An Analytical Study Regarding Few Scientific Elements of Bhūgola-Khagola-Varṇana

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Abstract - Bhūgola-Khagola-Varnana by Paṇḍita Īśvaracandra Vandyopādhyāya bears poetic excellence and represents the geographical approach simultaneously with the Eastern (Indic) and the Western (European) concepts in lucid and vivid manner on the basis of Purāṇa, Sūryasiddhānta and European concepts. *Dhāraṇāśakti* is gravity. During description of cosmological evaluation, a sequence of creation of matter has been found. Sun is the source of energy due to which all living being get their strength. According to the *Vidyāsāgara* colours of planet mars is red. There has a scientific reason - as planet mars created by rocks and soil on the surface of mars contained a dust composed by iron and other elements such as chlorine and sulphur. *Vidyāsāgara* was well known about the orbital period of the sun, earth and other planets. Latitude of a place, zenith distance, diameter of the sun, moon and other planets were also well known to him.

Keywords - *Dhāraṇāśakti*, gravity, star-composition, scientific

Introduction-

Sanskrit is not just a language but also it is a great storage of knowledge. It is Indian's soul. It flows through the blood of Indians. Its looks like a tree and its branches are astronomy, chemistry, cartography, astrology, geography etc. So, we can see many elements of science in Sanskrit language. Few year ago in 20th century a new era of modern science began into inception, changing, demolishing the ancient concepts. But according to the *nārada-saṁhitā* there were about eighteen scientists in ancient India named - *brahmā, ācarya, vaśiṣṭha, atri,*

manu, paulastya, lomaśa, marici, aṅgirā, vyāsa, nārada, saunaka, bhṛgu, cyavana, yavana, garga, kaśyapa and parāśara. So we can say that the seed of science have been fertilized there in a long time ago.

Sanskrit text, Bhūgola-Khagola-Varnana which was composed by Paṇḍita Īśvaracandra Vandyopādhyāya who is well known as Vidyāsāgara. The poetic excellence of the author is amply helpful to represent the geographical approach simultaneously with the Eastern (Indic) and the Western (European) concepts in lucid and vivid manner. Purāṇa, Sūryasiddhānta and European concepts amply helped the poet to describe the matters of discussion in convenient way.

It is true that the earth (Bhū / Pṛthivī) is more or less circular (gola) in its shape. The sky (Kha) is mainly appears to be a great vacuum. There may not be any appropriate size. But, for the sake of the literary test, he gave an idea that the firmament is also globular (gola). Mainly the outward structure of the earth and firmament were delineated by the poet [Bhū + gola {earth is circular} and Kha + gola {sky is round in its shape} Varṇanam {description}]. As a sequel to this, the name of the text appears as - Bhūgola-Khagola-Varnanam.

Bhugola-khagola-varṇana is a humble attempt which gives the readers a glimpse into the scientific heritage in ancient Sanskrit. *Āryabhaṭṭa, Bhāskarācarya, Varāhamihira* etc. were *siddhāntika* scientists. They contributed some valuable theory in Indian sphere of astronomy, physics, chemistry, mathematics and so on.

Physics:

The theories which have been described by the author, *Vidyāsāgara* were established by the Indian *ṛṣis.*

i) *Vidyāsāgara* used a special term *dhāraṇāśakti* which is an attractive force. At present time, this attractive force is law of gravity. Actually This term is used in physical science. So it bears the scientific significance.

ii) During description of cosmological evaluation, a sequence of creation of matter has been found. At per the concept it is evident that - from sky wind born, from wind fire, then from

fire water and from water earth came. Modern physics gives this sequence as plasma, gas, energy, liquid and solid.

iii) *Vidyāsāgara* gave a statement that the light coming from moon is nothing but the same light of sun. This is scientifically proved that the moon reflects the light of sun.

iv) God, sun controls our solar system or it holds the earth is scientifically true. This statement indicated by gravity of earth.

v) Sun is the source of energy due to which all living being get their strength - this theory also proved by scientists.

