Hindi / English / Gujarati

वेदों में विज्ञान

Sciences In The Vedas

महाकाव्य

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INTRODUCTION

The book which is going to be introduced to bulk of intelligentsia particularly and the public generally, is self-eloquent by its name regarding its subject-matter. This book is exclusively and principally dedicated to bring into light and represent those facts of the Vedic Samhitas which are pregnant with the germs of any kind of sciences. It is only Vedic Dharma where religion and science go in hand to hand. But for some people who have an air of scholarly ostentation, the idea of sciences in the Vedas seems an absurdity. They plead that the Vedas are simply the scriptures of religious sacraments and rituals. There are some extremists who go one step further and declare that the Vedas are the antiquated documents of galimatias of the Indian Rshi's which took place in different time. To them it is not merely waste of time and energy but a great absurdity to try to find out sciences in the Vedas.

But truth is quite reverse. The Vedas contain in them the germs of all true sciences. Blames should not be directed against the pole if the blind man does not see it. Blames directly go to the men. It is the fault of the man who does not understand the Vedas. Vedas should not be blamed. One who has profound knowledge to grasp the meanings enclothed in the Vedic hymns is alone worthy of praise. It is only he who can search the treasure of knowledge lying concealed in the Vedas. If there is no science in the Vedas what nomenclature can befittingly be assigned to the following grains of knowledge ?

(a) *Rtasya deva anuvrata guh* (Rg. I. 65-2) All the physical forces of the universe follow the course of eternal law.

(b) *Dasa cha me satancha me* : Atharva V.10-10
Ten times ten (or ten multiplied by ten) make hundred.

(c) *Bhinad valasya paridhin rivatritah*. (Rg. X.130.3)
Indra strikes the cloud in such a manner as the external triangle crosses the circumference of circles.

(d) *Ishanakrito dhunayo risadaso vatan vidyutas tavisebhirakrata*—Rg. 1.64.5
The *marutah* forming the north-east direction, Communicating tremor and consuming dead particles produce air and electricity by their operation.

(e) (*Mitravarunau*) *dhiyam ghritachim sadhanta*. Rg. 1.2.7.
Mitra and *Varuna* heated and mixed together complete the demonstration of composition of water.

(f) *Vishpatim saptapttram*. Rg. 1. 164.1
The Sun has seven kinds of rays.

(g) *Sushumanah suryarashmih chandramah*. Yajuh. 18.40
The *Sushumna* rays of the Sun illuminates the moon.

(h) *Agnirhimasya bheshajam*. Yajuh. 23.9
Heat is the remedy of cold.

(i) *Ayam somo ashvasya retah*. Yajuh. 23.2
Electricity is the powerful seed of fire.

These are few examples. If these are the facts of science denial of sciences in the Vedas has no meaning. Some one may say that these are really the scientific facts but are very propaedeutic. But it has no force. Propaedeutic facts of science have also the scientific value. Without them higher study can not be prosecuted. If Vedas contain the propaedeutic scientific facts they also contain the facts of higher scientific value. It is also baseless that these facts are of propaedeutic nature. Be these facts propaedeutic or ultimate but the idea that Vedas contain the germs of science

is valid and basic in both the cases. Vedas contain in them all the true sciences as they are not the scripture of mere rituals and sacraments. They are the repository of all true knowledge. Being so they are the *shastras* of all true knowledge including science and procedure of rituals and ceremonies.

How did the idea that Vedas possess the treasure of sciences also, gain ground ? The answer of the question is based on the following arguments. These arguments will give the satisfactory and convincible answer of the posed question.

1. Vedic Samhitas are four in number. There are six limbs of the Vedas which are called *Vedangas*. They are — *Shiksha*, *Kalpa*, *Vyakarana*, *Nirukta*, *chhandas* and *jyotisha*. Had the Vedas not possessed the sciences these systems of science would not have emerged from them. Thus the development of such systems of scientific knowledge is a sufficient and irrefutable proof to establish the notion that the Vedas contain various sciences in them.

2. There are four *Upavedas*, named as — *Ayurveda*, *Dhanurveda*, *arthaveda* and *Gandharvaveda*. Were there no scientific knowledge in the Vedas these *upavedas* which are the treatises of systematic sciences would not have come into existence.

3. Some Brahmanas directly refer to various departments of Vedic Sciences. They are the commentaries of the Vedas. If there was no scientific idea in the original Vedic texts the commentaries thereof would not have exposed them in such ways.

4. Six schools of Indian philosophy are known as the six *upangas* of the Vedas. They have profound respect for the four Vedas. These philosophical systems show that human mind soared to highest peak of the imagination. Had there been absence of science and philosophy in the

Vedas such systems of philosophy which have also the sciences in them, would not have originated and developed.

5. *Upanishads* which deal with the spiritual science as well as physical science in some cases are the offshoots of the careful examination of the Vedic verses. Had there been no scientific thought in the Vedas they would not have gain their ground.

6. Since the time immemorial till the great war of Mahabharata the scholars treated the Vedas as the repository of all true knowledge and interpreted them accordingly. If Vedas had not possessed sciences the various scientific developments would not have taken place.

7. *Vyasa* the author of the *Vedanta* Sutras unequivocally accepted this idea. Commenting on his *Sutra* (*Shastrayonitvat* 1.1.3) Shri Shankara-charya says that the Vedas are the scriptures of all ture knowledge. He attributes them with the adjectives *Saravidyo-pvrinhita* and *sarvajnakalpa.*

8. It was the great Dayananda Saraswati who not only confidently declared that Vedas are the scriptures of all true knowledge but positivistically approached to this problem. In his *Rgvedadi Bhashyabhumika* he collected some very conspicuous facts of science. This book is the real source of inspiration in this direction. Swamijis contribution to Vedic studies would always be remembered. His declaration that the Vedas are the scriptures of all true knowledge, is such a gift to the mankind on his part that he deserves the gratitude of posterity.

Here may be posed another problem. What sort of intellectual consciousness may be capable of grasping such esoteric ideas enclothed in the Vedic hymns ? General forms of knowledge are known between two— the experience and intuition. To the great extent the experience is based on the empirical knowledge. Intuition is natural and free from empirical observations. The field of empirical knowledge

is limited while intuition plays a very comprehensive and important role. Vedic hymns can not be completely grasped through empiricism.

Patnajali analysed the various states of highly attained intellectual consiousness of man. Apart from the emperical knowledge he described *Rtambhara prajna*, the truth-bearing intellect; *Pratibham*, the intuitive knowledge; *Vivekaja jnana* intuitional discrimination; *Taraka Vivekaja jnana*. Simultaneous, immediate and omni-objective knowledge. Our Rshis attained the highest empirical knowledge as well the intuititional knowledge of these categories. It is why they were capable to penetrate the mystery of the Vedas and to search out in them the various branches of science.

Therefore, this book— "Sciences in the Vedas". I has been divided in ten chapters. The first four chapters are dedicated to — Vedic Rta. Mathematics, Psychology and Physics respectively. The chapters fifth, sixth and seventh respectively deals with the subjects— Chemistry, Astronomy and Medical Group of Sciences. The eighth chapter captured as Miscellayy is concerned with miscellaneous scientific Vedic topics of great importance. The opinions of the great scholars in connection with the various sciences of the Vedas have been compiled in the ninth chapter under heading —What do the others say. Some extraordinarily important matters have been appended in the chapter tenth under the title—addenda.

The task of an author who undertakes to write a book on such a subject is not an easy one. He is dealing with a subject of profound and complicated nature. The Vedic ideas which he has to reflect and finally collect are at his disposal after turning out a great heap of knowledge. Even an infintesimal of knowledge is to be found out after a great deal of effort. Whatever has been attained and given in

this book would no doubt enhance the prestige of the Vedas and would give a new incentive to the Vedic studies and researches.

I am beholden to Shri R.P. Pathak who undertook the tedious job of reading the proofs of this book.

I am also thankful to M/s New India Press, Connaught Place, New Delhi, who took all possible care to nicely print the book and make it ready in a short time.

With this sincere hope that my effort will be appreciated in all quarters, I close it here.

VAIDYANATH SHASTRI,
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Maharshi Dayanand Bhawan
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CHAPTER I

VEDIC RTA

Veda is revealed by the Divinity, as it is a firm belief of an Arya. He treats this point quite incontrovertible. All the *Vedic Dharmins* are agreed on this conviction. It is not a case only with Aryas, but a sound thinker who desires to trace the origin of knowledge and speech would have to come to this conclusion. For him, this fact will be ineluctable. Vedic *Samhitas* themselves stand testimony to this view. Rigveda defining the Vedic speech says :

Tisro vacha irayati pravahnih rtasya dhitim brahmano manisam. Gavo yanti gopatim prichchamanah somam yanti matayo vavasanah. Rigveda IX. 97-33 i.e. the All-sustaining Lord of the universe reveals three kinds of speeches of four Vedas. These speeches consist of the revelation of *rta*, the laws eternal, and the knowledge of the universe. Speeches in the word-forms go to him who knows the words and their meanings and knowledge go to him who is a yogi.

In this verse the Vedas are called the revelation of eternal laws and cosmic order. What is this *rta*? It is here quite pertinent to know this *rta*. Without knowing it one cannot be able to explain mystery of Divine revelation and real nature of the Veda.

Describing *rta* the Vedic verse reads :

Rtanch satyancha abbiddhat tapaso adhyajayat. Tato ratryajayat tatah samudro arnavah. Rigveda X. 190-1.

From the heating (active) power of the Divinity became manifest the laws eternal together with the subtle matter, thence the disolution was produced, and thence the atmospheric ocean containing the cosmic principles came into existence.

In this verse the rta is defined as laws eternal. Here no other meaning can suitably fit. If the Vedic *rta* is defined and explained, the whole mystery may be cleared out Hence effort is being here made to throw light on this *rta*.

'*Rta*' means true, proper, right and honest in an ordinary sense. In the Vedas it has various meanings. It stands for truth, eternal laws, cosmic order, water and *Yajna*, etc. Sayanacharya in his commentary usually interprets it to mean 'water', 'sun', or sacrifice, while some European scholars take it in the sense of divine truth and faith etc. The great vedicist Maharshi Dayananda Saraswati interpreted the word in the sense of : true knowledge; eternal cause; what stands in conformity to cosmic order, the Veda, the eight proofs of reasoning, the practice of adepts, one's own experience and conscientiousness; water; true justice; moral order; God; time; sun; air; atoms and perseverance.

In the Vedic *nighantu* rtam denotes the names of truth, and water, but commenting on this *Yaskacharya*, in his Nirukta, has taken it to mean *yajna* and semen etc.

Brahmanas explain the word in various senses and some of them are : truth, sun, fire, universe, eye, mind, God and the act which enables one to enjoy unworlddly freedom and happiness. Here Sayanacharya's interpretation does not fall in line with the high grandeur of the Vedic *rta*. So far as Maharshi Dayananda Sarasvati's view is concerned, the word has been taken in a very comprehensive sense and his view as well as his method of exposition has been corroborated by *Yaska* and the Brahmanas. The Western scholars who hold the view that *rta* means divine truth and faith etc., are progressing towards the real fact.

Mr. Maurice Bloomfield opines "The high thought of the *rta* is many ways similar of the *Confucian* idea of order, harmony and absence of disturbance. It is unquestionably

the best conception that has been elaborated by the Aryans." He further says, "As far as the Veda is concerned, it presents itself under the threefold aspects of cosmic order, correct and fitting cult of the gods, and moral conduct of man. We have in connection with the *rta* a pretty complete system of Ethics, a kind of Counsel of Perfection".

As the basis of cosmic order the *rta* rules the world and nature. The established facts of the visible world, but especially the events of nature that recur periodically, are fixed or regulated by *rta*. Those daughters of heaven, the Maidens of Dawn, shine upon the morning sky in harmony with rta, or when they wake up in the morning they rise from the seat of *rta*. The sun is placed upon the sky in obedience to the *rta*. He is called the wheel of *rta* with twelve spokes. This means that he courses across the sky as the year of twelve months. Even the shallow mystery that the red, raw cow yields white, cooked milk is the *rta* of the cow guided by the *rta*. The gods themselves are born of the *rta* or in the *rta* (rtajata) they show by their acts that they know the *rta*, observe the *ria* and love the *rta*."

He further says "the religion of the veda, as we have observed, rests upon the material foundation of cult and sacrifice. These performances are not always regarded merely as merchandise wherewith to trafic for the blessings of the gods.....But even in Rigveda sacrifice fire is kindled under the 'yoking of the *rta*' or as we should say, under the auspices of world order. Agni, the god of fire, is 'scion of *rta*' or 'first-born of the *rta*'. He performs his work with *rta*, carries oblations to the gods, "on the path of *rta*". Prayers lowing like cattle, "longing for the soma-drink, "take effect in accordance with *rta*. A figure of speech, bold to the point of grotesqueness, turns prayer into "*rta* fluid, distilled by the tongue. Holy

sacrifice, in the distinction from foul magic, is performed with *rta*: "I call upon the gods, undefiled by witchcraft. With *rta* I perform my work, carry out my thought" Thus exclaims a poetic mind conscious of its own rectitude.

Finally in man's activity the *rta* manifests itself as a moral law. Here it takes by the hand the closely kindered idea of truth, *satya*. Untruth on the other hand, is *anrta* more rarely *asatya*, the same two words with prefix of negation. The two words satya and *anrta* form a close dual compound, "truth and lie," "sincerity and falsehood" both zealously watched over by God *varuna*. They remain the standard words for these twin opposits for all Hindu time. Varuna is the real trustee of the *rta*. When god Agni struggles towards the *rta* he is said in a remarkable passage to become for the time being God Varuna.

Truth and lie include, by an easy transition, right and wrong doing. In a famous hymn *yami* (Eve) invites *yama* (Adam) to incestuous intercourse.....when *yami* pretends to justify the act *yama* exclaims pithily: "In saying the *rta* we shall really say the *anrta*", which, rendered more broadly, means to say: when we pretend to justify the act as being *rta*, 'right-doing,' we really shall knowingly engage in *anrta*, wrong-doing". We may imagine *yama* finally saying: "Any-how don't let us beat the devil about the stump".

(The Religion of the Veda by M. Bloomfield p. 126-129).

If we carefully scrutinize the above remarks passed by Mr. M. Bloomfield we can easily come to the conclusion that he could not do justice to the veda. His was a biased and prejudiced mind and therefore he took every thing in the way shown by other Western scholars. Here, it is also evident that the author was not competent enough to grasp the meaning of the vedic verses on which he based the

structure of his fancy.

