Article 50

GLIMPSES OF VEDIC GANITA

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Vedic mathematics was lost to the modern world over several thousand years. Fortunately, the renowned scholar Jagadguru Swami Bharti Krisna Tirthahji Maharaj, Shankracharya of Sharda Peeth and Goverdham Math discovered 16 Vedic Sutras and 13 Upsutras in the Parishistha of Atharvved. After continuous Sadhana and hardwork, he was able to decode them and get wide ranging mathematical principles and applications from them. He found that these Sturas cover all aspects of mathematical science in depth. He wrote sixteen volumes on Vedic mathematics covering all aspects of these sutras in depth. Unfortunately, the manuscript was lost which fact was finally confirmed in 1956. During his last days when his health was failing and his eyesight was weak, he rewrote from his memory an introductory account of the subject. He attained Mahasmadhi in 1960. Later in 1965 a book entitled "Vedic Mathematics" was published. This book is edited by Dr. V.S.Agarwala with the help of Smt. Manula Trivedi on the basis of manuscript and notes left by

Swamijee. This book is therefore, the first book to give a glimpse of Vedic mathematics and to reestablished the subject. The book attracted the attention of several Indians and foreigners. Dr. Narinder Puri of Roorkee University took up the cause of Vedic Mathematics in right earnest. His Holiness Maharishi Mahesh Yogi spread the message of Vedic mathematics throughout the world by sending Dr. Puri to several countries and making it possible for many schools all over the world start teaching Vedic mathematics. A former minister of Human Resource Development, in the Government of India, Sh. P.V.Narasima Rao made a reference in Parliament about the work on Vedic mathematics which created a wider interest in the nation. Rashtritya Ved Vidya Pratishthan started looking into the matter and appointed a committee on Vedic Mathematics. During the same period a controversy arose about the source of these 16 Sutras and the level of mathematics contained in them. One view was that these Sutras do not have a Vedic source and that they deal only with simple arithmetical operations.

In the meantime, Dr. Sant Kumar Kapoor, inspired by integrated impact of the Ganita Sutras, started working on basic aspects of the mathematical structure of Vedic literature. He got several clues from Ganita Sutras, Maheshwara Sutra and many other Vedic Mantras. He was inspired by the divine blessing from Yograj Sri Sripad Babaji of Vrindavan and His Holiness Maharishi Mahesh Yogiji at Maharishi Nagar. He has been awarded Ph.D. degree by Kurukshetra University, in December 1990 on his thesis titled "Mathematical Basis of Vedic literature". His work shows that the potential of Ganita Sutras is much higher than what appears in the book "Vedic

Mathematics" and the mathematical structure of Ganita Sutras is similar to that of Samved indicating that Ganita Sturas belong to Vedic family. His work shows that the Devnagri alphabet and the Vedic scriptures are mathematically organized. Perhaps a more important aspect of his work in the existence of Real Geometric Spaces of higher dimensions in the form of a continuum. A comprehensive description of his research is given in the next section. Dr. Sant Kumar Kapoor is presently working as a Visiting Professor in the Indian Institute of Maharishi Vedic Science & Technology which is a part of Maharishi Ved Vigyan Vishwa Vidyapeeth, Maharishi Nagar. Three research students are working in our institution on the structure and properties of fourth, fifth and sixth dimensional spaces.

Vedic mathematical Research done by Dr. S. K. Kapoor

Studies reveal that knowledge and organisation of knowledge are two distinct disciplines. The thesis of Dr. S.K.Kapoor is substantively covering the organisational aspect of Vedic knowledge. The main results of the thesis and his subsequent research can be summed as under: 1. Real 4 and higher dimensional spaces do exist. Real 4 and higher dimensional spaces were not only known to the Vedic seers but those were precisely availed by them for organisation of vedic knowledge. Vedic alphabet format is a precise setup of4-space. The alphabet letters of Devnagri script, their forms formulations, combinations and rules etc. are precisely mathematical. Sakala Rigvedic Samhita is the oldeset scripture of mankind. The organisational format of this Samhita is precisely that of real 6-space. Vedic knowledge accepts a measuring rod constituted by regular

bodies of the first six real dimensional spaces which admit formulations as:

