

# Science and the Thirty Three Gods

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At the core of Vedic faith are the 33 Gods, long before the Puranic era of Shaiva Vaishnava sects etc. They are sometimes mentioned as 33 crore Gods, but the word Koti is used here in a sense of qualitative greatness rather than quantitative.

Earlier articles had discussed the Dawn of a Global Spirituality, through the sixteen stages of the Panchadashi mantra of Sri Vidya. These articles covered perspectives of Spirituality, Religion, Culture, Healthcare, Management, Science, Aksharas, Energy, Music and the like.

Bhaskararaya in the Varivasya Rahasya mentions how these 16, bring the very primordial mentions of Amma, also gives rise to the 33 Gods. These are in reality advanced concepts of science and life, and much much more than just Gods. These aspects are outlined in this article.

The 33 Gods are often split into groups: the 12 Adityas, 11 Rudras, 8 Vasus and 2 Ashvinis. All these have scientific significance through their mapping with the Panchadashi, which is the first 15 of the 16 stages, since the 16th is considered to be Amma Herself, in Samashti.

## **Adithyas**

First, one must understand that the 15 stages comprise of 3 sections or Kutas of 5, 6 and 4 stages representing Rig, Yajur and Sama Vedas respectively. The last stage of each Kuta is the Hreem which represents Atharva Veda. Thus, excluding these 3 stages namely 5th 11th and 15th, we get 12 stages. These are precisely the 12 Adityas.

The sun is the ultimate source of all energy as far as our planet is concerned. And relative to the Earth, the sun moves, and to make sense of this motion, the sky is divided into 12 sections, called zodiac. Each of these consist of several stars which are grouped into constellations by virtue of physical appearance.

Within the course of a year, the sun travels through the 12, and returns back to starting position. These 12 portions of the year, called months are named after the zodiac as Mesha, Makara etc.

Since stars are sources of energy, as and when the sun passes through a certain zodiac, the energies of the stars add up with the sun's energy, and it is this combination that reaches us. Thus the sun is seen with a different characteristic for each different zodiac or month.

The characteristics of these 12 also inspire the concept of houses or Bhavas. These are 12 areas of a person's life and are determined by constructive or destructive energies of various planets in various instants of life. However, these 12 are calculated from the ascendant at the time of birth and thus Mesha, the first zodiac need not always be the first house.

Thus, from the 12 stages, we have the 12 Adityas ruling the 12 months, inspiring the 12 house concepts. These will be seen now. The most popular form for each stage will be given here.

Prathami Allah: God as the Supreme in His creative aspect. Vidhata or Dhata meaning creator is the Aditya. Aries or Mesha is the ram, translated as Aja, which also means unborn. It signifies a person's uniqueness, personality and life as the first house.

Dvitiya Yahweh: God as the upholder of Dharma. Aryama is the Aditya who sets up contracts, symbolising formality and law. Taurus or Rishabha is the fierce bull, and its charging denotes a person protecting what he values most. That value or wealth is the second house. God Himself values Dharma most, and incarnates Himself to protect it.

Tritiya Trika: God in His varied forms as Trishakti etc. The focus here is on variety, and relationships and harmony between the variety. That relationship, siblings, friendship etc is the third house. The twins of Gemini or Mithuna, and Mitra Aditya denotes this friendship.

Chaturthi Ganesha: God as transcendence beyond all the variety and relationship. In life, this denotes the phase of old life beyond relations, kids etc. The need of security in old life, this is the fourth house, and is symbolised by the protective shell of the crab of Cancer or Kataka. Varuna is the Aditya of the waters completely surrounding on all sides, granting security and protection from evil.

Shashti Skanda: God in His purest essence, as bliss, love, beauty and wisdom. This is God first hand, and is here Indra, the King of the Gods. So also, Leo or Simha is the lion, the king of animals. The fifth house is thus the vitality or heart, and represents creativity.

Sapthami Surya: God in His role of worldly Leela. The Aditya Vivasvan represents sustenance through fire and cooking food. Similarly Kanya or Virgo, the female represents sensuality and body. The essence of body ie health and work is the concept of sixth house.

Ashtami Buddha: God as compassionate enlightenment. Compassion gives rise to love, to invaluable relationships. This is the seventh house inspired from Libra or Thula, the scales, which indicate equality - relationship like spouse that are valued equal to one's own life. Work towards such harmony is represented by Tvashta Aditya, who also represents harmony with nature are trees and herbs.

Navami Shakti: God as the eternal and infinite. Durga vanquishes enemies, and this is represented by the Aditya Vishnu. Scorpio or Vrischika the scorpion, represents the eighth house as poisonous venom and death, and also emotions which can at times get equally fatal.

Dashami Sastha: God as formless Atman giving wisdom Jnana. This is the realm of Religion and philosophy, which is the ninth house, represented by Sagittarius or Dhanur, the arrow

symbolising upward propagation. This wisdom is achieved by the mind which is equivalent of Prana, and representing this wind is Anshuman Aditya.