Agni and Varuna etc. are not the gods. They are the objects or elements of the cosmic order. Sometimes they mean God, the creator, sustainer and annihilator of the universe. Vedic terminology is not easy enough to be understood by the persons who are not wellup in the vedic language and the auxiliary scriptures. The words *deva* and *devata* cannot be translated as gods. They represent sometimes, the phenomena of the universe and sometimes the elements and elementary processes. Even the universal spirit is called Agni and Varuna etc. in the Veda.

Yama and *yami*, as the author of the above passage describes, are not Adam and Eve. This is his own imagination. No where this assumption finds any support in the Veda. *Yama* and *yami* are the sun and night as well as the wife and husband who desire to seek the term of *Niyoga*. It is not our subject here to deal with this point and therefore leave this here with this cursory remark.

Mr. Bloomfield seems right to an approximate extent in concluding the three-fold aspect of *rto* which consists of cosmic order, correct and fitting cult of the gods and the moral conduct of man. But he laboured under great misapprehension in understanding the meaning of gods. This second aspect of Vedic *rta* can be included in the first aspect. When it is clear from the Veda that Agni and Varuna etc. are the worldly objects and substances, not the gods of Mr. Bloom field, the cult of gods has no meaning. Every thing of the world is governed by *rta*. Therefore, the operations of these so-called gods are also the part of that governance. They also follow the path of *rta* in their operations. In this way the functioning of the whole universal system comes within the ambit of cosmic order. Thus two-fold aspect of *rta* can be derived from the passages refered to above and they are cosmic order and moral conduct of man.

Some references given by the author in respect of his own meanings require clarification :

(*a*) Daughters of heaven as well as the Maidens of Dawn are not the real meaning of Vedic term, *usa*. These two *usas* are nothing but dawn and dusk. They are regulated by the *rta*.

(*b*) The twelve spokes are not the spokes of chariot wheel. These are the twelve houses extending throughout the course of the sun.

(*c*) If a cow eats green grass and yields white milk it is absolutely due to the regular functioning of its system which is governed by *rta*; the law of nature.

(*d*) All organised bodies or physical objects animate and inanimate things of the world are called *devas*. They need *rta* for their existence, origination and function. This has been described in the veda.

(*e*) Fire also does its function in conformity with the world order. Same is the case with the working of speech and mind. It is the pretention of speaking or carrying out of the *rta*, the truth, that has been decried in the veda, not the *rta* or truth. No truth can ever be untruth. If there is any counterfeit of truth, the same cannot even be truth. It should be discouraged at all times.

What does one take in his or in her mind when he or she uses the terms 'cosmic order' or 'the law of nature'. The principle of the order of the world, of regularity, of cosmic phenomena, is conceived by the observers to have existed as a principle before the manifestation of any phenomenon. The argument would seem to be somewhat as follows :

The phenomena of the world are shifting and changeable, but the principle regulating the periodical recurrence of phenomena is constant; fresh phenomena are conti-

nually produced, but the principle of order remains the same; the principle, therefore, existed already when the earliest phenomena appeared; hence the vedic idiom, it is their father, the upholder of the *rta*, who gives or has given birth to them. This idea is found underlying the term *rta* when it is taken as cosmic order or the law of nature. Heaven and earth as well as all the wordly objects are born in conformity with the *rta*.

The word *rta*, in its various forms, occurs more than hundred twenty times in Rigveda; fourteen times in Yajur veda; forty three times in Samveda and thirty two times in Atharvaveda. At these places it has all those meanings which have been taken by Yaska, Maharshi Dayananda Sarasvati and the authors of the Brahmana literature. All the meanings have their own importance in their context but the most important of them are cosmic order or law of nature and the moral law. These two aspects of vedic *rta* carry very deep philosophical consideration. If all their details are thoroughly examined they will lead to the belief that the Veda is not only the scripture of religious rituals and sacraments but it is also a repository of all true knowledge. It is the knowledge which God, the Lord of this universe, revealed for the well-being of mankind.

Rta and the theory of moral law

Those who believe in evolution theory, inculcate that the first stage of morality was based on heteronomy i.e. the subjection of external law. In the primitive stage of human society, the elders or leaders were entrusted to form the standard of morality. Whatever they do becomes the example for others. As the human society advances this heteronomy gives its place to theonomy in which the standard of morality becomes the dictates of God. But

in the most advanced stage of society, says an evolutionist, it is neither the society, nor the state and nor the dictates of God which provide the mankind with the standard of morality. This must spring entirely from within ourselves. It is the very essence of human soul. Absence of morality shows the weakness of man's nature and strength lies in his moral integrity.

In the practical life it is not possible for every body to know which way he should move. He has to face many difficulties in solving his problems of moral criterion. He can make an effort to seek the solution of his problem through heteronomy or theonomy. It is fact that in a balanced life a person cannot ignore the counsels of others and the injunctions of scriptures, but without autonomy he is unable to be heteronomous or theonomous. All elders are not supposed to agree in matters of conduct of life. At the same time their ways of living and determining the standard of morality may differ from time to time. There may be conflict between their views. So it is not an easy task for an ordinary man to choose the standard of morals. To know the wish of God is another controversial problem. Sometimes it is not also possible to decide the authority of the scriptures in the matter of details. Equally tedious is the question of their right interpretation. The only way left for a man in this matter is to come to his own decision. This whole sole dependency on one's own self presupposes the idea of total freedom of his self. If this self of a man has no freedom of action the moral standard cannot be determined.

The very important method of deciding the moral standard is said to be one's own conscience. Listen to the inner voice and you will know which way to follow. Morality, thus, cannot be judged on any standard better than the dictate of conscience. But there is the practical difficulty

in hearing the voice of this conscience also. The voice is there but our organ of hearing it becomes deaf to it. The voice of conscience becomes feeble if it is not heard and followed. Conscience in matters of moral consideration gives clear-cut and definite decision devoid of all sorts of ambignity. It is the most reliable guide which guides one always on the right path. A pure conscience casts aside utilitarian considerations in the matter of morality and dictates an absolute path.

The value of morality lies in the freedom of acting agent. Dictates of conscience undoubtedly direct to the right path but they can not force one to follow them. Man is not like a machine which moves on acting in accordance with its original set-up. A machine neither follow nor can any moral code be prescribed for it. It is lifeless while the self of man is an animate entity. The freedom, thus, is the natural characteristic of the self. This freedom of the self implies three ingredients of freedom: doing, not-doing and contra-doing. This idea finds its source in the Vedic principle that the human self is eternal and it has three aspects in its consciousness : the cognitive aspect, affective aspect and active aspect. The Veda further maintains that there can be no departure from the moral scene, because the cycle of life and death is continuous. Morality is the natural characteristic of the self and any act immoral takes the self down in the series.

There are some objections raised against the idea of the freedom of self. The first objection is based on the argument of causal determination of human acts by antecedents. According to this the denial of causal determination of our acts by antecedents is meant to deny the presence of rational connection in the psychical sphere, and thus it is tantamount to pronouncing not only psychology in principle impossible but also all those sciences which utilize the physical

events as their material and attempt to discover rational connection therewith. But this argument cannot be treated valid on any cost. This autonomy or freedom is the distinction of acting agent. The question of rational connections transcends the psychic do-main.

The second objection is that this is still more evident that all sciences consist in the formulation of 'laws' or 'uniformities' and that this formulation of laws depends upon the solid principle "that the same result follows under the same condition". But this argument may be valid in dealing with 'material cause'. It does not hold good in case of the first cause which has a freedom of action and freedom of will.

Thus it is a fact that self is free to act and free to will. If the self has no freedom it cannot be held responsible for its action. Thus the responsibility of doer or actor presupposes his freedom of action. According to the veda the self is free in action and is dependent in reaping the fruit thereof under the dispensation of God.

There is another point of view regarding the theory of ethics. It is also influenced by the theory of evolution. Maxmuller, in his Hibbert Lectures, says, that the idea of physical law, denoting the uniformity of natural phenomena, originated in the perception of the "recurring return of day and night, the weekly changes of waning and increasing moon, the succession of the seasons, and the rhythmic dances of the stars"; which uniformity found expression in the word *rta*, right path or law, and that from this *rta*, the moral law, the right path for man to walk in, was deduced or inferred.

Maxmuller, as his remarks denote, fell pray to his own follies. On the one hand he speaks in term of evolution and on the other describes the Vedic *rta* as the source of his self-styled deduction and inference. We as ordinary

human beings are indeterminate to our lines, we accommodate ourselves to circumstances and enviorments. Therefore, we derive some rules of conduct from the fundamental rules of conduct. These rules of conduct vary from time to time and are conditioned by circumstances and environments. *Smritis* are the collection of such rules. But the fundamentals of morality do not yield to the pressure of circumstances, and environments. They remain the same and unchanged in all time and clime. So far as the rules of conduct pertaining to first set-up are concerned they are *smarta* and may be treated as deduced or inferred from the *rta*. Without being so they cannot have the moral value. Their being in conformity with *rta* or fundamentals, is most necessary. Other-wise they may not be treated as obligatory. In this aspect of moral standards Maxmuller's assumption may be right to some extent. But so far as the fundamental rules of morality are concerned they are not the deduction from previous ones. To think in term of evolution is also defective. *Rta* itself stands for the cosmic order or law of nature as well as moral law. The Veda is concerned with fundamental moral laws. Therefore, these are not an inference from the natural law. *Rta*, in its garb, contains cosmic order and moral law both.

From the study of Veda it becomes quite clear that the sin is not only as a fall, but also as the voluntary transgression of divine laws entailing punishments. The Veda recognises in this matter the reality of both the divine and human will including freedom. God has revealed the facts about moral laws and has laid down sound criterion of morality, but men, of their own free will can follow or break them. Therefore, the human consciousness of sin contains a knowledge of divine laws and the voluntary transgression of them. *Yuyodhi asmatjuhuranamenah* i.e. O Lord of the universe, thou knowest all my acts, kindly wipe off from me the spirit

of sin which is a transgression of moral rules. Here it is also explicit that the Veda accepts the freedom of soul in the matter of moral consideration.

If we follow the path shown by Prof. Maxmuller we will be faced with a large number of complicated problems. There seems nothing in the Veda to support the view adopted by the learned but so-called vedicist professor. The word *rta*, in the veda, has been used in a comprehensive sense. It has been used for outward cosmic order and also for inward moral order. Hence the conclusion whether one order is a deduction or an inference from the other is absured. This is not a question which could be answered on the grounds of philology and the theory of evolution.

Let it be granted that sensuous impression of the uniformity of natural phenomena did produce the idea of physical law, in the sense of the right path in which the heavenly bodies should move, how could that originate the idea of a right path in a moral sense, which a man should tread? If it be affirmed that the concept of outward cosmical order did not produce inward moral order as such, but the perception of it; then, we ask how can inward moral order exist apart from the perception of it? Is not perception the condition and evidence of its existence? Again, if it be affirmed that the concept of outward cosmical order that awakened the latent sense, or idea, was there already; and hence that concept of outward cosmical order, which *ex hypothesi*, was deduced from sensuous impressions. Before man could apply the word *rta* to the uniformity of natural phenomena, he must have known the *rta*, the right path and its opposite. He must have been conscious of a law within or a standard by which he could judge what is right and what is wrong. The very terms right and wrong imply the possession of such a standard. By this evolutional argument Prof. Maxmuller believes that *rta* is an invention

of the Aryans of Vedic period. If it was invented by the Aryans the idea of moral standard was also already there and hence it is wrong to say that the concept of moral order was deduced from *rta*, the outward cosmic order. Prof. Maxmuller's view is totally based on merely imaginary theory of evolution and unfounded philology.

Rta and Aghamarshana

Justice meets two ends: the innocent should not be punished and the offender should not be acquitted. To act otherwise is to trifle with the justice. Vedic idea of award of pleasure and punishment, as the case may be, is solely dependent on the criterion that it should be in conformity with the action of the actor. Accordingly an offence or a sin cannot be forgiven. If sins are to be forgiven, the justice to be administered by the power authorised for the purpose, would be tampered with and all men would become sinners. Mere prospects of forgiveness make the offender bold and courageous to repeat commitment of sins. It would in other words, amount to an encouragement for offenders to become habitual sinners. When an authority of justice pardons the failings to his men, they become bold and commit gross faults in the hope that they would beseech him with folded hands and on bended knees, he would forgive. Therefore, to reward virtue and punish vice in exact proportion it is the demand of justice, not to forgive sins. It does not only apply in the case of worldly dispenser of justice but it does equally holds good with God also.

When it is certain that offence or sin is not pardonable the idea of *aghamarshana* becomes futile. *Agha*, the sin cannot be any-how forgiven. If it can be forgiven the above-stated problems come in the way. If both views are equally entertained and there is no other rational interpreta-

tion of either, there appears a serious contradiction. If the Veda at one place treats the sin pardonable and at another unpardonable, both the views stand contradictory to each other. In this tedious condition it seems pertinent to pave the way for a safe corner. That way of safe corner can only be the adoption of a rationalistic approach in interpreting the word *agha-marshana* in its truest sense. *Agha-marshana* in its true vedic sense has been used to mean "the introspection of the misdeeds committed by some one". It is not the purpose of *aghamarshana* that it could make the sin forgiven. Its whole and sole purpose is to make a sinner think and repent for the follies he has committed. This leads one to realise his fault and to be far away from committing such things in future. This is an antidote against the repetition of foul-doings in future. The responsibility of misdeed once committed cannot be relinquished. One is bound to face the result of his actions. Justice prevails the kingdom of the Almighty God. None can have an escape from His ever vigilant eyes

The acquirement of strength of body and mind is not enough for us. This is not the only end of human life. Strength leads to pride if it is not accompanied with a sense of humility. *Aghamarshana* hymns spiritualize man through and through. In these hymns we are called upon to contemplate the stupendous cyclic creation and evolution of this gorgeous universe with its law and order, to ponder over the sublime Majesty of God and to realize our own finiteness in comparison with the infinity in which we live, move and have our being. This realization brings about the dawning of faith on man. A devotee through *aghamarshana* acquires humility or humbleness which pave the way to spiritual growth. In the hymns of *aghamarshana* we feel the pressure of supreme power guiding the majestic evolution of this universe and recording each heart beat or throb through which we are

passing. In this serious thinking of God's nature we are struck to all the worldly minutes and in the words of *yajusa* verse we exclaim 'what a grand wonderful world my Lord !' We whisper to ourselves : This universe of Lord is immense, but immense still is the Lord Himself. The immensity revealed in the form of physical universe is only an infinitesimal part of the huge immensity of Godhead.

