Rhythm –Sen. A.K.-Delhi Kanishka Publishers – 1994.
11. The rhythmic principles and & practices of South Indian Drumming- Sankaran. T - Lalith Publications – Canada - 1994.
12. Natural Rhythms and Dance- Colby. G.K. – NY: A.S. Barns and Co.- New York- 1922.
13. Relations capes, Movements, Arts, Philosophy - MA: MIT Press –Cambridge - 2012.
14. A Sense of Rhythm: Birds, Lemurs, Whales and Us – Candice Gaukel Andrews. Nov .2021 – Nature and Wild Life.
15. Rhythmic Abilities in Human and non human animals – Fleur. L. Bouwer, Vivek Nityananda, Andrew. A. Rouse and Carrel ten Cate - 2021.
16. Rhythm in Foundations in Music Psychology – Honing. H. Bowers FL- Cambridge – MA: MIT Press. 2019.
17. Perceiving temporal regularity in Music –Honing. H. Bower SH, Haden GP - NY: Springer – New York – 2014.
18. Synchronous Rhythmic Flashing in Fireflies- Buck, J - Q.Rev.Biol.13 (301- 314) - 1938.
19. Timing of Biological Clocks- Win Free. A.T. –Henry Holt and company – 1986.
20. Acoustic communication in Insects and anurans – Gerhardt HC, Huber. F, University of Chicago – Chicago IL – 2002.

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