Dwadashi Krishna: God as Divine Will, removing Karmas. Karma Vasanas are desires and tendencies, which is best described as the reptilian brain. Representing this is Makara or Capricorn the crocodile. The tenth house represents desire, ambitions, and honour which is possible if one masters these. The Aditya is Bhaga, representing accumulation of wealth, fortune etc.

Trayodashi Krishta: God as love, enduring suffering Himself to liberate us. This love makes one go extrovert, towards society, building harmony, and that is what is represented in the eleventh house, pictured beautifully by the water flowing out of the pot of Kumbha or Aquarius. The Aditya is Pusha the nourisher, comes directly out of Divine love.

Chaturdashi Shiva: God as liberation and wisdom, beyond form and Maya. Liberation is the keyword for the twelfth house, represented by Meena or Pisces, the fish caught up in bondage in water. The Aditya is Parjanya, the God of rain symbolising purification.

Since the 16 stages form a continuous exhaustive set, the 12 Adityas or Rashis taken from these are also an exhaustive set. Consequently, one can infer many patterns from this set.

Prior to this, one must understand the similarity inspired relations between the planets based on the numbers. Of the nine digits, from 1 to 9, 5 is the center. This splits the nine into 2 sets - 1 to 5 and 6 to 9.

There are correspondences between the numbers. 1 and 6 as Surya and Shukra relate to physical realm, health and wealth. 2 Chandra and 7 Kethu denote actions, physical and mental. 3 Guru and 8 Shani denote expansion-contraction duality - expansion of wisdom and negation of Karma. 4 Rahu and 9 Kuja denote superhuman effect - fate and birth-death. 5 is unique as Budha, denotes multiplicity and relations. However Rahu and Kethu represent spiritual effects, submitting to divine will and Sadhana towards Moksha respectively. For this reason, they are non physical or Chhaya Grahas. Thus, they are not assigned Rashis.

Largely, the 1st 8 Rashis represent a physical level, with Mesha and Vrischika represent birth and death. On the contrary, the last 4 represent Spirituality.

Representing completeness and birth-death, Kuja rules Mesha and Vrischika outlining the physical realm. At the center of this set are Kataka and Simha. These represent intellectual and physical Vitality and are ruled by Surya and Chandra. Shukra and Budha are complementary as the ending of 1st 5 and starting of last 5 numbers. These form the other Rashis of the 8. Shukra represents physical value and relations as Rishabha and Thula. Budha represents external exploration as friendship and internal exploration as health, as Mithuna and Kanya.

The last 4 Rashis represent Spirituality. Of these, by nature Brihaspathi is expansive and Shani has a tendency to negate and nullify Karmas. These are the 3-8 correspondence told earlier. Of the 4 Rashis, Brihaspathi forms the outer 2 ie Dhanur and Meena, while Shani forms the inner 2 ie Makara Kumbha.

In addition to these, there are axes formed among the Navagrahas. In this context ft, Rahu and Kethu are assigned only half values, since they are not only Chhaya Grahas but also complementary to each other by inherent nature.

The axes are Surya-Shani, Chandra-Rahu, Kuja-Guru and Budha-Shukra. This is seen as Rashis of exaltation and debilitation for each planet. These are Rashis in which the powers of the planets get highlighted. Exaltation and debilitation Rashis are always situated on opposite ends ie 6 Rashis apart. The exaltation Rashi of one planet forms the debilitation of the other in the axes mentioned. That is, Surya's exaltation is Shani's debilitation and vice versa. The exaltation of Surya, Chandra, Kuja and Budha respectively are Mesha, Mesha, Rishabha, Makara and Kanya.

There are friendships and enmities between the nine planets, which affect the significances of the Rashis in one's life as to whether or not a planet was in friend's or enemies house at any instant of time. Friendships and Enmities are poetic descriptions of compatibilities between the planets characters and energies.

Sun: moon Mars Jupiter friends, Venus Saturn enemies.

Moon: sun Mercury friends, no enemies.

Mars: sun moon Jupiter friends, Mercury enemy.

Mercury: sun Venus friends, moon enemy.

Jupiter: sun moon Mars friends, Mercury Venus enemies.

Venus: Mercury Saturn friends, sun moon enemies.

Saturn: Mercury Venus friends, sun moon Mars enemies.

Rahu-Kethu: Venus Mars Saturn friends, sun moon enemies.

Also, there's a pattern among the 12 Rashis when seen as houses. Triangles 1-5-9, 2-6-10, 3-7-11 and 4-8-12 represent Dharma, Artha, Kama and Moksha Purusharthas. There are many other relations and patterns that can be discerned from the Rashis and houses that can determine various aspects of a person's life. All this together forms the study of astrology.

For finer divisions of the sun's position within the zodiac, one uses the concept of Nakshatras or asterisms. There are 27 Nakshatras, which have 4 padas or quarters each, thus totalling 108 segments. Each of the 12 Rashis are composed with 9 of these segments. These are the properties of the Nakshatras, each of which is ruled by one of the 9 planets.