Our pride is humbled and we bow low before the great controller and ordainer of this great universe. We look within and observe the operation of Moral Laws. This observation deters us from committing any sin. This is the real spirit of *aghamarshana*. Says Rigveda (IV. 23.8) "The Eternal law has many streams of waters of life which gives energy, the thought of Eternal Law removes all the prohibited sins : The expression of Eternal Law in words opens the deaf ear by imparting knowledge and purifying the undertakings of life.

The word *rta* in the first verse of the *aghamarshana* hymns stands for this Eternal Law.

True aspect of religion is the observation of the *rta*. The study of *rta* makes one competent for embracing truth and renouncing untruth. Defining religion Kanada says "That which enables a man to achieve material prosperity along with spiritual welfare." This conception of religion places before us a balanced view of human life. It reconciles the claims of Matter and spirit. The observation and the study of *rta* reveals this fact.

Rta and Right

The word right comes from Vedic *rta*. In ethical theory the term 'right' may refer to the moral law or standard of conduct, however its source and nature are conceived; or it may refer to action or choice which conforms to that

law or standard. These are its substantive and adjectival uses respectively. Duty is always a correlative of Right inasmuch as the moral law always involves the obligation of obedience. Right is the basic conception in those ethical theories which regard morality as conformity to some standard. Right stands for good which is a basic conception of those which treat morality as the pursuit of some end. What exact relation this Right has with the good is variously conceived by the various schools of ethics. Right signifies good and good implies truth, pleasantness and beauty. Thus the word Right in the realm of ethics has been interpreted to mean the Right (proper), the pleasant and the beautiful.

In social ethics a right is a justifiable moral claim upon others that implies a duty or duties on the part of others. This constitutes obligation i.e. imperativeness and not merely a permisiveness. All the normal rules are mandatory and not merely recommendatory.

A legal right is also called right. It is a claim that is recognized and supported by law. There is another right which is named as political right. A political right is defined as a capacity or function granted to a citizen and guaranteed by the state.

Apart from these rights there is also a natural right. Natural right is a claim or more appropriately a liberty that belongs to a man as a man. It is one that is not derived primarily from the state or positive law but is conceived as having its source in the law of nature and therefore as something more basic and inviolable than a right granted and guaranteed by positive law.

It would not be impertinent to discuss the natural law here in this context. In scholastic theory that part of the divine law that is known to man through reason, is natural law. The notion of an eternal law of nature as constituting

the standard of evaluation of man-made law was taken from Stoic philosophy. It has maintained a prominent place in political philosophy in post-medaeval times. Conservative, liberal, revolutionary and collectivist schools of political thought have equally claimed for their respective basic postulates the transcendental validity of natural law and even the force of over-ruling positive law at variance with its maxims. The natural law of liberalism which was developed by the philosophers and jurists of the enlightenment and which is often referred to as natural law pure and simple, became of particular importance as constituting an effective check to monarchical absolutism, as providing the guiding principles of modern individualistic liberalism and democracy, including the doctrine of inalienable rights, and as furnishing since Grotius the ideas guiding modern International Law.

Loosely, the interest or privilege protected may be called a right. The capacity to get the protection of the state for some interest, privilege, or power, on one's own motion, is called a legal right. The capacity to get protection (not necessarily from state) which one ought to have is called a moral right. The word 'natural' combined with 'right' is one which historically has been used in ethics and politics to mean that an ethical or political principle was accepted universally as opposed to what had only local acceptance; or that it was rooted in the nature of things, in harmony with the course and purpose of nature and required by man's instinctive nature, as opposed to the customary conventional and merely traditional, or that it was self-evident, or that it was or would be practised in a state of nature as opposed to what occurs in man-made civilization. The conception of natural law, in which the doctrine of natural rights may be said to have been implicit to some extent, as a fundamental law of reason was distinguished from positive law.

Natural law consists of generally accepted principles of equity, good faith and moral principles : such as that no one should be allowed to profit by injuring others. At the beginning of the modern era it began to be, asserted explicitly that there are natural rights, a claim which, in its fundamental defense of equality against privilege, was in part a result of protestant ideas. Many political philosophers held the view that man as man self-evidently has certain inalienable rights. This doctrine is embodied in the Virginia Declaration of Rights, the Declaration of Independence, the French Declaration of the Rights of Man, the preamble to the constitution of 1793, etc. Such rights as the right to life, liberty of thought and private conduct, public meeting, contract, equality, property, pursuit of happiness, and government only by the consent of the governed are often mentioned.

The utilitarians in practice accept as an absolute right the greatest freedom compatible with the like freedom of others although in theory they accept utility as their only first principle. In more recent times this theory of natural rights has declined, partly because of general scepticism about self evident principles. Some writers would still use the term, partly to distinguish certain fundamental rights from those, e.g., which arise out of contract; that is, it may be said that protection of some privilege or power is a 'natural right' if the realization of the ideal society requires that all persons receive such protection, at least where it does not conflict with the rights of others or interfere seriously with general welfare.

It is evident that all man-made laws have their source in the natural law. All the rights accept to some extent the natural rights. The idea of such laws and rights presuppose the basic ground and that basic ground is the conception of *rta*. Had not there been such a concept the details would not

have taken place.

Manu has been accepted as the first law-giver to the human society. His treatise is called *smriti*. The *smriti* is nothing but a treatise which remembers *sruti*, the veda for its testimony. It is purely dependent on the veda for its purpose.

Rta and A-bsolute

Absolute is a derivation of Latin absolutium etymologically. It means whatever is self-sufficient unconditional, independent and not relative. Hegel's absolute is the all-inclusive all-comprehending totality of the real. Lotze and Bowne describe absolute as first cause, the world ground. Mr. Knudson takes absolute as "self-existent infinite energy producing and sustaining the universe." This is the idea of the theistic absolute.

The world visible to us is phenomenal. This phenomenality of the world has been taken in different meaning by the philosophers. Some of them reduce this to an illusion. But this is not a right conclusion. The world is phenomenal, it cannot be denied. But to say that phenomena are unreal, is a mistake. There are changeability in them. But this does not give one to think that change has no reality. Changes take place in a substratum which seems permanent in all of the changes. If a phenomenon is not manifest it does not mean that it is absolutely a not. It is not perceived by us due to its non-manifestativeness. But it is present in its cause. All phenomena and changes presuppose a causal relation. This causal relation is not an illusion. This gives rise to a thought that all changes are governed by causal law. This world of change reminds us that there are law, order and purpose contrary to lawlessness, disorderliness or purposelessness. Thus this world is real. Its relativity

or phenomenality or changeability does not deny its reality. Within a number of phenomena there seems a general principle. A many minor principles are governed by a higher principle. But this higher principle does not deny the minor ones. It embraces them all. In the same manner a general principle does not deny phenomena. If the phenomenality of world is an illusion, the underlying principles, become equally illusive. But it is not so. An ordinary phenomenon presupposes the existence of minor principles, these minor principles presuppose the existence of laws, these laws refer to the fundamentals and ultimately to the law of laws, the *rta* which is the absolute.

Thus a critical survey of vedic *rta* leads to the conclusions reached in the above lines. The Veda, in true sense, is the knowledge of *rta* and hence it is said to be divine revelation. Almighty Divine self himself is the *rtasya gopah*, the upholder of laws eternal. He reveals his knowledge *rta* to mankind in the form of Veda. In this sense the Veda is '*rtasya dhih*' and *brahmano manisa*. In this way Maharshi Dayananda was right in his assertion that 'Veda is the repository of all true knowledge.'

CHAPTER II

MATHEMATICS

Mathematics is a very important science. Its rules are as much exact as those of logic. Mathematics like logic is useful in the study of other branches of knowledge. Had there not been the idea of space and time there would have dawned no succeptibility of mathematical rules and principles. Arithmetic wholly dependent on numbers is the science of time. Possibility of motion in all directions is called space while the succession of motion is called time. Succession has order and order is measured in numbers. The term mathematics is sometimes used in its limited sense meaning geometry. Therefore it is known to be the abstract science of space and quantity. Geometry therefore deals with the properties and relations of magnitudes in space. Algebra, as it is known, is the investigation of the properties of numbers and quantities by means of general symbols. What the divine Veda says in this connection is given here. We quote some relevant verses below with their english translations under the pertinent headings :

Arithmetic

Notation—i.e. the term only used to indicate the expression of numbers by means of character or figure.

Sa eva eka ekvrideka eva
sarve asmin deva ekvrito bhavanti

(1) *Na dvitiyo na tritiyaschaturtho napyuchyate*
Na panchamo na sastah saptamo napyuchyte
Nastamo na navamo dasamo napyuchyate

Atharva, 13-5, 20-25, 16-18.

Translation—

He is the one, one alone and only one.

All these mighty forces of nature become one in Him.

He is called neither the second, nor the third nor yet the fourth.

He is called neither the fifth, nor the sixth, nor yet the seventh.

He is called neither the eighth nor the ninth, nor yet tenth.

In these quoted verses we find the numerals 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 (0).

2. *yadyekavriso asi srijarasosi*
yadi dvivrisosi srijarsosi.
yadi trivrisosi srijarasosi
yadi chaturvrisosi srijarasosi
yadi panchavrisosi srijarasosi
yadisadvrisosi srijarasosi
yadi saptavrisosi srijarasosi
yadyastavrisosi srijarasosi
yadi navavrisosi srijarasosi
yadi dasavrisosi srijarasosi
yadyekadasosi sopodakasi

Atharva V.16. 1-11.

Translation—

If you possess one potential power, use it to success otherwise you are of no use. If you possess two potential powers use them to success otherwise you are of no use. If you possess three or four or five, or six or seven, or eight potential powers use them to success otherwise you are of no use. If you possess ten potential powers, use them to success otherwise you are of no use. If you possess eleven potential powers you are devoid of all succulence.

Here in the verses one to nine the numerals from 1 to 9 are very clearly described and in the verses ten and eleven the numbers of two units like ten and eleven are mentioned. It shows that by placing zero in the right of number one and one in the right of number one, two unit numbers ten and eleven are easily made.

How a Zero placed just in the right position of the units 1 to 9 increases their values ten times and the same process makes hundred and thousand from ten and hundred respectively, is described in the following verses :

2. *Ekacha me dasa cha me apvaktar osadhe.*
Rtajata rtavari madhu me madhula kara.
Dve cha me vinsatishcha me.....
Trischa me trinsachcha me .....
Chatasrascha me chatvarinsachchame .....
Pancha me panchasachcha me .....
sat cha me sastischa me .....
sapta cha me saptatischa me .....
Asta cha me asitischa me .....
Nava cha me navatischa me .....
Dasa cha me satancha me .....
Satancha me sahasrancha me .....

Atharva V. 15 1-11

Translation—

Used in performing *yajna* and full of juicy potentialities the herb make us regain health if we are attacked by one disease or ten, by two or twenty, by three or thirty, by four or forty, by five or fifty, by six or sixty, by seven or seventy, by eight or eighty, by nine or ninety and by ten or hundred or by hundred or thousand.

In these verses the following numbers are explicitly mentioned :

1	—	10	6	—	60
2	—	20	7	—	70
3	—	30	8	—	80
4	—	40	9	—	90
5	—	50	10	—	100
			100	—	1000

This statement indicates :

that ten times one make 10
that ten times two make 20
that ten times three make 30
that ten times four make 40
that ten times five make 50
that ten times six make 60
that ten times seven make 70
that ten times eight make 80
that ten times nine make 90
that ten times ten make 100
that ten times hundred make 1000

Here in these verses we find not only the numbers of two digits but also the numbers of three and four digits. By this description it is quite clear that the rule adopted in making various numbers from 10 to 90 does not stop on ninety but also may be applied further in making the numbers of three and four digits and further on. Besides, twenty third hymn of the 19th Book of Atharvaveda gives the following numbers :

4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 19.

Numeration :

4. *Ima me agna istaka dhenavah*
santveka cha dasa cha dasacha satancha
sahasran-chayutamcha chayutamcha
niyutamcha niyutancha prayutancha
prayutamcharvudamcha nyarvudam
cha samudrascha madhyanchantascha
eta me agna istaka dhenavah santvamutramusmin
loke.

Yajuh. XVII. 2

Translation :

O wise man ! may the bricks of these mentioned numbers properly arranged in the *yajna kunda* be the source of prosperity for us like milk giving cows in this life and also in the other life.

eka
Dasha
satam
Sahasram
Ayutam
Niyutam
Prayutam
Arbudam
Nyarbudam
Samudrah
Madhyancha
Antascha
Parardhah

In this verse *Ayutam* stands for ten thousand and *niyutam*

for lac. *Prayutam* denotes ten lacs and crore is not mentioned. Similarly *arbudam* is used here for ten crores and *nyarbadam* stands for *arab*. *Kharva, nikharva, mahapadma* and *shanku* are not mentioned. *Samudrah* is here meant for ten *shankha* and the digit of *dasha sankha* has been mentioned. By mathematical method we find here used the number of 19 digits. The verse places an ordinary man in the sea of Zeros.

Addition Substraction
Multiplication and Division } These are given in the following verses:

5. *Eka cha me fisrascha me tisrascha me pancha chame pancha chame sapta cha me, sapta cha me nava cha me, nava cha me, ekadasa cha me, ekadasa chame trayo—dasa cha me, trayodasa chame panchdasa cha me, panchadasa cha me saptadasa cha me, saptadasacha me navadasa cha me navadasa cha ma ekavinsa-tischa me, eka vinsatischa me trayovinsatiocha me trayovin satishcha me panchvinsatisbcha me pancha vinsatischa me saptavinsatischa me sapta vinsatischa me navavinsatischa me nava vinsatischa me ekatrinsachcha me ekatrinsachacha me trayastrinsachcha me yajnena kalpantam.*

Yajuh. XVII/ 24

6. *chatrasascha me astau chame astau chame dvadasa cha me, dvadasachame sodasacha me sodasa cha*

me vinsatischa me, vinsatischa me chaturvinsatischa me, chaturvinsatischa me astavinsatischa me astavinsatischa me dvatrimsatcha me, dvatrinsachaha me sattrinsachcha me, sattrin sachha me chatvarinsachcha me chatvarinsa chcha me chatuschatvarinsachcha me, chatus— chatvarinsachcha me astachatvarinsachcha me yajnena kalpantam.*

Yajuh. XVIII. 25

7. *Indro dadhicho asthabhir vritranyapratiskutah. Jaghana navatirnava.*

Rg. I. 84. 13

8. *ye te ratri nrichakso drastaro navatirnava, ashitih santyasta uto te sapta sapta tih.* 3. *Sastischa sat cha revati panchasat pancha sumnayi, chatvaraschatvarinsachcha trayastrinsachcha vajini.* 4. *dvau cha te vinsatischa te ratryeka dasavamah* 5.