So, Europeans did not establish any new theories. Most of them were propounded by Indian *ṛṣis*.

Chemistry :

Hydrogen and helium are created inside the cores of stars. According to the *Vidyāsāgara* colours of planet mars is red. There has a scientific reason - as planet mars created by rocks and soil on the surface of mars contained a dust composed by iron and other elements such as chlorine and sulphur. The iron within the dust reacted with oxygen and produce a red dust colour. So, the planet mars look like a red ball.

Vidyāsāgara also said that the star, *dhumaketu* has a tail - after observation scientists have proved that, the composition is mainly nucleus. When they come closer to the sun, the sun's heat vaporized some of the comet's material. Then fire wind blow comes away in form of burning of gas and dust from the comet's nucleus. In this way, a tail is formed. All statements bear a scientific significance.

Mathematics:

Āryabhaṭṭa is a great scientist who discovered 0 (zero) theory. Also *Sūryasiddhānta* is a book written on the basis of astronomy and mathematics. So, some mathematical formula and

theory has been applied here. But he has used limited principle for finding the astronomical value. Through observation some formulas have been come out from verses. Subtraction multiplying, division, square etc. methods have also applied. *Vidyāsāgara* was well known about the orbital period of the sun, earth and other planets. Latitude of a place, zenith distance, diameter of the sun, moon and other planets were also well known to him.

Circumference of the earth is about 5059.6800 *yojanas* according to the *Sūryasiddhānta*. To find out the circumference a rule has been given by *Āryabhaṭṭa* that - the radius of earth is about 1600 *yojanas*. The circumference of the earth is the result of multiplication of its radius with 2 and square root of 1024056. This is a rule which indicate the decimal system.

Vidyāsāgara used the term *yojana* and *daṇḍa*.

1 *yojona* = 9 miles (approximtely).

1 *daṇḍa* = 1.25 meters (approximately).

Few mathematical formulas which have been came out through analysis:

A) Circumference of earth = $\sqrt{10 \text{ X Square Diameter of the earth.}}$

B) Diameter of planet's orbit is –

$$\frac{\text{Diameter of planet's orbit X Diameter of the earth}}{\text{Circumference of the earth.}}$$

C) Height of the planets from earth surface is –

$$\frac{\text{Diameter of the Orbit} - \text{Diameter of the Earth}}{2}$$

Others scientific impacts on bhugolo khagolo varnanam out of physics and

Others:

The great astronomer and scientist William Harshel (1738 – 1822 AD) discovered the planet, Jarjiya or Uranus and its two bright satellites were seen by telescope. And this telescope was invented by Galileo Galileo (1564-1682 AD) and with that telescope he discovered that the earth was not a perfect circular in shape, but a changeable, as spotted in globe. As a sequel to this, *Vidyāsāgara* told *kadambakusumakārā dharā.* Galileo's discovery clearly shows that the earth was not the centre of the solar system.

Conclusion - Few year ago in 20th century a new era of modern science began into inception, changing, demolishing the ancient concepts. But according to the nārada-saṁhitā there were about eighteen scientists in ancient India named - brahmā, ācarya, vaśiṣṭha, atri, manu, paulastya, lomaśa, marici, aṅgirā, vyāsa, nārada, saunaka, bhṛgu, cyavana, yavana, garga, kaśyapa and parāśara. So we can say that the seed of science have been fertilized there in a long time ago. Bhugola-khagola-varṇana is a humble attempt which gives the readers a glimpse into the scientific heritage in ancient Sanskrit. Āryabhaṭṭa, Bhāskarācarya, Varāhamihira etc. were siddhāntika scientists. They contributed some valuable theory in Indian sphere of astronomy, physics, chemistry, mathematics and so on. Both Eastern and Western concepts have been compiled by Vidyāsāgara here in. It is possible only for him to think geography as a poetic way. Asia, Africa, Europe and America these four countries, their boundaries, width everything has been sketched by him.

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