Thus, the changes in position of sun relative to earth, covering an entire 360 degree cycle of the zodiac is seen as the 27 Nakshatras, with each Nakshatra represented by

one of 27 forms of Aadityas, each of which symbolize the nature of radiation received by a person on the earth when the sun is in the corresponding area of the zodiac. So too, nine of the most important celestial bodies in the solar system, are seen as the Navagrahas, which are also seen as manifestations of Aaditya. The nature and power of the 27 Aadithyas and Navagrahas, as well as association of each of the Navagrahas with three Nakshatras are as follows:

1. Ashvini Kethu Ashvinis – accuracy and recovery of health
2. Bharani Shukra Yama – death, liberation, expiration
3. Karthika Soorya Agni – transformative power, fire, focus
4. Rohini Chandra Prajapathi – Creative power, substratum matter
5. Mrigashirsha Angaraka Soma – fruition, pleasure, nectar
6. Aardra Raahu Rudra – intensity, focus, destroying negativity
7. Punarvasu Guru Aditi – fertility, creative processes
8. Pushya Shani Brihaspathi – wisdom, implementation of spiritual learning
9. Aslesha Budha Naaga – paralyzing of victim, victory
10. Makha Kethu Pitrus – enlightenment, fruits of sacrifice
11. Purvaphalgunya Shukra Aaryama – contract of union, formalizing relationships
12. Uttaraphalgunya Soorya Bhaga – accumulation of wealth
13. Hasta Chandra Savitr – creativity, creative energy, procreation
14. Chitra Angaraka Tvashta – Work, Artisan abilities, Dexterity
15. Swathi Raahu Vaayu – Scattering, Spreading, Air, Speed, Lightness
16. Vishakha Guru Dyaus – Sky, seasons, maturing time
17. Anuradha Shani Mitra – Friendship, relationships, diplomacy
18. Jyeshtha Budha Indra – Victory through Leadership, Smart Thinking
19. Moola Kethu Nirruti – Turbulence, Chaos, Variety
20. Poorvashada Shukra Apa – Refreshment, Rejuvenation, Water
21. Uttarashada Soorya Kubera – Victory by effort, treasury
22. Shravana Chandra Vishnu – Interconnectivity, Fundamental underlying relations
23. Sravishta Angaraka Vasu – Pooling of wealth and resources
24. Shatabhishak Raahu Varuna – Temptations and Punishment, Ocean
25. Purvabhadra Guru Ajaikapada – Fire, Rising up, Spiritual Elevation
26. Uttarabhadta Shani Ahirbudhnya – Water, Settling down, Building stability
27. Revathi Budha Poosha – Nourishment, Building up

As can be seen, 12 of the 15 stages are covered, giving rise to the 12 Adityas.

### **Vasus**

Of the remaining stages in Panchadashi, the 5th stage is Bhairava. Earlier articles explained how the 5th 11th and 15th stages represent the three Shaktis, of which Bhairava is Jnana.

Scientifically the three represented energy realms of Information, Potential and Kinetic, the latter two representing the dark energy and the five states of matter.

The information realm, which is Bhairava, is denoted by the, 8 charge E8 structure, which is nothing but entangled states of three chaotic signals.

These 8 charges, can be seen as represented by the 8 Bhairavas in combination with the 8 Matrikas or Yoginis. These also represent the 8 Vasus.

The charges  $x$ ,  $y$  and  $z$  are transformed versions of the  $g_3$  and  $g_8$  which denote the colour or flavor responsible for strong nuclear force, and  $B_2$  the baryon lepton number, which indicates presence of color charge holding quarks. These three represent the energies of Brahma, Vishnu and Shiva as Brahmi-Asithanga, Vaishnavi-Krodha and Maheshwari-Ruru Bhairavas. They also denote respectively the Three Vasus Prithvi, Vayu and Agni which are earth, air and fire respectively.

The charges  $w_S$  and  $w_T$  denote rotations and movements in space and time which can describe the force of gravity as well as other concepts like frame, spin and mass. Space as Iccha Shakti is Lakshmi and time is Mahakala or Mahakali. Thus, these represent the two Bhairavas as Mahalakshmi-Samhara and Chamunda-Bheeshana. All pervading space or Antariksha and the motionless Dhruva or Nakshatra are the respective Vasus.

The charges  $U$  and  $V$  together denote weak and electromagnetic forces. They are obtained as a transformed version of the  $W$  and  $B_1$  charges which act on left and right handed particles respectively. The former denotes visible matter and the latter is its antithesis. The right handed and left handed are the Surya and Chandra Nadis or the Vasus Surya and Chandrama respectively. They denote Varahi-Unmatta and Mahendri-Kapala Bhairavas, since Varahi denotes pride over what exists and Indrani denotes envy for what doesn't - this dichotomy is the case for matter and its antithesis.

Finally the charge  $w$  represents Generations of particles such as quarks. Furthermore, non standard model particles similar to Higgs are predicted. On account of its bridging the strong and graviweak structures, the Vasu is Dyaus or the sky. Corresponding Bhairava is Kaumari-Chanda.

Thus, Panchami Bhairava represents the 8 Vasus. These are in turn the 8 charge spaces of E8, which following from an earlier article [viXra:1808.0371](#) are nothing but the entangled states of 3 qubits, which in turn are 3 chaotic signals. The E8 in its full symmetry exists prior to the big bang, as a non-physical informational space, while the big bang breaks the symmetry of the E8, rendering gravity different from the rest. In the created universe, E8 is the information space signal trio present in each physical point of 4 dimensional spacetime. The composite of the three signals is called the Pranava, and is the universal wavefunction, which describes the position and state of every single point of the universe at every instant of time.