Atharva IXX. 43.35

Translation :

5. The numbers mentioned in the verse viz. 1, 3, 3; 5, 5; 7, 7; 9, 9; 11, 11; 13, 13; 15, 15; 17, 17; 19, 19; 21, 21; 23, 23; 25, 25; 27, 27; 29, 29; 31, 31; 33, may be for my use and they may solve various mathematical problems through the process of addition, substraction, multiplication and division etc.

6. May the numbers mentioned as 4; 8, 8; 12, 12; 16, 16; 20, 20; 24, 24; 28, 28; 32, 32; 36, 36; 40, 40; 44, 44; 48

be for my mathematical use by the process of addition and substraction etc.

7. Indra, the powerful king whom enemies cannot ever overpower, kills his foes by the strategies of wise commander just like the unit nine divides all its multiplied units upto ninety.

8. The natural powers enumerated in numbers like 99, 88, 77, 66, 55, 44, 33, 22 and eleven and which directly have their connection with man in the night that is the source of rest, ease and strength. May that daughter of sun, the night, be for our protection.

For example take the *Yajurvedic* verse given in the serial No. 5 and add one to each or deduct one from each you will find the multiplication of two.

(*a*) 1 + 1 = 2
3 + 1 = 4
5 + 1 = 6
7 + 1 = 8
9 + 1 = 10
11 + 1 = 12
13 + 1 = 14
15 + 1 = 16
17 + 1 = 18
19 + 1 = 20
21 + 1 = 22
23 + 1 = 24
25 + 1 = 26
27 + 1 = 28
29 + 1 = 30
31 + 1 = 32
33 + 1 = 34

(*b*) 1 — 1 = 0

3 — 1 = 2
5 — 1 = 4
7 — 1 = 6
9 — 1 = 8
11 — 1 = 10
13 — 1 = 12
15 — 1 = 14
17 — 1 = 16
19 — 1 = 18
21 — 1 = 20
23 — 1 = 22
25 — 1 = 24
27 — 1 = 26
29 — 1 = 28
31 — 1 = 30
33 — 1 = 32

Write the numbers read in the verse in a line in perpendicular style without their dual, and add the units from one to 15 to them beginning from third digit, you will find that thus calculated numbers will make the multiplication of three.

(c) 1 } 3
3 }
5 + 1 = 6
7 + 2 = 9
9 + 3 = 12
11 + 4 = 15
13 + 5 = 18
15 + 6 = 21
17 + 7 = 24
19 + 8 = 27
21 + 9 = 30

23 +10 = 33
25 +11 = 36
27 +12 = 39
29 +13 = 42
31 +14 = 45
33 +15 = 48

Again we find in the verse that numbers mentioned by the difference of two are susceptible to repercussion of square. The units mentioned are the square-roots and in multiplying them by them we will have squares.

(d) 3, 3 } 3 x 3 = 9

5, 5 } 5 x 5 = 25

7, 7 } 7 x 7 = 49

9, 9 } 9 x 9 = 81

11, 11 } 11 x 11 = 121

13, 13 } 13 x 13 = 169

and further on

Further there is given a unique method of making square. Write the numbers mentioned in the verse without their duality in perpendicular line and add them upto the digit of which square is desired. If one desires the square of three he

should add the number 1, 3, 5 and total will come nine which is the square of three.

(*e*) For square of 4.

4 digits

1
3
5
7

+ 16

(*f*) For square of seven

7 digits

1
3
5
7
9
11
13

49

This method may be followed in other cases also. It should also be borne in mind that the numbers mentioned here as square-roots are odd. Square-roots of even numbers are mentioned in the verse quoted on the serial No. 6.

The numerical units read in the *Yajurvedic* verse quoted on serial No. 6 are directly a multiplication of four. By writing units one to twelve against the numbers mentioned in the verse and calculating them by the method of addition the multiplication of five may be found.

(*g*)

4
8
12
16

20
24
28
32
36
40
44
48

(*h*)

4	+	1	=	5
8	+	2	=	10
12	+	3	=	15
16	+	4	=	20
20	+	5	=	25
24	+	6	=	30
28	+	7	=	35
32	+	8	=	40
36	+	9	=	45
40	+	10	=	50
44	+	11	=	55
48	+	12	=	60

Besides this here in the verse we find the square-roots and squares of even numbers.

(*i*)

8	x	8	=	64
12	x	12	=	144

In these two *Yajurvedic* verses the term *yajna* plays very important role. It is used for the process of arithmetic and mathematics. By these process various mathematical problems may be solved.

In the *Rgvedic* verse quoted on the serial No. 7 we come

across multiplication of unit nine :

(*j*)

9
18
27
36
45
54
63
72
81
90

All these numbers upto ninety may be divided by nine and if their digits are added together the sum of all the numbers thus become nine :

(*k*)

9	=	9					
18	=	1	+	8	=	9	
27	=	2	+	7	=	9	
36	=	3	+	6	=	9	
45	=	4	+	5	=	9	
54	=	5	+	4	=	9	
63	=	6	+	3	=	9	
72	=	7	+	2	=	9	
81	=	8	+	1	=	9	
90	=	9	+	0	=	9	

It is also a fact which comes to light in the verse that the unit nine multiplied by any number upto any digit if calculated by additional process in digitary manner, becomes nine. In the case of 99 if two 9 are added together they become 18 but their addition will become 9. We also come across in the structure of numbers of multiplication of nine

that the numbers 18, 27, 36 and 45 have become respectively 81, 72, 63 and 54 by changing their places.

(*l*) $111111 \times 9 = 999999 = 9+9+9+9+9+9..54$
$= 5+4 = 9$

(*m*) $99 = 9+9 = 18 = 1+8 = 9$

(*n*)

9	=	9
18	=	81
27	=	72
36	=	63
45	=	54

The *Atharvanic* verses quoted on serial No. 8 give the number 99, 88, 77, 66, 55, 44, 33, 22 and 11 which are the units of the multiplication of eleven. If the units from 1 to nine are placed against them and added to them there will result the multiplication of twelve.

11	+	1	=	12
22	+	2	=	24
33	+	3	=	36
44	+	4	=	48
55	+	5	=	60
66	+	6	=	72
77	+	7	=	84
88	+	8	=	96
99	+	9	=	108

There are some other statements in the vedas regarding mathematical calculations and they are given here :

a. *sastim sahasrasvasya ayutasavam ustranam*

vinsatinsata. Dasa syavinam sata dasa tryarusinam desagavam sahasra.

Rg. 8=46. 22

Here in the verse we find the description as follows :

1. sixty thousand mares
2. Ten thousand camels
3. Three thousand sheep
4. One thousand she asses
5. Ten thousand cows.

b. *Trini shata tri sahasranyagnim trinsatcha deva nava chasaparyan*
Auksanghritairastrinan varhi raṣma adid hotaram nyasadayanta:

Rg. 10=52=6

In this verse the number of devas has been described 3339.

c. *shatam te auytam hayanan dve yuge trini chatvari krinmah. Indragni visve devastena manyantam ahriniyamanah.*

Atharva. 8. 2-21

Translation :

O man ! I, the Lord of the universe, make for you every thing in a *yuga* for hundred *ayuta* years by adding two, three and four into digits (i.e. four, three and two according to method of calculation. The physical elements including

air, fire, and the sun etc. be continued to yield you favour till that period.

Here in this verse the time of creation till its' dissolution has been described 4320000000 years. Here *yuga* has been applied for the time of creation. *Hayana* has been used for *samvatsara*, the year. Number calculated by the process of *ayut* x 100 becomes 0000000. According to method that digits always begin by left side, the digits 2, 3 and 4 in this way be written as 4, 3, 2.

Example :

Ayuta x *satam* = 00000 x 00 =0000000

Addition of 4, 3, 2 as digits makes=4320000000

Geometry

1. *kasitprama pratima kim nidanam ajyam kimasit paridhih ka asitchhandah kimasit praugam kimuktham yaddeva deva mayajant visve.*

Rg. 10. 130.3

2. *Abhisva Vristim made asya yudhyato raghviriva pravane sasru utayah.*
Indro yad vajri dhrismano andhasa bhinadvalasya paridhinriva tritah.

Rg. 1. 52-5

3. *Yo akrindayat salilam mahitva yonim kritva tribhujam shayanah. Vatsah kamdugho virajah sa guha chakre tanvah parachaih.*

Atharva. 8. 9.2

4. *Tritah kupe avahito devan havata utaye.*
Tachchasusrava brihaspatih krinvan anhuranaduru.

Rg. 1-105. 17

Translation :

1. What was the measurement, what was the outline, what was the purpose, what was the ghee, what was the circumference, what was the metre, what was *prauga* and what the *uktha* of that *yajna* which *devah*, the cosmic elements performed in the beginning of creation cycle.

2. In the pleasant strife of Indra, the electricity with *vritra*, the cloud, atmospheric airs (*marutah*) go to cooperation just like rivers flow in the low places. This electricity equipped with lightning and being uncontrollable in its power strongly strikes the clouds in such a manner as the external triangle crosses the circumference of circles.

3. The area which making a triangular figure and [illegible] hid therein, makes it eloquent itself being dependent on the properties of space, with all its particulars, makes its abode in the heart of the figure.

4. The triangle fell down in the circle and called the learned men for its safety. The Geometrician attended its call and made it safe by enlarging its angles.

The *Rgvedic* verse quoted on serial No. 1 gives three main points of Geometry. These points are—the measurement of the *vedi*, its outline and its circumference. The terms *prama*, *pratima* and *paridhib* raise very salient points of geometrical consideration. We find in vedic literature the vedis (Altars) of various forms. Three of them are very important. One of these three is a square in shape and is generally used for performance of *yajnas*. The other one is of circular form. It is just like a circle. The last one

is of the form of half-moon or half circle.

The verse given on serial No. 2 discloses more important factors of geometry. Herein we find a reference to the geometrical conception of a ratio of circumference to diameter of a circle. The verse very explicitly says—'triangle crosses the circle. It is generally known to all of us that this ratio of circumference to diameter of a circle must be more than three. It may be exemplified as under :

$$\frac{\text{Circumference}}{\text{Diameter}} \quad \frac{22}{7} = 3\frac{1}{7}$$

It is a belief that diameter is almost one third of the circumference, therefore, the ratio is called *trita*, the triangle. This fact should not be ignored that if the circumference is 22, the diameter must be more than 7. But in this verse also has been drawn a conception in which the ratio is exactly one third of the circumference. Under such a circumstances the diameter will cross the circumference and will not actually fit in.

Here this fact should also be realized that there are three kinds of *trita* in vedic geometrical system. Exact *trita*, less *trita* and more *trita*. When the *tritas* are more and less they respectively cross and submerge in the circle. When *trita* is neither more nor less but exact, it actually fits in the circle. Thus the method of pie π $\frac{22}{7}$ has been referred to in this verse.

The verse given on serial No. 3 describes the area of a triangle. Here it has been enlightened that the area is lying hidden in the triangle. But it is a reference which directly touches that triangle which may be called equal-angled triangle. Rule behind that is 3, 4 and 5. Another thing which has been directly referred to in this verse is that the science of geometry is entirely based on the property of space.

The *Rgvedic* verse quoted on serial No. 4 refers to the *trita* which is less. When geometrician makes the triangle exact $\frac{22}{7}$ it becomes actually fit in the circle. This indication is quite clear here that *trita* (triangle) has got sunk defectively in the well which is cylindrical. If ratio is only 1/3 then it would be squeezed in that. Thus *trita* was obviously caught in such a cylindrical diagram and it called out mathematician who detected the irregularity. The mathematician saved it. Here the implication is clear enough that if the ratio is more or less than $\frac{22}{7}$ then the diameter will not be correctly set but will cross through like a chord.

In the vedas *yajna* has been described as the paramount factor of sacraments and vedic rituals. *Yajna* is performed in the *Vedis*. The forms of vedis have been described in *kalpa* and *Brahmanas*. *Sulva sutras* which are the parts of *kalpa* give the form and size etc. of various *Vedis*. Square-shaped *vedi* generally comes in the use of performing *yajnas*. This square-shaped *vedi* is nothing else but two triangles put opposite to each other. Thus two triangles arranged in opposite position to each other make one square. Further it is obvious from the shape of square-formed *vedi* that it is the measurement of flat. To measure flat area the vedi which I mean to say square yards, square miles etc. are used.

Connected with *vedis* we find in the veda the idea of *Vishnu* who is said to have been found in *vedi*. *Vishnu* according to Brahmana literature means *yajna*, sun God and many other things. But so far as the context of vedi is concerned Vishnu more clearly and specifically means *yajna*. *Yajna* is performed in *vedis*, therefore it is a fact that Vishnu is found in *vedi*. In the Vedas we come across the hymns of *Vishnu* wherein this fact has been made eloquent that *Vishnu* compasses the whole universe in three steps. We are not concerned with the various meanings of the *Vishnu*. Ours is

only the concern as far as it is connected with the geometrical conception. How *Vishnu* can be found in *Vedi* geometrically is the main question to be considered here. But before considering this aspect of *Vishnu* it is necessary to find out as what are the three steps of *Vishnu*. *Vishnu* is known as a dwarf. How can a dwarf measure the whole of the universe in three steps ? It is a problem which seeks its satisfactory solution. *Vishnu* may here be taken as triangle. Three steps are the three angles of it. By these three steps the whole spatial property can be measured. Flat can be measured by the square while the whole of the space can be measured by triangle. Space has three dimensions. These are height, length and breadth. So *Vishnu* measures all the space in three steps. The mystery around the fact that *Vishnu* can be found in *Vedi*, becomes also clear on this ground. *Vedi* is in square form. If it is devided by a cross from its any angle to any angle it results into two opposite triangles. Thus it becomes as clear as anything that *Vedi's* square form is the result of two *Vishnus* in opposite position.

This remarkable conception of geometrical treatment of *vedis* was vastly elucidated in the *sulva sutras*. Mr. Thebout studying *sulva sutras* came to certain convincible and irrefutable conclusions. He says, "These *sulva sutras*, as we have stated before, dated from the eighth century before Christ. The geometrical theorem that square of the hypotenuse is equal to the squares of the two sides of a rectangular triangle is ascribed by the Greeks to Pythagoras, but it was known in India centuries before and Pythagoras undoubtedly learned this rule from India."

It is the 47th theorem of the present Euclidian geometry. This may be expressed more clearly in the following manner :

(1) A square made on the diaognal of any square becomes

two times more in area and

(2) a square made on the diagonal of an oblong becomes equal to the square of the two unequal sides of the same oblong.

Shatapatha Brahamana gives the form of *Mahavedi*. First we quote here the wordings and after-wards its contents.