The organisational format of Srimad Bhagwad Gita emerges to be of prime importance as it is parallel to the organising power of the knowledge content of the scripture. This format tallies with the format of human body on the one hand and the sun on the other hand as of real 6-space. The Trinity of Gods namely Brahma, Mahesh, Vishnu are the overlords of real 4, 5 & 6 spaces respectively. The geometrical continuum expressed as manifestation layers of 4 folds of consecutive dimensional spaces contents. These folds of the nth manifestation layer can be represented as under:

First Fold

Dimension

(n-2) space content

The transcendence from one manifestation layer to another manifestation layer giving rise to the following (five steps) chain reaction or five steps which are possible within the setup of Panch Mahabhut.

Manifestation Layer

nth

(n+1)th

Transition from one space to another space is to be had in terms of unlocking of the seals of the origin points of all the four folds of the manifestation. The modern mathematical models of transition from straight line to plane deserve serious reexamination. In particular the axioms of space filling curves and the axioms of 'one' without a predecessor deserve close scrutiny as their rationale emerges to be without basis.

The role of real numbers additive group (R,+) and real numbers field (R,+,×) with reference to straight line deserve to be differentiated.

The plane deserves to be studied as four geometrically distinct quarters. One faced plane and two faced plane are two distinct geometrical setups and they deserve to be taken up as such.

The concepts of origin and dimension are two concepts with respect to which the modern geometrical models are not up to date. These two concepts deserves to be studied in detail as transcendence to the higher dimensional spaces is possible only in terms of their understanding.

Human body is a compactified phenomenon of multi-layer physiological existence. The start with state of existence is that of waking state which is parallel to the expression of 1-space as dimension into 3-space domain. Sequentially, the existence

phenomenon unfolds until seventh state of consciousness which would be corresponding to the 7-space as dimension into 9 space domain. The origin point of the 6-space, being the 7-space setup, the human body, geometrically, turns out to be hypercube-6 and this would explain how the primordial sound, the planetary effects, the Yajna oblations etc. operate and precisely influence the individual existence patterns.

Srimad Bhagwad Gita is one such scripture whose organisational format precisely workout for us the structural set up and frames of the 6-space. The study zone of Srimad Bhagad Gita can be worked as under:

The organisational setups of Ganita Sutras, Maheshwara Sutras, Saraswati Mantras, Gyatri Mantra and Om formulation deserve interdisciplinary explorations.

Sankhay Nistntha and Yoga Nistha are complementary and supplementary of each other and as such their complementary nature and supplementary nature deserve to be distinguished well. Non-differentiation of the same is bound to deprive us of most of the results in specific forms.

GANITA SUTRAS

Ganita Sutras is a complete system in itself. These are Vedic aphorisms. These are 29 in number; 16 of them are designated as Sutras and other 13 as Upsutras. Credit goes to Swami Bharti Krisna Tirthaji Maharaj, a Shankracharya of Kanshipeeth to focus the attention of the present generation about potentialities of Sutras.

The information contained in the book titled "Vedic Mathematics" compiled by Prof. V.S. Agarwala, published (1965) from the manuscript papers of Swamiji make us known as how Swamiji had to devote many years to decode the working rules of these Sutras.

From the demonstrations of the working rules of these Sutras in this book it has convinced many about the potentialities of the Sutras. Since then many scholars have further demonstrated about their potentialities to make the mathematics much easier and more effectively within the comprehensions of much larger population and also about their utility and academic values in many ways. Dr. S. K. Kapoor has approached the organization format of this system on the whole and as individual Sutras. His approach and the results give us further insight of this wonderful system.

Here Sutras 1, 2 & 3 and Upsutras 1 & 2 are being introduced from the book "Goldbach Theorem" to give insight about their formats and to give idea about the basics of the different processes and the way this system is approaching different branches of mathematics in a unified way as a single discipline. The parallel text of the Sutras adopted in different scriptures is being searched. Dr. Kapoor points out Shatpath Brahman. Hereunder, the illustrative reference with working rule is indicated in reference to Ganita Sutra 1. The other Sutras may be taken up in due course of time.