## Rudras

Next, in the Panchadashi, the 11th stage Ekadashi as Hanuman represents the 11 Rudras. As already described, the Hanuman stage denotes the realm of potential energy or Iccha Shakti.

There are two prominent lists of Rudras. One from the Mahabharata is a generic list, while the other is particular to the present Kalpa, given along with the names of consorts. The latter eleven Rudras are versions of the former specific to the present age. Thus, the mappings are given, with consort names in parantheses.

Mrigavayadha-Mahadeva (Dhee)

Sarpa-Hara (Dhruthi)

Nirrti-Maharudra (Ushna)

Ajaikapada-Shankara (Uma)

Ahimbudhnya-Neelalohita (Neeyut)

Pinaki-Eeshana (Sarpi)

Dahana-Vijaya (Eela)

Iswara-Bhima (Ambika)

Kapali-Devadeva (Airavathi)

Sthanu-Bhavodbhava (Sudha)

Bharga-Adityatmaka (Diksha)

To understand the Rudras scientifically, one must understand the cosmology of the universe in its timeline starting with the big bang. We understand that the “dawn of time” essentially is the instant where the Higgs field is non-zero. This follows from the fundamental fact stated by General Relativity: Spacetime tells matter how to move, and matter tells spacetime how to curve.

In earlier article ([viXra:1808.03711](https://arxiv.org/abs/1808.03711)), it was explained that the mass of particles essentially comes from their interactions with the Higgs field, mediated by the Higgs Boson. Thus, without a non-zero Higgs field, there is no mass, no matter, and hence, no spacetime.

It was also seen that there were initially not one but four Higgs bosons, and all four were equally relevant in a perfectly symmetrical case, ie when the Higgs field was zero. However, as soon as Higgs field assumes a non-zero value, a Mexican Hat potential is created. This means that the lowest energy states are no longer at the center of the potential. When this happens, the four Higgs Bosons are no longer treated in the same way, and the non-zero value is transferred only to one of those, “The Higgs Boson”.

The other three become Goldstone Bosons, absorbed by the W and B Bosons as degrees of freedom, to create the Weak Nuclear Force Bosons W and Z, and the photon, of which all except the photon acquire mass. This also breaks the way electromagnetic and weak forces work, and is called “Electroweak Symmetry Breaking”.

Thus, we can see that the origin of Higgs, mass, and the universe all lie in a fundamental concept - breaking of symmetry, particularly of the E8 group. However, in the earlier article, it was mentioned how the E8 itself could be seen as a system of three qubits, their entangled states forming the 8 fundamental charges. Further, it was also seen that these qubits are in essence chaotic signals, a consequence of chaotic interpretation of quantum mechanics, the theory highlighted in viXra:1510:0438.

In that article, we had seen how the superposed state of a qubit represents a signal in chaos, much like the classical states represent order. Extending this to 2 and more qubits, we encountered entangled states, where the state of one qubit was completely linked with the other, so much that one cannot describe one independent of other. Thus, in two such entangled qubits, measuring one, while collapsing it to a classical state, will automatically collapse the other qubit also, immaterial of how far they are physically separated. This entanglement was described in that article as the interaction of chaotic signals so as to maximize their entropy, ie information content. This aspect of the theory has been experimentally verified in <https://www.nature.com/news/2009/091007/full/news.2009.980.html>, a big step in bringing together two pillars of modern physics, quantum and chaos, in understanding of the universe.

Also, it was discussed in that article, that more chaos is synonymous with more information, more entropy, and also more asymmetry. One can extend this understanding to Seth Lloyd's Computational Universe models, [arXiv:quant-ph/0501135v9](https://arxiv.org/abs/quant-ph/0501135v9), where one finds information mapped to matter and hence mass. Through this, one can infer that more mass is synonymous with more information, and more chaos/asymmetry. Thus, one can see creation of the universe the journey from nothing to something, and this means increase in matter, or asymmetry, or entropy. This is consistent with the second law of thermodynamics: entropy is always on the rise in a closed system.

The birth instant of the universe is the breaking of E8 symmetry - the transition from symmetrical zero Higgs Field to asymmetrical E8 with non-zero Higgs field. This symmetry to asymmetry is fundamentally the play of Chaos, as explained above. Chaos, or Disorder, is the literal translation of the word Nirruti, Nir meaning lack of, and Ruti or Ruta translating as order. Thus, the third Rudra, Nirruti or Maharudra, corresponds to the Divine play of Chaos, by making the Higgs field non-zero, thus 'birthing' the universe.

Immediately, what ensues is the 'Singularity', what is popularly called the Big Bang. The name Ajaikapada is made up of three components, Aja meaning unborn, Eka referring to the singularity, Pada meaning foot, alluding to the universe brought into existence or 'standing up' as a physical entity. Clearly, of the 11 Rudras, Ajaikapada or Shankara is the most crucial, and Lord Krishna affirms this in Bhagavad Gita. Also, Ajaikapada is Hanuman, who is the consolidation of all 11 Rudras.