Te ye ha tatha kurvanti etam ha te pitaram prajapatim sampadaschyavayanti. Ta istva papiyanso bhavanti sa yavatasa saptavidhasya vedihtavatim chaturdesha kritva ekasatavidhasya vedim vimimite. Atha sattrinsat prakrama rajjum mimite tam saptadha samasyati tasyai trin bhagan pracha upadadhati nihsrijati chaturah.

Shatapatha X. 3.7-8.

Translation :

Indeed, those who do it in that way, deprive their father *prajapati* of his due proportions, and they will become the worse for sacrificing, for they deprive father *prajapati* of his due shares. As large as this *vedi* of the seven-fold is fourteen times, as large as he measures out the *vedi* of the one hundred and one fold *vedi*. He now measures off a cord thirty six yards long, and folds it up into seven equal parts; of this he covers the three front eastern parts with bricks, and leave four parts free.

(*Sacred Books of the East series, Vol. XLIII, P.* 310)

Here in this quotation of *Shatapath Brahamana Mahavedi* is described to be of the form of an isosceles trapezium, in which the unit of measure is $14\frac{3}{7}$.

Algebra

Algebra is dependent on geometry and arithmetic. It is a development not the original science. Therefore it is not expected to have a clear reference in vedic hymns. It was developed on the ground of these two parts of mathematics by the Aryans. This has a very clear mention in later vedic literature. Decimal notation was invented by the Aryans.

So far as it is derived from geometrical calculations, it can be easily traced and understood from the equation $ax=b^2$ which is nothing but a geometrical expression, transforming a square into a rectangle having a given side.

Laplace, the great scientist of his time eulogizes the attainment of Aryans in this branch of mathematics. He says, "How grateful we should be to the Hindus who discovered this great decimal system that did not occur to the minds of such mighty mathematicians as Archimedes and Appollonus."

CHAPTER III

PSYCHOLOGY

Psychology is the science of nature, functions and phenomena of mind. In its headlong struggle it has occupied its place in the form of a large number of branches. The various branches of psychology are, at present, known as: Pure Psychology; Individual Psychology; Group Psychology; Social Psychology; Applied Psychology with its branches; Educational Psychology. Industrial Psychology and Religious Psychology; Animal Psychology; Comparative Psychology; Abnormal Individual Psychology; and Abnormal Group Psychology. There are some other theories which have a very close relation with the Educational Psychology. They are Behaviorism. Existentialism, Psycho-analysis and Purposism. This science has a very vast area. Our scope and purpose do not allow us to give more details on these branches. To be too meticulous means to have a voluminous scope which is not desired here. Here are few *Vedic* verses which we want to give with their correct rendering and proceed onwards with the subject.

Yajjagrato durmudaiti daivam tadu suptasya tathaivaiti. Durangamam jyotisam jyotirekam tanme manah sivasankalpa mastu.

Yajuh. XXXIV.1

That efficacious entity which wonders far when a man is in his wakeful phase and strolls similarly while he is in his slumbering state and that which traverses far and wide, and

is the light of all organic lights; may that mind of mine be predominated with noble intentions.

Yena karmanyapso manisino yajne krinvanti vidathesu dhirah. Yadapurvam yaksmantah prajanam tanme manah sivasankalpamastu.

Yajuh. XXXIV. 2

Through whose operative force the men of wisdom and perseverance perform the feats of *yajna* and warfare etc. and that which is an extraordinary cohesive power placed in innermost recess of all creatures; may that mind of mine be predominated with noble intentions.

Yatprajnanam uta cheto dhritischa yajyotirantarmritam prajasu. Yasmanna rite kinchan karma kriyate tanme manah sivasankalpamastu.

Yajuh. XXXIV. 3.

That which is endowed with power of cognition, recollection and cohesion and that which is the perpetual light amongst all the sensuous susceptibilities and that without whose agency no act can be performed, may that mind of mine be predominated with noble intentions.

Yenedam bhutam bhuvanam bhavisyat parigrihitam amritena sarvam. Yena yajnastayate saptahota tanme manah sivasankalpamastu.

Yajuh. XXXIV 4.

That immortal entity by which all the past, present and future are comprehended and by whose operations *saptahota*

yajna, the seven-fold psychic phenomenon or the function of seven organic powers, takes place; may that mind of mine be predominated with noble intentions.

Yasmin richah sama yajunsi yasmin pratisthita ratha-nabhavivarah. Yasminschittam sarvamotam prajanam tanme manah sivasankalpamastu.

Yajuh. XXXIV. 5.

In which the *Rg*, the *Sama*, the *Yajuh* and the *Atharva* are placed together like spokes in the naval of the chariot-wheel and in which the entire power of recollection of all the creatures is inter-woven; may that mind of mine be predominated with noble intentions.

Susarathirasvaniva yanmanusyanneniyate abhisubhi-rvajina iva. Hritpratistham yadajiram javistham tanme manah sivasankalpamastu.

Yajuh. XXXIV. 6.

As a skilful driver of chariot drives the horses with reins similarly the mind controls mankind. That which resides within the heart and is most swift and agile; may that mind of mine be predominated with noble intentions.

Vi me karna patayato vi chaksurvidam jyotirhridaye ahitam yat. Vi me manascharati duraadhih kim svidvaks-yami kimu nu manisye.

Rg. VI. 9.6.

O, Lord ! my ears go hither and thither, mine eyes wander all around; even the light which implanted within

my heart falls on distant objects and my mind wanders far far away, under the circumstances what shall I speak and what shall I accept.

We find the following salient points in these above quoted verses :

1. Man's mind goes far away when he is in wakeful phase.
2. It wanders far far away when a man is in his sleeping state.
3. Mind is the only light of all sensuous lights.
4. Persons of wisdom and persons of perseverance perform their acts through mind.
5. It is an extraordinary power which coheses all grains of knowledge acquired through sensuous perceptions.
6. It is placed in the hearts of creatures.
7. Mind is endowed with the faculties of cognition, recollection and cohesion.
8. It is a perpetual light which remains in all sensuous susceptibilities.
9. Without mental operation no action can be performed.
10. The past, present and future are grasped by mind.
11. Seven-fold mental phenomenon takes place through the operation of mind.
12. Seven organic and psychic powers perform the act of perception.
13. All sort of knowledge is gained through mind.
14. Mind controls men like a skilful driver of chariot.
15. It resides in the heart and is agile.
16. Senses hunts their objects hither and thither.
17. The individual soul resides in heart but it is led far away by mind.

Man's mind goes far away and wanders similarly in sleep also, is such a fact which needs not to be interpreted. It is realised by all. No one can deny this fact. In the state of awakening mind perceives through cognitive senses and acts through active senses. It gains the grains of knowledge from sensuous sensations. In sleep it reflects the perceived objects whether they are perceived a fresh or perceived long long ago.

'Mind is the light of lights' is a fact which reveals that there are many lights. These lights are the lights of senses which perform the feat of perception. A man's limbs work and hunt the objects outside. This hunting procures the true picture of the objects and present them before the mind. Soul, the human spirit has direct contact with mind and mind in its turn with the concerned organs and the organs with their respective objects and then function of cognition becomes accomplished. Without this no cognition can take place. Thus the mind is the light of all lights which enlighten the external objects to mind and soul through their own operations. Mind coheses all these grains of knowledge and consequently the rememberance becomes preserved in the human soul. If there is no cohesion by soul through mind there would be no reminiscence at all. Human spirit is the main source of all sort of reminiscential activities but it works out them through the mind.

Mind has its place in the heart of the creatures. Those who believe that mind resides in brain are sticking to a half truth not to a complete truth. Mind is placed in the heart but it has its cell in mind through which it works.

Cognition, recollection and cohesion are the important faculties of mind. There is no necessity of throwing more light on this subject. Every student of psychology is well acquainted with this fact.

Mind's function is of two-fold. It works internally and

externally both. In its external working mind's operation is performed through cognitive and active limbs. But in internal working mind does not take help of these limbs.

It feels pleasure and pain etc. through its own agency. Therefore, it is not only the light which has its dependence exclusively on the senses but it is a perpetual light.

It is entirely right and perfectly correct that actions cannot be performed without mind. In our bodily frame we have cognitive senses as well as active senses. Active senses are the instruments which are used to accomplish an action. The soul which is the master of the body inspires the mind and the mind in its turn operates to contact the active limbs and consequently action takes place. So far as the voluntary actions are concerned, mind's performance seems to be very clear. In the involuntary action it is not realised as this sort of action is the out-come of soul's direct contact with limbs. The consciousness is mainly responsible for this.

Here we come across a very important philosophical fact described in the verses. This is concerned with comprehension of time. The past, present and future are realized by mind. Not only the things happened to be in past, present and future are grasped by the mind but the past, the present and the future, which are the conventions of time, are comprehended by mind. What is time ? It is a measurable form of continuity and externality of parts in all real process. More clearly it is constituted of the complex of relations of duration and succession in the experienced order of events. Time is infinite. All accounts of it agree in connecting it with change. We realise this change in the external things as well as the psychic phenomena. The flux or flow of time is comprehended in the mental modifications. There are five modifications of mind counted in *yoga* philsoophy of *Patanjali*. They may be innumerable but they are qualitatively classified under five heads. Mind

grasps only one knowledge at a time. More than one cannot be apprehended in its normal condition. This nature of mind gives a clear indication of comprehending the objects in order. Order is always in time.

Five modifications of mind according to *Patanjali* are: *Pramana*, true cognition; *viparyaya*, the false cognition; *vikalpa*, merely verbal cognition; *nidra*, sleep; and *smriti*, memory. The past, present and future are caught up by mind in their true nature. But when mind attains supernormal powers it can perceive the things without any obstruction of past, present and future.

Seven kinds of mental tendencies are enumerated as : Perception, Retention, Discernment, Comparison, Composition, Abstration and Ideation. These activities of mind are called the *Saptahota Yajna*.

Five cognitive senses, mind and soul are the seven powers which perform the perception. This has been also indicated by the word *saptahota*.

We find a very suitable simile in the 5th verse quoted before. This simile is '*rathanabhavi varah*', like spokes in the wheel. We can make two vast divisions of our mental tendencies. They can be called as 'centripetal tendencies and centrifugal tendencies. If our all tendencies be centripetal we cannot succeed in wordly sphere and dealings. We seek our contact with the external things for our food and clothes etc. But in this perpetual struggle of contact we are led far away from the centre. To control these centrifugal tendencies there arises the need of centripetal tendencies. Here it becomes a mathematical problem which we should always be aware of. Making a circle needs a centre andradius both. In absence of either of the two circle cannot be formed. The centre fixes its position and the radius its extension. When centre is fixed the extension of circle will be in conformity to its radius. A bullock tied in past

with a piece of rope in its neck will present a very good example here. He can make a radius from the fixed post, in any direction, to the extent which the piece of rope in its neck allows. It cannot form a radius which could be longer than the piece of rope. This piece of rope will fix the length of radius and the post its position. The soul in our body is the centre and our tendencies are radius. Thus good rests in maintaining the equilibrium of centripetal and centrifugal tendencies both. This fact has been revealed by the simile used in the verse.

CHAPTER IV

PHYSICS

The world before us is not only material. It is not merely the play of matter and energy. There are other forces working in its realm. These forces are the individual soul and the universal soul. We cannot interpret the history of the universe only materialistically. It is wrong to say that this is materialistic one. It is spirituo-materialistic. Therefore the phenomena of the universe cannot be considered merely in the light of matter and energy. Important roles in the world are played by God and soul also. There is one paramount conscious entity governing all the play of matter and energy. This is an all-controlling supreme cosmopsychic energy. In considering the physical world one should not neglect this Supreme Being. Thus, it is pertinent and most important factor to be realized that this world behind its scenes has three root-causes which are known as God, soul and matter. The veda takes this to be the sound philosophy. Here the subject under heading is concerned only with matter and energy. In considering the physical aspect of this world we are not going to neglect or overlook the spiritual aspect but the theme is concerned only with physical aspect therefore, we are proceeding onwards with the same.

Matter And Eternal Law

In the universe there is the kingdom of eternal law. All things and phenomena are pervaded by it. There is nothing which escapes its governance. Unity and unformity in the

world are the eloquent proof of it. Here are some verses from the Vedas with their English translations :

(a) *Trayah kesinah ritutha vichaksa'e samvatsare vapata eka esam. Vishvameko abhi chaste sackibhilr dhrajirekasya dadrise na rupam.*

Rg. I 164.44

(b) *Avirvai nama devata rtenaste parivrita. Tasya rupena ime briksa harita haritasrajah.*

Atharva. 10-8. 31

(c) *Asatcha satcha parme vyoman daksasya janman aditerupasthe. Agnirha nah prathamja rtasya purva ayuni vrisabhasch dhenuh.*

Rg. 10.5.7

(d) *Rtancha satyanchabhiddhat tapso adhyajayata. Tato ratryajayata tatah samudro arnavah.*

Rg. 10.190. 1

Translation :

(a) There are three luminous substances which are apprehended performing various operations of the universe according to law and order. One of them sows the seed in the beginning of the cycle for the creation of the world (i.e. Divine Spirit), one observes the world by all his powers (i.e. soul) and the one whose forces in active manifested forms are seen but essence is not visible (i.e. matter

in homogeneous state).

(*b*) Verily this matter perceptible in all its manifestations is an entity which remains ever-covered with the eternal law. The chain of these green trees are green by the essence of this eternal substance.

(*c*) Both of the manifest and unmanifest matter exist in the vastly extensive space which is the generating place of energy and is just like the bosom of Infinite Divine. In the beginning of the creation-cycle the self refulgent God is the originator of the law eternal for us, the souls and *prakriti*,them atter whose substance flows like milk in all objects (remains as the material cause of it.)

(*d*) From the all-pervading heat (generated by God) came into manifestation the Law Eternal and subtle matter. Thence was manifest the dissolution at its tern. Came into being thence the atmospheric ocean containing the mass of nebulae.

In the verses cited above there is seen an especial reference to matter, energy and law eternal. Though there is also a clear mention of God and soul, yet these elements do not form here our subject of elucidation. Matter, the material cause of the universe is covered, or governed, as we mean, by the eternal law of which the Divine Spirit is the only originator and controller. The unity and uniformity in nature are due to this law. Besides, there is found a mention of energy and its birthplace. Extending space is the birthplace of energy. But at the same time emphasis has been laid on the fact that it is Divine Being who is the main fountain of energy.

Energy :

1. *Bhurjajne uttana pado bhuyah asha ajayanta.*

Aditerdakso ajayata daksadvaditih pari.

Rg. 10-73-5.