GANITA SUTRA 1

Text in Roman script: Ekadhikena Purvena

Working rule / simple English rendering: "One more than the previous one."

Source concept: "One"

Format:

Basics / technical words: Text avails three technical words which take us to the basics of the working domain of the Sutra. These are: (1) Eka (one), (2) Edhikena (more than), and (3) Purvena (previous). These three technical words take us to the three basic concepts: (1) the concept of "one", (2) the concept of "one more than", and (3) the concept of "previous one". The first concept is the wholesome concept. Here it manifests in many ways and can be availed as a unit, unit entity, unit measure, the counting number 1, the close interval of unit length etc. etc. The second concept "more than" is the concept of increase, the concept of comparison of one entity being bigger than / more than other entity. The third concept is the concept of "order". It is the concept of a queue, a pair of entities of a queue of which one is previous as comparison to the second and the second automatically being subsequent to the first. Therefore, the Sutra 1 has many applied values which would work out for us (1) counting, (2) arrangement of counting pebbles, (3) arrangement of beads along a thread, (4) the queue of points along with line etc. etc. If we try to chase the repeated applications of "one more than the previous one", we can have a countably infinite steps. Not only that, we can by a suitable choice of "one" and the application of the working rule of Sutra 1, have a chase for uncountable infinity as the line is by having sequential placements of points as counts with

index values allotted as per the working rule of Sutra 1 from the set of natural numbers (whole numbers / counting numbers).

Parallel text and application of Sutra 1 in Shatpath Brahman:

1.1.2.5 (Kanda 1, Parpathaka 1, Brahmana 2, Kandika 5) Page 10 YADEV AGRE TAD KARVANITE That which is first to be acted first.

2.5.2.22 (Kanda 2, Parpathaka 5, Brahmana 2, Kandika 22) Page 300 EKAIN EKEIN YA ASYE PRAJA ..... EKE NATI RIKTANI For everybody there is one utensil. As many are the members of the family, so many are the utensils and there is one extra.

2.6.2.4 (Kanda 2, Parpathaka 6, Brahmana 2, Kandika 4) Page 328) EKAIN EKEIN YA ASYE PRAJA ..... EKE NATI RIKTANI

VEDIC GANITA [Log In]

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For everybody there is one utensil. As many are the members of the family, so many are the utensils and there is one extra. Let there be a family F of members m1, m2, ...mf. Let this family has a kitchen K with utensils u1, u2, ...uk.

For one-to-one association of family members of F with the utensils of K, the first member m1 is to be associated first, the first utensil of K i.e. u1.

To each member of F is associated from K.

The requirement is that after such association we should have one extra utensil in K. This makes the cardinality of K as f+1.

The set F (of cardinality f) and the set K (of cardinality f+1) makes a pair of sets (F, K) and they supply us the pair of numbers (f, f+1). This is precisely the basics and formation of Ganita Sutra 1.

GANITA UPSUTRA 1

Text in Roman script : Anurupyena

Working rule / simple English rendering: "Proportionate selection (of multiples and sub-multiples)" / "proportionately".

Source concept: "Oneness" / symmetry

Format:

Basics / technical words:

The text of Upsutra 1 avails a pair of technical words: (1) Anu (to follow), and (2) Rupyena (the form of). When 'one' is viewed as synthetic i.e. composed of parts, then each of its parts would be symmetrical to the whole and it would be proportionate of the whole. As such, (1) part as symmetrical to the whole, and (2) part as proportionate of the whole would be two distinct aspects of the same organisation. Infinity is another word in which melt away all finiteness. In infinite domains or self-contained domains, the uniformity and patterns are other keywords in terms of which the

concept of oneness can be approached as a symmetry and proportions. The applied values of Upsutra 1 would help us reach at unit interval as replica of infinite line, the universality of Yatha pinde tatha brahmande (as in the body so in the universe) and Yatha brahmande tatha binde (as in the universe so in the body) as well as the universality of the Upanishadic comprehensions as that even when full is taken out of full, there still remains full. With this, when one would work Sutra 1 with double of a unit instead of a unit or with any multiple of a unit instead of a unit, one would see that the rule works. With this, the Sutra 1 coupled with Upsutra 1 makes the potentialities of Sutra 1 manyfold.