It is very important to understand that the symmetry breaking of Nirruti is in the informational space of the E8. There is no physical space, and the size of the universe is simply zero. As



Stephen Hawking said in "A Brief History of Time": 'At the big bang itself the universe is thought to have had zero size... the total energy of the universe is zero. Now twice zero is also zero. Thus the universe can double the amount of positive matter energy and also double the negative gravitational energy without violation of the conservation of energy... as the universe expanded, the temperature of the radiation decreased'.

General Relativity, when extrapolated to the Big Bang predicts an infinite density, and infinite temperature. This is possible since size and volume of the universe is zero. Before Nirruti, the density would be an indeterminate 0/0, since the Higgs field is zero. However, making the Higgs non-zero would mean that mass/volume or mass/area values would now result in non-zero numerators but zero denominators, resulting in infinite density etc.

To summarize, this state of the universe, the big bang, does not yield to understanding using conventional mathematics and physics, due to its zero size and infinite temperature/densities etc. This state is a singularity called Ajaikapada, caused by Nirruti's asymmetry in informational realm, even while physically the size is zero.

This state, the Shankara Rudra represents the earliest stages of the universe from the Big Bang, until  $10^{-36}$ s after the Big Bang. Because of the inherent discrete nature of quantum mechanics, the smallest indivisible unit of time is the Planck time, at  $10^{-44}$ s, and this is the time light takes to traverse the planck length at  $10^{-35}$ m. Thus, earlier than  $10^{-44}$ s, the universe is a singularity, as discussed above. Next, the Higgs symmetry breaking separates gravity from the other three fundamental forces - electromagnetic, strong and weak nuclear, which are still united as one force. This time period until  $10^{-36}$ s is called the Grand Unification Epoch.

The E8 explains Unification of Strong with the Weak and Electromagnetic forces through B1 a hypercharge which favors right handed particles mirror to the conventional weak hypercharge Y. B1 works in tandem with baryon-lepton number B2 and color charges g3 and g8, to give electric charge Q. Consequently, there are mirror fermions as part of the 248 particles accounted for.

To understand what happens next, it is necessary to understand the implications of General Relativity, written as the Friedmann Equations with the cosmological constant  $\Lambda$ .

$$H^2 = \left(\frac{\dot{a}}{a}\right)^2 = \frac{8\pi G}{3}\rho - \frac{kc^2}{a^2} + \frac{\Lambda c^2}{3}$$

$$\frac{\ddot{a}}{a} = -\frac{4\pi G}{3}\left(\rho + \frac{3p}{c^2}\right) + \frac{\Lambda c^2}{3}$$

An alternate form of these equations is the FRW form as shown below.

$$\dot{\rho} = -3(\rho + p)\dot{a}/a$$

$$4\pi G(\rho + 3p)/3 = -\ddot{a}/a$$

$$8\pi G\rho/3 = \dot{a}^2/a^2 - k/a^2,$$

$a$  is the scale factor representing the size of the universe. Thus,  $a'$  is the rate at which the scale factor changes ie, expansion of the universe. One can also characterize this as the Hubble Parameter  $H=a'/a$ . Moreover,  $a''$  is the rate of change of  $a'$ , ie  $a''$  is the rate at which expansion occurs. The  $\rho$  denotes energy density, which is a measure of the amount of matter or equivalent radiation energy within a given volume, matter and energy related by the famous relation  $e=mc^2$ .  $p$  denotes pressure, caused by rapid movements of particles, which causes mass dilation by special relativity. This relativistic increase in mass, as well as mass and energy described in  $\rho$ , all contribute to the stress-momentum energy tensor of general relativity, ultimately resulting in the spacetime curvature.  $k$  denotes the curvature, and thus the very shape of the universe. Values of  $+1$ ,  $-1$  and  $0$  for  $k$  denote positive curvature (spherical universe), hyperbolic negative curvature and flat universe. Measurements have beyond doubt confirmed that the universe is indeed flat with  $k=0$ .

Further, taking on-diagonal and off-diagonal parts of the stress momentum energy tensor as Kinetic Energy  $K$  and Potential Energy  $U$  respectively, we have  $p=K/3-U$ , and  $\rho=K+U$ . Also, comparing the Friedmann and FRW forms, it is easy to understand  $U$  as representing the Cosmological constant  $\Lambda$ . Using all this, one obtains a simplified set of equations involving just  $K$  and  $U$  in relation to inflation parameters  $a$  and  $H$ .

$$-16\pi GK/3 = \dot{H} \quad (3.4a)$$

$$8\pi G(K + U)/3 = H^2 - k/a^2. \quad (3.4b)$$

In the first instance following big bang, clearly there is no matter or radiation, and  $K=0$ . This sets  $H'$  as  $0$ , making  $H$  constant. Therefore, there is inflation at a constant rate.

This is a very significant stage in the creation of the universe and explains many observed facets of the universe such as among others, its nature to be isotropic and flat, and the lack of magnetic monopoles.