2. *Yajnena yajmamayajanta devastani dharmani prathamanyasan. Te ha nakom mahimanah sachanta yatra purve sadhyah santi devah.*

Rg. 10-90-16.

3. *Yo yajno visvatas tantubbhistatah eka shatam devakarmebhirayatah. Ime vayanti pitaro ya ayayuh pravayapa vayetyasate tate.*

Rg. 10-131-1.

4. *Panchare chakre parivartamane tasminahtasthurbhuvanani visva. Tasya naksastapyate bhuribharah sanadeva, na shiryate sanabhih.*

Rg. 1-164-13

5. *Tamidgarbham prathamam daddra apo yatra devah samagachahant visve. Ajasya nabhavadi ekamarpitam yasmin visvani bhuvanani tasthuh.*

Rg. 10-82-6.

6. *Apsvasin matarisva pravistah pravistah devah salilanyasan. Brihanha tasthau rajaso vimanah pavamano harita a vivesha.*

Atharva. 10-8-40

7. *Agne jayasvaditir nathiteyam. brahmaudanam pa-*

chati putrakama. Sapta risayo bhutakritasta tva manthantu prajaya saheha.

Atharva. 11-1-1.

Translation :*

1. The earth came into being from the sun and the directions were known from the earth. *Aditi*, the primordial matter was manifest in names and forms from energy and energy from the primordial matter.

2. The elements of nature work out the manifested world through the force of integration and disintegration. The forces of nature were present in the primeval state of matter. These elements of nature combined with energy dissolve them in space where in were dissolved the elements and forces of nature of previous cycle.

3. Consequent on integration and disintegration the world, which is stretched out with the various threads of material substance and is further extended by the hundreds of elemental actions and reactions, is woven (composed) by the protective powers of nature which pervade through out it, like a textile piece, and on its being extended they maintain to strengthen the warp and weft of it.

4. The cycle or wheel of the universe in which the five elements are fixed like spokes is in motion and all the worlds are bound therein. The axle of this wheel bearing heavy load on it, does not get hot and does never become tottered as it has in it the resistance of eternal cause and is moving from the time immemorial.

5. In the beginning of creation the atoms of material substance caught the all-creating spirit in their embryo wherein all the natural forces got submerged. In the naval of eternal matter tehre was placed one Supreme Spirit wherein all the worlds havet heir sustenance.

6. The energy of the universe got dissolved in five elements of matter and natural elements in their material causes. One pure Supreme Spirit stood unaffected in the vast space governing affairs of the world.

7. All-pervading worldly heat becomes active at the time when *aditi*, the materia radica (the root-cause of the universe) tending towards the proginition under Divine control cooks the mess of cosmic creation. The seven physical elements which are the cause of manifested objects with all their effect-forms churn out (galvanise) this heat.

In these verses there is a very clear description of matter and energy. It should be borne in mind that energy and matter cannot be separated. Energy is property of substance which without substance can not exist. Terms *aditi*, *deva*, *pitarah* and *rishayah* etc. are used for matter, natural or material elements as well as energy. Vedic *angirsah*, *ribhavah* and *atharvanah* are sometimes according to their context used in the sense of *deva* and *rishi* and sometimes in the sense of *pitar*. *Yaska* in his *Nirukta* (11-18-14) has clarified this fact elaborately. Thus it may be said that *deva*, *pitar* and *rishayah* can be interchanged for each other in various contexts and according to their different operations.

Aditi is primordial matter. When it is in equilibrated state the role of energy does not become manifest. But it cannot be said that in that state matter is without energy.

Energy is the property of elements. More clearly it can be said that it is the property of *panch tanmatra*, five elements and their modifications. The term *bhuta* is applied for five elements. They are rare, therefore, they are called *suksma bhuta*. Their modifications the air, fire, earth, water and *akasa* are known as *sthula bhuta*. Further they are respectively known *bhuta* and *mahabhuta*. *Bhuta* means

matter combined with energy. The term *bhuta* is applied for them because of their being combined with energy. The following verse of the Vedic *shakhas* gives the description of these five *tanmatras*, the five elements :

> *Panchabhir dhata, vidadhddam yat tasam svasrirajanat pancha pancha. Tasamuyanti prayavena pancha nana rupani kratvo vasana.*

Mai 2-13-10; *Kathaka* 39-10 *and Taitiriya* 4.3.11.2

From the five elements the creator created the existing world. He gave birth to their coexistents, the five senses and five *mahabhutas*. Of these the five *mahabhutas* are the combinations which assume numerous forms, by wearing (entering in) various process of actions and reactions. It is also a well known philosophical fact that substances give rise to other substances and qualities give rise to other qualities. Energy being property of substance cannot give rise to substance. It should further be kept in mind that matter and energy cannot be separated and distinguished. Einstein, a great scientist of his time, himself accepts this plain fact and says that "matter and energy are indistinguishable" (The Universe and Dr. Einstein).

The World is Continuously in Motion

The world present to our eyes is not spherical. It is not static. In reality the world expands and contracts. It is always in motion and subject to change. We give here a sentence from a verse of the *Yajurveda* to prove this fact. The verse reads :

> *Isavasyamidam sarvam yatkincha jagatyam jagat.*

i.e. Whatever is present in this universe is in motion and is

pervaded by God.

Cyclic Creation and Cyclic Dissolution

Modern science has now to believe an idea of 'Elastic Bound". We don't want to go in details of such assumptions. We only want to deal with the subject under heading. Craming of terms has no value. It is an established fact that universe is not static and it is the changing universe. Creation and dissolution are the two grand forms of that change. These two are materialized by the process of change. But these changes are not haphazard. They have some solid grounds. They are felt cyclic. Creation has a cycle as well as dissolution. This universe of ours is not a new one. It was before dissolution and it would be again after chaos. Prior to the existence of the present universe there was a period of dissolution. In that state the material of the universe remained in equilibrated state and everything of that state was incomprehensible to our senses. Before that state of dissolution there was a previous universe which gradually passed into annihilation. At the end of dissolution there will come the state of creation. Every thing of creation may be traced to its material cause during the period of dissolution and similarly every thing present in the cause can be traced to its assuming previous form in the creation. Thus, it gives rise to an idea of cycle of creation and cycle of dissolution. This cycle is turning its wheel and going on from eternity.

We quote here some verses from *Rgveda*, with their English translation :

1. *Surya chaudramasau dhata yatha purvamakalpayat.*
   Divancha prithivim chantariksamatho svah.
   Rg. X. 190.3.

2. *Ayam pantha anuvittah purano yato deva udajayant visve. Ataschida janisistha pravriddho ma mataram amuya pattave kah.*

Rg. 4.18.1

3. *Vaisvanarah pratnatha nakam aruhad divaspristham bhandamanah sumanmabhih. Sa purvavat janayan jantave dhanam samanamajmani paryeti jagrivih.*

Rg. 3.2.12.

Translation :

1. *Dhata*, the upholder of the worlds created the sun and the moon, the heaven and firmament etc. just as he had created them in the previous cycles.

2. This path, subsequently realised, is the old eternal one from which were born upwards all the physical forces. None who comes into existence can violate this path based on the principle of cause and effect.

3. *Vaisvanara Agnih* as in olden times ascended to the *nakah*, the heavenly region, being helped by other physical forces it gives all sorts of richness to creatures, as before and pervades the common path of intermediary region.

In the first verse quoted above the following scientific facts have been revealed :

1. Rebound of evolutionary process has been pointed out cycle after cycle.
2. There is a direct reference to *dhata*, the upholder of the universe.
3. The present creation is just the same as was the former one.

4. The matter of which the universe is composed is not new. It exists now and existed before. It undergoes changes only and is never destroyed. It is indestructible. It always assumes the similar transformations in a regular order during creation and retards these during dissolution.
5. The changes which always follow one after another are in due order, and are thus governed by definite laws. The universe being the same in all cycles, the laws are also the same.

The second verse gives the following ideas :

1. All the physical forces come into their existence from their causes. And thus the causal law has its control over the process of cosmic order and dissolution.
2. Nothing happens without cause.
3. The law of causation is inviolable.

Thus, it appears that it is one of the fundamental laws of physics that the creation of the universe is governed by a course of cycles of dissolution and creation.

Atom

There are several verses wherein the idea of atoms has been given. Kanada in his treatise entitled *Vaisesika* expanded this idea into atomic theory. Particulars given by Kanada are based on the Vedic idea of atoms. Vedas tell us of the *pancha tanmatra*, the five rare elements which are the atoms of five gross substances known as *mahabhuta*. These five gross substances are *Agni*, *Vayu*, *Apah*, *Prithiyi* and *Akasa*. The *parmanus* or the atoms of these are called *panch tanmatra*, the five elements. Here are some verses :—

1. *Panchasvantah purusa avivesa tanyatahpuruse arpitani. Etattvatra pratimanvano asmi na mayaya bhavasi uttaro mat.*

Yajuh. 23.52

2. *Visvataschaksu visvato-mukho visvatobahuruta visvataspat. Sambahubhyam dhamati sampatatraih dyavabhumi janayan deva ekah.*

Rg. 10.81.3

3. *Yaddevah salile-susamrabdha atisthata. Atravonrityatam iva tibro renurapayata.*

Rg. 10-72.6.

Translation :

1. The individual soul took its seat in the five elements and these five are also given to it in the form of organs and objects. This is the real answer of the problem. Nothing more is to be comprehended here.

2. He whose eyes are everywhere, whose mouth is in all sides, whose arms are all around and whose feet are in all directions is the only one Divine Being who has created the heaven and the earth by the process of integration and disintegration of the atoms.

3. In the end of chaotic state the physical forces were endowed with the energy to assume the forms of creation. There did get rise the multitude of atoms full of motion.

In the first of the quoted verse we get the description of five elements while the second verse reads the term *sampa-*

tatraih for the atoms. In his *kusumanjali* commentary *Udayauacharya* also took the term *sampatatra* for atoms. The third verse describes the *permanus* or atoms by the term *renu*. *Renu* is atom. In this verse atom has been described to be full of motion.

These were the original terms on which *Kanada* based and adopted a six-fold classification of *padarthas*. His classification consists of substance, quality, activity, generality, particularity and inherence. Of these the first three categories of substance, quality and action possess a real objective existence. The other three, generality, particularity, and inherence, are products of intellectual discrimination.

So far as atom is concerned *Kanada* has a very convincing idea in this regard. According to him there can never come a time when there will be an utter annihilation of things. Though the structures built are perishable, the atoms of which they are built are not perishable at the same time. The components which unite to form a whole, and therefore were previously able to exist apart from such combination, possess the capacity of independent existence and return to it. Fabric after fabric in the visible world upto the terrestorial mass itself may be dissolved, but the atoms will remain ever new and fresh, ready to form other structures in the ages yet to come. The individual atoms combine with others and continue in that co-operative existence for some time and again disintegrate into their original solitary being to form new combinations. According to the *Vaisesika*, atoms do not exist in an uncombined state in creation. During creation they are said to possess a vibratory motion. Singly the atoms are not productive. If an eternal thing were singly productive, there would be an unceasing production and this would necessitate the admission of the indestructibility of the products also. Nor can triads be

productive, since a gross material object is the product of parts of smaller dimension than the object itself. The triad which is of a gross dimension must be regarded as a product of something that is itself a product. So dyads alone produce things. Even the dyads composed of two primary atoms are minute, and three of these produce the triad, which has a dimension not too small for apprehension. Both single atoms and dyads are invisible, and the least magnitude required for visibility is a triad said to be of the size of a mote in the sunbeam. Apparently, this is an exception to the general rule that the qualities of the causes produce corresponding qualities in the effects. When two atoms of white colour combine to produce a dyad, the latter will also have the corresponding white colour. But the atoms are *parimandalya* and the dyads are minute, and yet they produce a visible magnitude. That is why it has been said that the magnitude of the product depends on the magnitude of parts or their number or arrangement. As the number of the dyads increases, there is corresponding increase in the dimension of the product. The things produced by the union of atoms are not mere aggregates but the wholes. If we deny the whole we have only the parts, which may be subdivided further and further until we reach the ultimate parts of the imperceptible atoms. Atoms are imperceptible. Union of atoms produce aggregates and visibility in product because product is due to multiplicity of atoms and a particular feature which is known as *prachaya*. Denial of atoms will lead to *regresus ad infinitum*.

Here it should also be borne in mind that *Sankhya* and *Patanjal* systems which confine themselves to principles of cosmic evolution and *yoga*; and *Nyaya* and *Vaisisika* confining themselves to the methods of science elaborate the concepts of mechanic, physics and chemistry. Of these four the former two explaining the order and process of cos-

mic evolution arrived on the material cause of the universe besides other causes. The material universe with its manifold phenomena is presumed to be derived from *Prakriti*, the *mula* or the primordial force which is depicted as endless, immutable and indestructible and pervading in all of its effects, without shape or form. Finite universe is thus the product of infinite *prakriti* which has three kinds of substances and qualities. This *prakriti* is a substance and quality both blended together in an equilibrated state. Namely they are known as —

1. *Sattva* or the essence, the cause of different manifestations or phosphorescence ;
2. *Rajas*, the energy factor constituting the principle of work, by over-coming obsatcles or resistance and producing motion; and
3. *Tamas*, the inertia.

All energy is kinetic, and even potential energy is motion in imperceptible form. According to *Kapila* and *Patanjali* the material universe is the result of differentiation and integration within the formless *prakriti*. The three *gunas* which are substances and qualities both, found in forms of infinite diversity can neither be created nor destroyed. Thus the *prakriti* is material substance combined with energy. The order of evolution with the transformation of energies follows a definite law. The qualities or properties of things are only modes or forms of energy sometimes kinetic and sometimes potential. *Parinama* or cosmic evolution is two-fold process, creative as well as destructive, dissimilative as well as assimilative, katabolic as well as anabolic.

The ultimate constitution of matter is a question of the profoundest interest in the system of *Sankhya* and *Pytanjali*.

The following orders of particles are recognized or formulated viz. (1) original infinitesimal particles (*bhutadi*) or units of mass which are homogeneous, and susceptible to the influence of energy changes with disturbance of equilibrium; (2) infra-atomic particles charged with different kinds of energy (*tanmatra*); (3) five different classes of atoms into which matter is capable of subdivision, through combination of the five — sound, touch, colour, taste and smell· As result of this combination arise the *pancha-mahabhuta*— ether, air, fire, water and earth.

Kanada dealt with more particulars. He starting with a few hypotheses on the constitution of matter and its divisibility into atoms and molecules and the formation of the latter from the former through the operation of infra-atomic forces realized the general properties of matter, such as elasticity, cohesion, impenetrability, viscosity, fluidity, porosity etc.