GANITA SUTRA 2

Text in Roman script : Nikhilam Navatascaramam Dastah

Working rule / simple English rendering: "All from nine and last from ten."

Source concept: Ten place value system is the source concept.

Format:

Basics / technical words:

Text avails four technical words which take us to the basics of the working domain of the Sutra. These are: (1) Nikhilam (all), (2) Navastasca (from nine), (3) Caramam (last), and (4) Dastah (ten).

Nine numerals and ten place value system are the two basic steps in terms of which the infinitely long line stands tamed. The counting

pebbles technique requires infinite pebbles for coverage of infinitely long line. However, symmetry / proportions / replica rules suggest that proper system can be constructed to express "infinity in terms of finite". Vedic seers comprehended ten place value system. From the method of expression tenth counting pebble as 10 as in two digit form, we can notice that here lies a shift from single digit expression for first 9 counts to the next multiple digit

expression initiation for expression of tenth count onwards. We also know that first 9 counts as well can be expressed in double digit forms as: 01, 02, 03, 04, 05, 06, 07, 08 & 09. Therefore, the first thing about this transition is the introduction of the tenth symbol for the zero count as "0". Further, it also would be interesting to note that the double digit form for 1 as 01 provides us an expression for the tenth count as 10 simply by having swapping of places for first and the second digit. Further, the above interlink of 01 and 10 takes us to their link and inerlocking as reflection pair of numbers as much as that the formats beneath 01 and 10 get interconnected like image of an arrow through looking mirror gets interlocked with the arrow itself. The placements of arrow, mirror, and the image of the arrow work out a di-monad format with mirror playing the role of joint of the di-monad. This as such is a big leap forward from the organisation format of Sutra 1. This had become possible with the transition stage of Upsutra 1. Therefore, Sutra 1, Upsutra 1 and Sutra 2 together make much interesting dimensions to the mathematics.

The above organisation of Sutra 1, Upsutra 1 and Sutra 2 takes us to a stage where the middle of interval, which otherwise had the

privilege of uncountably infinite placements, gets tamed as a unique mirror placement to have half unit in front of the mirror as first half and its image through the mirror as the second half. It is this way unique fixation of the middle makes the mathematics workable in terms of "half unit", like the organisation in terms of "half dimension". With this, it becomes possible to go to a number which exists prior to "one" i.e. half. It is a big achievement over the mathematics of "one" without predecessor. However, simultaneously, it makes the working very delicate as we shall be permitting the second half to remain dormant while structures because of the second half also shall be silently marking their presence. We cannot afford to ignore the existence of the structures because of the second dormant half. If one is to see the type of difficulties in which the mathematics when worked without taking care for the second dormant half, one is simply to pose to oneself as to why from hypercircle-8 onwards the values start decreasing. It simply happens as the linear order worked in terms of half-dimension helps us sequentially increase only uptil seventh step parallel to the possible seven geometries of 3-space of linear order.

The organisation of pairing of two halves with the help of a mirror at the middle is unique organisation of many features, of which the most important is the feature of common remainder for both the halves while both halves are divided by a common divisor. Though this property may appear to be obvious but in fact when the same is viewed in the context of uncountably infinite points being handled in terms of counting numbers, one would realise, how important this

property of constant remainders emerges to be. This is precisely Upsutra 2.

GANITA UPSUTRA 2

Text in Roman script : Sisyate Sesasmajnah

Working rule / simple English rendering: "Remainder remains constant."

Source concept: The source concept here is the concept of equality of units, the pair of halves etc. etc.