What does inflation mean? It means that the spacetime itself expands. In other words, the region in which one would find the E8 chaotic signals, and the non-zero Higgs field increases, correspondingly increasing the relevance of mass and thus matter and spacetime.

From the Heisenberg uncertainty principle, one knows that there is no way to exactly pinpoint both momentum and position of a particle simultaneously. Similarly, there is no way to pinpoint the exact energy of a system at an exact instant of time, and all this follows from the inherent

uncertainties of Quantum Mechanics. This is in turn due to very minute changes in initial conditions of the chaotic signals, blowing up to vast variations in course of time.

This energy-time uncertainty has a very significant implication. At any precise instant of time, the energy of a system is never a fixed value, but a vast compilation of fluctuations, called quantum fluctuations. These create 'virtual particles', such as photons seemingly out of nothing. The Feynman diagrams describe how these virtual particles can mediate various particle interactions through the four fundamental forces. As the universe expands, in various regions, one finds these quantum fluctuations giving rise to various particles. These are in essence, "local inhomogeneities".

At this stage, owing to formation of some particles, the strong nuclear force starts behaving differently to the other forces, and the grand unification breaks, giving rise to an 'electroweak' force, and a color based strong nuclear force. This period is known as the "Electroweak Epoch".

The electroweak force is characterized by photons. However, the inflation of the spacetime ensures that the wavelengths of photons are continuously stretched as they travel through space. This is called "Redshift", and because of this phenomenon, we observe that photons in visible and higher regions of Electromagnetic spectrum have been stretched over billions of years, to infrared and even microwave frequencies. This forms the Cosmic Microwave Background or CMB, which can be measured in the present age, which gives vital observations about the early stages of the universe.

It is based on this phenomenon that we obtain the 5th Rudra - Ahirbudhnya or Neelalohitha. Neela means blue, and Lohitha means red. The name describes a transition from blue to red, which is nothing but the redshift mentioned above. The name itself connotes stretching of wavelengths, which comes from an inherent stretching of space-time itself, ie, inflation. Thus, the Neelalohitha Rudra represents the Inflationary epoch directly following the Singularity of Shankara.

The inflationary epoch is typically stated to last until  $10^{-32}$ s, after which inflation slowed down considerably. This is due to the local inhomogeneities eventually give rise to mass, and thus  $K$ , by virtue of both density and pressure. However,  $U \gg K$ , and thus inflation still goes on, albeit, since  $K$  is now positive and non-zero,  $H'$  becomes negative ie, the rate of inflation slows down. Ideally, this should continue until  $K > U$ , which would make  $a'' < 0$ , and cease inflation fully.

It is here that one must understand the significance of the cosmological constant  $\Lambda$ .

Physical observations since the days of Hubble show beyond doubt that the universe is expanding at an accelerated rate; galaxies are moving farther from each other. In the earliest versions of the second Friedmann equations without  $\Lambda$ , this could not have been possible, since the creation of mass would render both  $p$  and  $\rho$  positive, making  $a''$  negative, and thus making

the universe contract rather than inflate. Thus, the only factor enabling inflation is  $\Lambda$  - the mysterious force still keeping the universe inflating.

How does  $\Lambda$  work? Cosmological constant is referred to as vacuum energy or dark energy - an "energy" inherent to space itself - empty space. If dark energy is viewed as a combination of  $p$  and  $\rho$  just like ordinary matter, then one would observe that  $p$  is positive, favouring contraction rather than inflation.

However, dark energy has a very important property - it has constant density. Since it is an inherent quantity of space, as the universe inflates, the bigger space becomes, the bigger is the dark energy. Equivalently, one might start with constant energy. As the universe expands, energy is pumped from 'outside' into the expanding space. In other words, it takes "work" to expand dark energy. This is viewed as "negative pressure"  $p$  - in contrast with normal matter with positive pressure, where one must 'work' to compress. Then, in the Friedmann equation the dark energy term would surpass the combination of matter  $p$  and  $\rho$ , to give inflation a'' positive.

This view of Dark Energy violates the conservation of energy: as the universe expands, where does the extra energy pumped in come from, given that energy cannot be created or destroyed? The only way to explain this is that the inherent 'dark energy' of space is nothing but its information energy, which is as valid a kind of energy as potential and kinetic.

There is another interesting facet to dark energy, which makes up 68% of the universe today. Observations and measurements of the universe show it is flat. However, from the first Friedmann equation, if  $\Lambda$  were excluded, one would observe a hyperbolic  $-1$  for  $k$ , if the observed matter in the universe, contributing to  $p$  and  $\rho$ , as well as observed values of  $a$  and  $H$  were incorporated. There is no way of explaining the flat structure of universe with  $k=0$ , without the dark energy term  $\Lambda$ . The reason for this is the constant positive density  $\rho$  of dark energy. Thus, in expanding space, even in regions where matter is not existent, the  $\rho$  of dark energy works in favour of matter, counteracting the hyperbolic curvature tendency of inflating  $a$ '.

However, the role of dark energy in primordial inflation corresponding to current inflation is vastly different in orders of magnitude, as many as  $10^{60}$  times weaker today. This can be explained as locally potential dominated universe causing both inflations.