Kanada's Doctrine of Motion

Sage Kanada conceived motion, both atomic and molocular, to be underlying the physical phenomena of sound, light and heat. Motion was defined somewhat in the manner of the modern definition, as change of place of a particle, two types of motion being distinguished, namely instantaneous (*ksanika*) and impressed motion or momentum (*vega*) which implies a series of motions. In one and the same particle there could be only one motion at one instant and this motion might be (1) rectilinear, i.e. in the same direction, upwards or downward, and (2) curvilinear, with successive changes in direction i.e. rotary motion (*bhramana*) and vibratory motion (*spandana*). Both are collectively called *gamana*. Various kinds of motion were recognized, viz. (*a*) volition (*prayatna*), (*b*) motion of body by

gravity (*guruttva*) which is ascribed to forces of attraction (*akarshana*) and which may be counterbalanced by volition (*c*) motion of fluids downward (*syandana*) and (d) unclassified motion, causes for which are unknown (*adrista*), examples of which are dispersion of gases, magnetic attraction, etc. He had a good grasp of the concept of forces and was able to indicate the resultant motion when a particle was subject to a number of forces or motions. The direction depends on the fact that pressure or impact is made in the original or opposite direction.

Here are some salient factors which may conclusively be drawn on the back ground of Kanada's Theory of atom with special reference to his commentators :

Heat —(1) Light and heat are different manifestation of the same substance.

(*Kanada*)

(2) Evaporation produces rare-faction and the phenomenon of ebullition of a liquid is caused by the equalization of the pressure of its vapour with that of surrounding air. *Shankar Misra*

Optics

(*a*) Substances were classified as transparent, translucent and opaque to light.

(*b*) The law of reflection and refraction of light and the phenomena of shadows were known and explained.

(*c*) Examples of the chemical effects of lights were known and studied.

(*Jayanta*)

(*d*) Lenses and mirrors of various kinds were used and ignition of combustible materials was brought about by focussing on them the sun's rays.

Magnetism—

Elementary magnetic phenomena, such as the attraction of iron by lodestone, or grass and straw by amber, were explained as due to unknown cause (*adrista*).

Heat, Light, Electricity And Magnetism

Different kinds of energy are due to different arrangements of the atoms of *Agnih*. Some of these cause heat, others light, and still others electricity and magnetism. Of these the heat atoms cause motion. This is not all. It should be remembered that there are *parmanus* of *vayu* also. Individually, they had, at first during the earliest phase of creation, no contacts with the *parmanus* of *Agnih*, and yet they enjoyed the inherent property of motion. Besides *Agnih* and *Vayu*, motion is inherent in the atoms of *Apah* and *Prithvi* also. In reality motion is the property of all the four kinds of atoms. Here are few verses of *Rgveda* which give clue of the real fact.

1. *Divaspari prathamam jajne agnirasmad dvitiyam pari jatvedah. Tritiyamapsu nrimana ajasramindhana enam jarate svadhih.*

Rg. 10. 45-1

2. *Samudre tva nrimana apsvantarnrichaksa idhe divo agna udhan. Tritiye tva rajsai tasthivansam apam-*

upasthe mahisha avardhan.

Rg. 10. 45.3

3. *Tvamagne dyubhistvam asusuksanis tvamadbhyas tvamasmanaspari. Tvam vanebhyas tvamosadhibhyas tvam nrinam nripate jayase suchih.*

Rg. 2-1-1

Translation :

1. Fire first got born in solar region in the form of the sun. Secondly it got its place in the earthly objects as *jatvedas* and thirdly it occupied its place in the atmosphere as *nrimanah*, the benefactor of creatures, in the form of electricity. He who knows the properties of fire appreciates it highly utilizing it in various ways.

2. *Nrimanah*, the gas called as *varuna* (*udana*) kindles this fire in ocean, the sun which is the source of eye-sight of all creatures enkindles this fire in heaven, and the clouds originate it in the third region, the atmosphere in cloud-waters.

3. *Agni*, the electricity is generated from the rays of the sun; it is born from water, it is born from stones (lodestone), it is born from water, it is born out of wood, and is born from herbs. It is the source of protection for men and is of the nature of sharp devastation. It creates light.

In the first two verses it has been very clearly mentioned that the *Agni* which has the properties of light, heat, electricity and magnetism, occupies its place in three regions, the heaven, earth, and the atmosphere. In the third verse the whole mystery has been disclosed and it has been emphasized that there are five sources which give rise to electricity.

In the second verse the description of submarine fire is also found, *Varuna* has been made responsible for its maintenance.

Cosmic Rays

Antariksa is called interstellar space in which remain stars, nabulae, galaxies and all the vast gravitational systems of outer space are incessantly in motion. On this ground Einstein described it a restless place. *Antariksa* in *vedic* terminology is the middle space between the earth and stars. Why is it called *Antariksa* ? *Riksas* mean stars and *antah* means between or middle. Thus *antariksa* is the interstellar space. So far as the *Vedic* idea about cosmic rays is concerned it gives an account of groups of cosmic rays. These groups may be described as under :

(*a*) *Vayo group which is a kind of Heat Waves* :

These heat waves are called *vayansi* in *Vedic* scientific terminology. Some verses from the *vedas* are quoted here to prove this fact :

(*i*) *Agne tava sravo-vayo mahi bhrajantearchayo vibhavaso. Brihadbhano shavasa vajam ukthyam dadhasi dasuse kave.*

Rg. 10.140-1

(*ii*) *Agniramrito abhavadvayobhi yadenam dyaur janayat suretah.*

Last half of the Rgvedic Verse 10. 45-8

(*iii*) *Jyotismatim aditim dharyat ksitim svarvatima*

sachete divedive jagrivansa dive dive. Jyotismati ksatram asati aditya danuaspati :

Rg. 1-136-. 3

(iv) *Vayo na ye shrenih papturojasantan divo brihtah sanunaspari. Asvesa-esam ubhaye yatha viduh praparvatasya nabhanurachyuchyavah.*

Rg. 5.59.7

Translation :

(*i*) This fire is enriched with various kinds of beams. Its powerful smoke blaze mightily. Most powerful agni gives various uses of its forces to him who is competent to know its operations.

(*ii*) *Agnih* became immortal or stable by the powerful smokes of beams which are manifest in the magnificent heaven.

(*iii*) This sun sustains the earth which seems shining (in the night). *Mitra* and *varuna*, the day and night visit this light-retaining earth every day punctually. Created by the dawn and dusk both these day and night have contact with the umbrella of light and give protection to all creatures.

(*iv*) *Marutah*, the cosmic rays like birds fall powerfully in all directions of interstellar space and ground and heavenly region. Both the physicists and Chemists realize the fact that the powerful rays of the *marutah* make the cloud water come down in the form of rain.

(*b*) *Marichi group of cosmic rays*:

Maruts in the *Vedas* are known as the important factors of physical force. They form the group of forty nine.

Their names have been given in *Yajurveda* (17, 80-85), *Rgveda* (5.53-10) and *Yajurveda* (33.45 and 7.37) use the terms *ganam marutam*, *marutam ganam* and *sagano marudbhih*, to indicate this fact. Since they form group therefore, they are called by the name of *gana*. The *marut* rays possess electric charges and are called *vatatvisah*, the rays of air. More appropriate term for them may be used as *auroras*. Some verses in this connection are quoted here.

(*i*) *vatatviso maruto varsa mirnijo yama iva susadrisah supesasah. Pisangasva arunasva arepasah pratvaksaso mahina dyaurivoravah.*

Rg. 5.57.4.

(*ii*) *Vidyunmahaso naro asmaaidyavo vatatviso marutah parvatachutah. Abdaya chin muhura hraduni vritah stanayadama rabhasa udojasah.*

Rg. 5.54.3.

(*iii*) *Sakanyatah subhvah sakamaksitah sriye chida prataram vabridhurnarah. Virokinah suryasyeva rasmayah shubham yatamanu ratha avritsata.*

Rg. 5.55.3.

(*iv*) *A vidyunmadbhir marutah svarkaih rathebhir yata ristimadbhir asvaparnaih. A varsisthaya na isa vayo na paptata sumayah.*

Rg. 1.88.1

Translation :

(*i*) The *marutah* are the possessors of rays which charge electricity, creator of rain, born like twain, similar in their operation and of nice forms. They possess white and red

rays, they are pure and of light weight, they permeate through the whole space.

(*ii*) The *marutah* are full of electrical charges, they are the sustainer of the planets, they shine in the clouds, they are always brilliant, and they cause conversion of cloud, into rain. They create lightning and arouse sound waves. By their activities they are the giver of rain and they are always agitated with activities.

(*iii*) Powerful, living together, and born together these *marutah* advance nicely in their operation to succeed. They are active and resplendent and similar in effect to solar rays and their rays follow the same solar track.

(*iv*) *Marutah* perform their operation through their rays which are possessed of electric charges; full of various motions; and multifarious activities and are endowed with forces creating lightning. They, encouraged with their activities, like birds be useful for us.

These *maruts* are called the offspring of *Rudra* in *Rigveda* 1. 33.1 and 1.85.1. In one verse of *Yajurveda* (III. 44), they are given the name *risadasah*, which means the eaters. This context gives rise to the idea that *maruts* eat up or consume the dead particles.

(c) *Vayu-group of Cosmic rays*

In the vedas it has been mentioned that *vayu* has penetrating lustre. *Yajurveda* (1.24) says that *vayu* is *tigmatejah*. *Tigma* means poignant or pungent. *Tejas* means lustre. *Vayu* possesses the poignant lustre therefore, it is called *tigmatejah*.

(d) *The Marut Groups of Cosmic rays*

In *Rigveda* 2.34.3, 2.34.2 and 1.31.1 *Maruts* are respec-

tively referred to as *Hiranya sipra, rukmavaksasah* and *bhrajadristayah*. In the context of 1.88.5 we find *marutah* being called *ayodamstram* which means the possessors of iron teeth. This description encourages us to say that *maruts* possess magnetic power. Not only this but all the electromagnetism in the vast space is due to those *maruts*.

Further we come across the verse 4th of hymn 87 of the book 1 (one) of *Rgveda* which makes us believe that there is an electro-magnetic field in space in which the *maruts* move. Again in *Rgveda* 1.64.5 we find a wonderful mention of the activities of *marutah*. The verse runs thus :

> *Ishanakrito dhunayo risadaso vatan vidyutas tavisebhirakrata. Duhantyudhar divyani dhutayo bhumim pinvanti payasa parijrayah:*
>
> *Rg.* 1.64.5

Translation :

The *Marutah* forming the north-east direction, communicating tremor and consuming dead particles produce air and electricity by their operations. They, giving convulsion to clouds of heavenly space and making them tremble, milk out water from them and cause rain to water the earth.

In this verse the term *ishankritah* is very very important. It indicates that *marutah* are the creator of north-east direction. This is really the direction of electro-magnetic field.

In *Rgveda* 1.45.14, 1.146.4 and 1.110.6 *marutah* have been described assuming the various shapes including men. Why are these shapes? These are due to the laws of pressure and frictions in the atomic molecules.

To carry rain is also a function of *maruts*. Here are quoted some verses in this connection :

1. *Udirayatha marutha samudrato yuyam vristim varsayatha purisniah.*

(1st half of the verse, 5th of the hymn, 55 of the book, fifth of Rgveda).

2. *Krishnam niyanam harayah suparna apo vasanah diyam utpatanti. Ta avavritrantsadanadrtasya adid ghriten prithvi vyudyate.*

3. *Samanam etadudakam uchchaityavacha.*
Bhumim parjanya jinvanti dva jinvantyagnayah.

Rg. 1.164.51

Translation :

1. These *maruts* raise the water from ocean to atmosphere and carry rain full of water.

2. The rays of light carrying water rise to the heaven in the *uttaryana* and return back *in daksinayana* from the atmospheric region and the earth is made wet with water of rain.

3. This is the same water which ascends upward through the rays (by the process of evaporation) and descends down again. Rain brings new life to earth, fires animate heaven.

Here the verses very clearly describe the process of vaporisation and moistification. Evaporation makes clouds and the moistening causes rains.

Ribhu—groups of Cosmic rays

This group belongs to solar rays. These rays are extremely resplendent. In *Rgveda* (1.110.4) the *Ribhus* have

been described as becoming mmortal by attaining the medium of the Sun. The sun has been known as *sahasrarashmih*, the thousand—rayed one. *Ribhus* are one kind of the solar rays. The whole one hundred tenth hymn of the *Rgveda*, Book one, is concerned with *Ribhus*. Here it needs not write more about them.

The Galaxies

The galaxies are also inhabitants of space. They are greater in number. *Rgveda* (10.68.11) gives a very clear picture of galaxies. The Verse reads thus :

> *Abhishyavam na krishnebhirasvam maksatrebhih pitaro dyam apinshan. Ratryam tamo adadhajyotirahan brihaspatir bhinad adrimvidadgah.*
>
> *Rg.* 10.68.11

Translation :

The physical forces made the heavenly region (the space) resplendent with the various stars just as the people decorate the black horse with gold ornaments. *Brihaspatih*, the all-pervading electricity placed the darkness into night and light in the day. It destroyed the vast umbrella of darkness and found out the rays of light.

What is *Brihaspatih* may here be known from the *Rgvedic* verse which is as under :

> *Brihaspatih prathamam jayamano maho jyotisah parme byoman. Saptasyas tuvijato raven vi sapta rashmih adhamat tamansi* :
>
> *Rg.* 4.50.4

Translation :

Brihaspatih, Agnih without flame and sparks i.e. all-pervading cosmic electricity was born first in the endless space of the solar region. It was of seven-fold power, seven-rayed and full of motion. It dispelled the spatial darkness by its operation of creating sound.

In the *Rgvedic* verse (10.68.11) the thick darkness of the unfathomable space has been resembled to the black horse. Just as a black horse decorated with golden ornaments seems beautiful in the same manner the thick darkness having been penetrated, the heavenly space becomes resplendent with the stars.

The galaxies which are made of a number of stars, are adornment of the stellar space. This idea has been clearly conveyed by the *Rgvedic* verse referred to above. According to *shatapatha Brahmana* (X. 4.4.4) the number of stars in our galaxy is 10800000.

The Dust in Space

In the vedas term *rajas* is used for the dust. These tiny dust particles are found in space. Word *pansu* is also meant to express these particles. In *Yajurveda* and also in *Rgveda* (1.22.17) term *pansure* has been used for the interstellar space full of particles.

Directions

Says *Rgveda*:

> *Yastatambha sahasa vijmo antan brihaspatis trisadhastho raven. Tam pratnassa risayo didhyanah purovipra dadhire mondrajihvam.*

Rg. 4.50.1

Translation :

The all-pervading cosmic electricity having magnetism in its fold establishes the ten directions by its magnetic power. It remains in the three regions—the earth, the atmosphere and the heaven. Seasoned persons, seers and scientists celebrated with wisdom give more importance to this form of undisturbed fire.