Format:

Basics / technical words: The basic / technical word availed by the text of Upsutra 2 is "Sesa" (remainder). The text as such is the definition of remainder: remainder is that which remains (as uncovered part of the divisor, on division).

The basic operation is the operation of "division". This Upsutra along with Upsutra 1 makes the mathematics of Upsutras a very interesting branch in itself.

The "one" which permitted itself as a pair of halves, sequentially by the rule of symmetry of Upsutra 1 and the rule of equality of remainders of division of equals takes the process of partitioning of "one" into as many equal parts as one would like to have.

This makes the external expansion of counts from one to two, two to three and so on parallel to the internal partitioning from

wholesome one to a pair of parts, then to three parts, four parts and so on. With this, the arrays of mathematical tools become sufficiently large to work out very rich structures only in terms of "parts", of which the working with "half" is most rewarding.

GANITA SUTRA 3

Roman script : Urdhva-Tiryagbhyam

Working rule / simple English rendering: "Vertically and crosswise."

Source concept: The source concept is the partitioning parallel to reflection pairing of object and image.

Format:

Basics / technical words: The basic / technical words availed by the text are: (1) Urdhva (vertical) and (2) Tiryag (crosswise).

We may illustrate one of the working rules of this Sutra, which would help us to reach at its organisational format as well. Let us multiply 11 by 11. We shall be getting the product equal to 121. Let us have a close look at this number. The central digit of this number is 2. It admits expression as 1+1. Let us replace the central digit 2 with its above expression 1+1. The three parts of the number 121 would permit depiction as: 1, 1+1, 1. Now, let us chase the multiplication the Sutra way:

The first Sutra gives us the working rule to proceed step by step as "one more than the previous one". When we are working only with "half", therefore, in this case of 121 we shall be requiring the last

two digits 12 or the first two digits 21. Therefore, when we shall be having 1 as start with position, as a next step under the rule of Sutra 1, we shall be reaching at 12. Then the reflection image of 12 would give us 21 and we shall be obtaining 121. If we would have been multiplying 111×111, we would be obtaining in three steps 123 and its image 321 which when combined would give us 12321 as the product of 111×111. Likewise if we would have been multiplying 1111×1111, we would be obtaining in four steps 1234 and its image 4321 which when combined would give us the required product as 1234321. The process can be extended.

The product 11×11 being the product of pair of numbers of double digits, therefore, these four digits, here each being 1, can be expressed as the numbers located at the four corners of a square. The pair of above corners may be taken as representing the first number 11 and the pair of lower corners may be taken as second number 11.

Now, when we shall be multiplying the first digit of lower number 11 with the pair of digits of the above number 11 one by one, we shall be approaching as is depicted above in terms of the arrows.

The depiction is of two parts. The first part is Urdhva (vertical) and the second part is Tiryag (crosswise). This as such, would help us comprehend as that geometric format of square is being divided into two triangles and only 1 out of two triangles is being utilised by the organisation format of Sutra 3.

Here it would be relevant to note that the triangle is the first close organisation of lines. In other words we require a minimum of three lines to have a close organisation to enclose planes (area) / surface within its lines.

The triangle as such is the printout of 3-space on 2-space. The sum of all the three internal angles of a triangle isp. The sum of all the three external angles of a triangle is 2p. We can express p as (3–2)p. The sum of all the four internal angles of a quadrilateral is 2p. We can express it as (4–2)p. In general, the printout of n-space on 2-space is n-polygon and the sum of the internal angles n-polygon is (n–2)p. This in general can be seen as that the printouts of n-space in the role of dimension on 2-space is n-polygon.

Therefore, the organisation format of Sutra 3 is that of a printout of 3-space in the role of dimension on 2-space format.

Like that, one can proceed to reach at the organisation formats of the entire range of the text of 16 Ganita Sutras and 13 Upsutras but the context and the space at hand would not permit to proceed ahead with it.

However, the organisation formats achieved uptil this stage well indicate about the mathematics of linear order of Sutra 1, spatial order of Sutra 2 and of solid order of Sutra 3.