Thus in summary so far, 3rd Rudra Nirruti creates chaos/asymmetry by making Higgs field non-zero. This is followed by the 4th Rudra Ajaikapada which is the singularity of big bang, where gravity breaks apart from the other three forces. This is followed by the 5th Rudra Neelalohitha, which is the inflation of spacetime, creating along with it the dark energy.

Meanwhile, the local inhomogeneities coalesce to form various particles. These further form matter, as we know it, in various densities ranging from least to highest. These are described as the Pancha Bhutas and form the 6th to 10th Rudras.

The 6th Rudra is Eeshana or Pinaki. Among the five faces of Lord Shiva, Eeshana is Akasha, the least dense of the states of matter. Translated variously as space, ether etc, Akasha in general is a framework where other states of matter exist and interact. Akasha itself, while a state of matter does not interact with the others.

This is the description of dark matter, making up about 85 percent of observed mass in the universe. It is difficult to detect dark matter, which does not interact with the fundamental forces other than gravity. In the absence of dark matter, galaxies would fly apart instead of rotating, or would not have formed. Dark matter can also be observed from gravitational lensing, CMB and galactic collisions.

Various candidate particles have been proposed for dark matter, most prominently WIMPs. In the E8 model, axions are the candidates for dark matter, originally proposed by Peccei-Quinn for resolving the strong CP problem - that is, when charges and chiralities are reversed, Quantum Chromodynamics, or the strong nuclear force still holds, and Charge-Parity or CP symmetry is not violated, which contradicts CP violating terms found in the QCD Lagrangian.

The resolution to this problem is to understand the CP violating term  $\theta$  as a field, by virtue of the Peccei Quinn symmetry, which becomes spontaneously broken. This would result in the formation of a particle, the axion. Axions could change from and to photons in magnetic fields, while interacting minimally with ordinary matter, having zero spin and charge.

It is presumed that axions were created abundantly during the big bang, but with the field having an initial value not near a potential minimum, the axion fields dissipates energy, decaying to other particles until the minimum is attained. This is called misalignment mechanism, and due to dynamical friction creates significant loss of kinetic energy. Being low mass, the universe would be filled with a cold Bose-Einstein condensate of primordial axions. Furthermore, axions would explain and also be a possible origin for the luminosity and wavelength of Fast Radio Bursts.

A Bose-Einstein condensate (BEC) is a state of matter of a dilute gas of bosons cooled to temperatures very close to absolute zero. Under such conditions, a large fraction of bosons occupy the lowest quantum state, at which point microscopic quantum phenomena, particularly wavefunction interference, become apparent. A BEC is formed by cooling a gas of extremely low density, about one-hundred-thousandth the density of normal air, to ultra-low temperatures.

Thus, the 6th Rudra Eeshana pertains to the creation of Akasha, or Dark Matter, which forms the first and least dense of the Pancha Bhutas.

Following this stage, one observes creation of various fundamental particles. Between about  $10^{-12}$  to  $10^{-6}$ s, is the Quark epoch - a quark-gluon plasma of high energy. However, as the time increases, upto about 1s, one sees the Hadron epoch, where quarks are bound into hadrons such as mesons and baryons such as protons and neutrons. Baryon Asymmetry as a result of earlier stage quantum fluctuations rules out antimatter, favouring matter. Following this

is the Neutrino decoupling, where the neutrinos cease interacting with Baryonic matter, followed by Lepton epoch until 10s, where leptons and anti-leptons remain in thermal equilibrium.

Following this, until  $10^3$ s, protons and neutrons bind to form the primordial nuclei of hydrogen and helium, along with isotopes. Most of the energy in this Nucleosynthesis epoch is still electromagnetic radiation. From the end of this epoch until 380ka, is a long period of the Photon Epoch, where the universe contains a plasma of electrons and protons, yet unbound to form atoms.

All these stages, right from  $10^{-12}$ s till end of photon epoch at 380ka, constitute creation of various subatomic particles. Atoms, mandating charge neutrality haven't been created yet, and thus the matter in this phase comprises of charged particles. This ionized matter is called plasma, the state of matter represented as Agni among the Pancha Bhuthas. This is the 7th Rudra Vijaya or Dahana, meaning to burn.

Further to this, we encounter the recombination at 380ka, where the first neutral atoms are formed. Photons are no longer in thermal equilibrium with matter; universe becomes transparent, and baryonic matter density is atleast a billion times higher than that of today. This is followed by the formation of first stars until 150Ma, with the only source of photons as hydrogen emitting radio waves, and infrared photons due to CMB red-shift. Reionization and Galaxy formation periods until 10Ga denote coalescing into galaxy clusters and superclusters.

This entire duration of time, from 380ka to 10Ga results in formation of matter, as we know it. Most of this is gaseous, while right temperature and gravitational conditions could create liquid and solid matter too. These states of matter are Vayu, Jala and Prithvi among the Pancha Bhuthas, and are represented by the 8th, 9th and 10th Rudras - Iswara or Bhima, Kapali or Devadeva and Sthanu or Bhavodbhava respectively. Interestingly Bhima is also the name of the Pandava in Mahabharata, who is seen as the son of Vayu. Also, Devadeva with consort Airavathi has connotations with Indra, who is King of the Devas, whose mount is the elephant Airavatha. Indra is the God of rain, corresponding to water, and hence liquids.

The above-mentioned duration, from about 47ka to 10Ga is also called the Matter-Dominated Era, where matter density dominates radiation density and dark energy. From the FRW equations stated earlier, it must be noted that  $K > 3U$  corresponds to ordinary matter and radiation, while  $K < U$  is energy undergoing inflation.  $K$  between  $U$  and  $3U$  is non-inflating "negative pressure" matter, speculated to be cold dark matter, existing in the halos of galaxies.

After 9Ga until the present age, ie 14Ga, we find that matter density falls below dark energy density, leading to accelerated expansion of space in the Dark Energy dominated Era. This is the same timeline of the formation of the Solar System, with the sun at its center. This leads to the name of the 11th Rudra, Bharga or Adityatmaka, Aditya being a name of the Sun. This era also encompasses the evolutionary history of life.

Thus far, we have seen Rudras 3 to 11 in their role of universe creation. Rudras 1 and 2 represent the universe prior to the Big Bang, and thus are seen best in metaphysical rather than physical roles. In essence, these Rudras represent the 'blue-print' of the universe in informational space, prior to creation.

The 1st Rudra is Mahadeva, whose name is derived from Mahad, meaning greatness. The consort Dhee represents the consciousness. This fundamental consciousness is the first Rudra, the primordial vibration, which is called Pranava.

The second Rudra is variously called Shiva, Hara and Sarpa. The Devi is called Dhruthi, meaning adorned. Fundamental consciousness Pranava undergoes variations in its three components A, U and M. These are the fundamental trio of qubits seen as chaotic signals. Together, in various entangled states, they would materialize into the E8 charge space, which is explained in the earlier article. The Divine Perfection of creation is reflected in the exceptionally beautiful symmetry of the E8 structure. This symmetry determines the ways in which the 3 signals can get entangled.

Following this, is the 3rd Rudra Nirruti, which corresponds to creating an asymmetry in the E8 as explained earlier, kickstarting the physical creation of the universe.

Thus, one can see that the 11 Rudras, of the 11th (Ekadashi) among Panchadashi, represent various stages in the creation of the universe, all the way from the Big Bang to the present era. The Rudras are represented in the five faces of Hanuman. These five Mukhas are depicted as Vishnu Amsas to highlight Hanuman merging into Rama through Sharanagathi. But these faces are also the five faces of Shiva, representing the Pancha Bhuthas, through their inherent qualities and characteristics. The mapping is described below.

1. Prithvi, representing stability and fertility: Sadyojatha Shiva as Garuda Mukha - Solid matter Rudra Bhavodbhava and Mahadeva Rudra presiding fertile creation.
2. Jala, representing waves and flow: Vamadeva Shiva as Varaha Mukha - Liquid matter Rudra Devadeva and Hara Rudra representing Pranava wave trio.
3. Agni, representing energy and ionization: Aghora Shiva as Narasimha Mukha - Plasma matter Rudra Vijaya and Maharudra representing asymmetry in E8 charge space.
4. Vayu, representing expansion and wind: Tatpurusha Shiva as Vanara Mukha - Gaseous matter Rudra Bhima and Shankara representing big bang explosion.
5. Akasha, representing inertness and space: Eeshana Shiva as Hayagriva Mukha - Dark Matter Rudra Eeshana and Neelalohitha representing spacetime inflation.

Finally, It is interesting to note that the Rudras are mentioned as sons born out of Lord Shiva, none of the 11 being older or younger than the others. The significance of this statement is twofold.

First, while the Rudras represent various epochs in the history of the universe, one can also see their aspects today, in various forms such as dark energy, dark matter, gases, solids, plasma, solar system etc. Thus, the end of certain epochs do not mean the end of a Rudra, but survival all the way until eternity.

Second, this statement of Rudras being same age, confirms the Drishti Srishti nature of the universe. Ultimately, the universe is but a creation of Maya, through the mind, just as a dream. Just as when one drifts into sleep dream worlds instantaneously exist, the universe instantaneously exists by virtue of Maya. The Krama srishti, or ordered creation of universe is but an illusion.

### **Ashvinis**

Finally, the 15th stage of Panchadashi is the only one left out, and here Amma is the Nirguna Sacchidananda manifest as Guru. The Guru is seen as the very form of Shiva Shakthi in union. This masculine and feminine principles in harmony constitute the 2 Ashvinis - Nasatya and Dasra. They represent matter-energy dichotomy, a specialization of the general physical-nonphysical dichotomy, and this is represented as the consorts of the Ashvinis. Nasatya's consort Jyoti represents the human body, while Dasra's consort Mayandri represents the intellect. In the cosmic scale, they represent the dichotomy of Kinetic and Potential Energies. They also represent matter and energy in the famous  $E=mc^2$  relationship.

Thus, this article describes the 33 Gods of the Vedas. It is crystal clear that these are way more than just Gods. These denote various concepts and energies which have significance scientifically, and play various roles in human life.