These directions are known as boundaries in space, though in reality there can be no boundary in space. Without earth there can be no imagination of direction. Therefore the verse quoted here describes the directions as *vijmoantan*, the ends of the earth.

The Sun

Birth :

1. *Yajnairatharva prathamah pathastate tatah suryo vratapa vena ajani. Agah ajad ushana kavyah sacha yamasya jatam amritam yajamahe.*

Rg.1.83.5.

Translation:

The *prathamah atharva*, the primeval fire by the process of certain combinations paved the way and then was born as the shining sun, the adherent of the cosmic laws. The sun attained the rays and beautiful tremor-creating air became its co-operator. We praise the controlling immortal power of this primal fire.

Matter composing the Sun:

Apam gambhan sida ma tva suryo abhitapsin ma agnir

vaisavanarah. Achchhinnapattrahpraja anuviksasvanu tva divya vristih sachatam.

Yajuh. 13.30

Translation :

May the constructive power of the sun (air) be reserved in the deepest heavenly abyss of the waters where the sun itself as well as fire could not heat it. This may see all the creatures in their complete forms and may there be Divine showers of blessings on it.

This verse gives indication that the sun is composed of *apah, agnih* and *vayu*. *Shatapatha Brahmana* correctly declares "Certainly the sun is the deepest abyss of heavenly *apah*, the water. The other salient factor of the sun has been very beautifully described in *Jaiminiya Brahmana* (1.3.30). It says that the sun is *samvatsara*. The outer part which shines is called *samvatsara* and the black in the interior is called *sarah*. This statement indicates that there is spot in the sun.

Besides, the sun has another content which is called *asmaprishnih*. This matter is responsible for the electricity in the Sun. *Shatapatha* informs us of the fact that it contains electricity. The word is a compound one which means containing electricity. This also creates colours.

Says *Rgveda* :

Uksa samudro arusah suparnah purva sya yonim pituravivesha. Madhye divo nihitah prishirasma vichakrame rajasasapatyantau.

Rg. 5.47.3.

Translation :

The shining beautiful atmospheric ocean which causes rain finds its place in the vast *antariksa*, the atmospheric region. The sun possessing *prishnirasma*, the matter responsible for solar electricity and colours got its position in the centre of heaven and it protects the whole world and demarcate the east and west directions of the interstellar space.

Various operations :

1. *Savita yantraih prithivim arammat askambhane savita dyamadrinhat. Asvamivadhuksadhunim antariksam aturte vaddham savita samudram.*

   Rg. 10-149.1

2. *Iravati dhenumati hi bhutam suyavesini manuse dasasya. Vyastabhna rodasi visnavete dadhi... prithivim abhito mayukhaih.*

   Rg. 7.99.3

3. *Indro divah pratimanam, prithivya visva veda savana hanti susnam. Mahim chid dyamatanot suryena chaskambha chit kambhanena skabhiyan.*

   Rg. 10.111.5.

4. *Rupam rupam pratirupo babhuva tadasya rupam pratichaksanaya. Indro mayabhih pururupa iyate yukta hyasya harayah satadasha.*

   Rg. 6.47.18

5. *Sapta yunjanti rathmekachakram eko asvo vahati saptanama. Trinabhi chakram ajaram anarvam yatrema visva bhuvanadhi tasthuh.*

Rg. 1.164.2

6. *Brahma jajnanam prathamam purastat visimatah surucho vena avah. Sam budhnya upama asya visthah satascha yonim asatasch vivah.*

Atharva. 6.1.1.

Translation :

1. The sun sustained the earth by its gravitational powers and estabilized the heavenly region in the supportless space. It made the clouds tremble like a horse in agitated atmosphere and milked out the ocean placed in atmospheric region.

2. The heaven and the earth become full of grains, full of cows and full of crops for giving their advantage to the people. The sun sustains these two and puts in its control the earth by its rays and gravitation.

3. The all-pervading electricity is the controlling power of heaven and the earth. All the activities are performed by it. It destroys repulsion and make the earth and heaven lightened by the sun. It is the greater among all supports and endured the heavenly region through its subsisting power.

4. The powerful electricity of the cosmos becomes the model of every form of physical force which it assumes for the expression of its essence. Or the sun is the substitute of all colours to express its main form (the whiteness.) By its various operations this sun forms multifarious colours and it possesses in it ten hundred kinds of rays.

5. The seven rays of the sun are yoked to a single wheel-

ed chariot (the wheel of the sun) and one white ray which is madeout of seven draws it. Three-navelled wheel the period of year (*samvatsara*) in which the summer, rainy season, and winter are included, is imperishable and irresistible and wherein rest all the worlds.

6. The grand sun appearing in the east first emits light by the rays named *suruchah* (brilliant rays) and makes the part of globe lustrous. It lightens the boundaries, directions of the space as well as various regions and the objects of the world. It makes known the place of gross bodies and rare ones.

There are other verses which give the description of various activities of the sun. But all of them are not referred to here. A few needed are quoted to show some very salient features:

1. *Asya vamasya palitasya hotustasyobharata madhyamo astyasnah. Tritiyo bhrataghrit pristho [illegible] trapasyam vispatim [illegible]apta putram.*

Rg. 1.164.1.

2. *Akrisnena rajasa vartamano nivesayan anritam martyancha. Hiranyema savita rathena devo yati bhuvanani pasyan.*

Rg. 1.35.2.

Translation :

1. Extendant in the atmospheric region this all-pervading air is the second associate or cooperant of the sun which is the source of evaporation and moistification and protection and to which all our appraisements and appreciations are due. The third associate of this is the fire which carries

ghee on its back in the *yajna* and ritualistic ceremonies. I, the scientist explore and examine the multifarious functions of the sun which has in it the seven rays.

2. Existent in the space with gravitational power or black particles this sun upholds all the worlds and makes everything visible and forms and colours of all objects clear and distinct.

Rgveda (1.84.15) reveals this fact that the moon is illumined by the sun. It is not luminous by itself. The solar rays assume their seat in the moon and make it illumined. *Yajurveda* (18.40) says that *susumna* ray of the sun illuminates the moon. It enters the moon and makes it luminous.

Estabilization and Expansion of the World

Here are some verses which throw light on the subject :

1. *Yah prithivim vyathamanam adrinhad yah parvatan prakupitan aramnat. Yo antariksam vimame variyo yo dyamastabhnat sa janasah indrah.*

Rg. 2. 12.2

2. *Sa prachinan parvatan drinhadojasa adharachiina akrinod apamapah. Adharayat prithivim visvadhaayasam astabhnat mayaya dyam avasrasah.*

Rg. 2. 17.5

3. *Dhira tvasya mehina janunsi vi yastatambha rodasi chidurvi. Pranakmrisvam nunude brihantam dvitanaksatram paprathachcha bhuma.*

Rg. 7.86.1

4. *Dyavaprithvi varumasya dharmana viskabhite ajare bhuiretasa*

Rg. 6.70.1

5. *Agne yatte divi varchah prithiyam yadosadhisvapsva yajatra. Yenantariksam Urvatatantha tvesah sa bhanurarnavo nrichaksah.*

Rg. 3.22.3.

6. *Tvamima osadhih soma visvatvamapo ajanmayastvam gah. Tvama tatantha urvantariksam tvam jyotisa vitamo vavartha.*

Rg. 1.91.22.

7. *Yo bhanuna prithivim dyam utemam atatana rodasi antariksam.*

Rg. 10.88.3

Translation :

1. He who upheld firmly the earth that staggered and set at rest mountains agitated, He who measured out the grand atmospheric region and supported the heaven, O men, is Indrah, the Electro-magnetic wave.

2. Indra, the electro-magnetic wave with its power made firm the clouds which were moving forward, made the downward rushing tendency of waters, ordained and held fast the earth that is the source of all life and resisted the heaven from falling by its wondrous power.

3. Powerful and stable are the operations of this atmos-

pheric air which uphold the grand heaven and the earth. It ordains the sun and the stars to become visible to us in two-fold manner (the sun in the day and stars in the night) and it expands the earth.

4. Both the heaven and the earth which are very much powerful, are held firm and stable by the operation of *varuna*, the air.

5. Praiseworthy is the lustre and vigour of *Agni* which is in heaven, which is in earth, which is in herbs and plants, and by which it spreads wide the firmament and that which is the source of brilliance, is ocean of light and the vision of creatures.

6. This *Soma*, the powerful electricity produces herbacious plants as well as waters and chunks of fire. It spreads out the firmament and it with its light removes the darkness.

7. The *vaisvanara agni* by means of its brilliancy expanded the earth and the heaven separately and the pair of earth and heaven (when they were not separated) and the middle region.

In the vedas we come across a large number of verses which inculcate the idea of expansion, estabilization and mounting up of the sun, and earth etc. All of them cannot be quoted here. It will demand a volume after volume if they are quoted and dealt with. We are here satisfied only with a few instances which are sufficient to prove the theme under our consideration.

The Earth :

1. *Adbhyah sambhritah prithivyai rasachcha visvakarmanah samavartatagre. Tasya tvasta vidadhadrupameti tanmartyasyā devatvamajan magre.*

Yajuh. 31.17

2. *Iyam vedih paro antah prithivya ayam yajno bhuvanasya nabhirayam somo vrisno asvasya reto brahmayam vachah parmamvyoma.*

Rg. 1.164.35

3. *Ayam gauh prishnirakramid asadan mataram purah. Pitaramucha prayantsvah.*

Yajuh. 9.6

4. *Ya gaurvartanim paryeti niskritam payo duhana vrataniravartah.*

Rg. 10.65.6.

Translation :

1. The *purusha*, in order to form the earth made the attenuated matter, the *apah* solid and thus made the earth.

2. This *vedi* is the centre of the earth and this *yajna* is the sustainer of the world. Thus soma, the electricity is the most powerful form of *asva*, the *agni*. The all-pervading space is the seat of all sounds and speeches.

3. This globe along with waters of the ocean moves round the sun in the space.

4. The earth revolves round the sun in her orbit and supplies the living beings with abundant juices and fruits of various kinds.

The first verse gives an idea that the earth has been created from the water. In *Brahmanas* the order of creation of earth has been described as follows :

1. Foam.
2. The shell treated to be the parent of clay.

3. *Suskapah*, dried water.
4. Saline earth.
5. *sikta*—silica.
6. *Sharkara*, Pebbles.
7. *Asma*, stone.
8. Iron, copper, etc. and Gold.
9. The plant life.

In the second verse it is distinctly said that *vedi* is the centre of the earth. *Vedi* stands for *vindu*, the point. Any point on a ball becomes its centre as the ball is round. So globe is round and any point of the globe is its centre. All this means that earth is round.

Says *Rgveda* (2.3.1.) that ignited *agni* is deposited in the earth. *Rgveda* further clears out this mystery. The verse reads as under :

Yamerire bhrigavo visva vedasam nabha prithivya bhuvanasya majmdn

Rg. 1.143.4

Translation :

Agnih which is the source of weather, to it placed the *bhrigus* from all sides in the navel of the earth, the strength of the *bhutas*.

Birth of Gold :

Says *Atharvaveda* (5.28.6.).

Tredhajutam janmanedam hiranyam agnerekam priyatamam babhuva. Somasyaikamh insitasya par-

apatata. Apamekam vedhasam reta ahuh tatte hiramyam trividastvayvise.

Translation :

Triply born by birth is this gold, from the atoms of *agnih* is one, it became dearest to *agnih*, one fell away from the *soma* when it was hurt, one they call the seed of virtuous and powerful *apah* (watery molecules); let that triple gold be for your long life.

Brahmanas like *Aitreya* (1.23) and *Kausitaki* (8.8) and *Taittiriya* (3.9.6.5) give the idea that the earth is full of iron and its form is iron needles. This indication points out that the earth contains iron filings which have magnetic property:

Comet

Besides, moon, planets, stars etc. we find the description of comets in the *Veda*. *Rgvedic* text (5.11.3) reads thus :

Asammristo yajase matroh suchih mandrah kavirudatistho vivasuatah. Ghriten tvavardhayam agna ahuta dhumaste keturabhavad divisritah.

Griffith translates the verse thus :

Pure unadorned from thy two mothers art thou born, thou comet from *vivasvan* as a charming sage. With oil they strengthened thee, O *agni* (*Suchi*) worshipped God, thy banner was the smoke that mounted to the sky (i.e. thy smokes became the comet).

Our Translation :

The fire created from its cause the earth and heaven. The comet which is highly brilliant is born from the sun. Other luminous forces strengthen it when it comes in their contact. The smoke of this *suchi Agnih* mounting to sky forms comet.

There are many other details which could not be dealt with. In doing so the avoidance of voluminousness is the main cause.

CHAPTER V

CHEMISTRY

Chemistry is generally found to be concerned with medicine. It has its relation with metalurgy and industrial arts. But chemistry as a science enfolds in it the idea of its being a science of the elements and compounds and their laws of combination and behaviour under various conditions. We want to give here whatever we find in the *Vedas* about this section of science.

Water and its formation

1. *Mitram huve putadaksam varunam cha risadasam. Dhiyan ghritachim sadhanta.*

Rg. [illegible]

2. *Trayah krinvanti bhuvanesu retastisrah praja arya jyotiragrah. Trayo gharma usasam sachante sarvan it tan anu vidur vasisthah.*

Rg. 7.33.7.

3. *Ta inninyam hridayasya praketaih sahasra valsam abhi sancharanti. Yamena tatam paridhim vayanto apsarasa up sedur vasisthah.*

Rg. 7.33.9

4. *Vidyuto jyotih pari sanjihanam mitravaruna yada-*

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pasyatam tva. Tatte janmotaikam vasistha agastyo yattva visajabhara.

Rg. 7.33.10

5. *Utasi maitravaruno vasisthorvasya brahman manaso adhijatah. Drapsam skannam brahmana daivena visvedevah puskare tvadadanta.*

Rg. 7.33.11

6. *Satre ha jatavisita namobhih kumbhe retah sisichatuh samanam. Tato ha mana udiyaya madhyattato jatam rishim ahur vasistham.*

Rg. 7.33.13

7. *Imam vidhanto apam sadhasthe dvita dadhur bhrigavo viksvayoh. Esa visvanyabhyastu bhuma devanamagniraratirjirasva.*

Rg. 2.4.2

8. *Mahattadulbam sthaviram tadasidyena vistitah praviveshithapah. Visva apasyadbahudha te agne jatvedastanvo deva ekah.*

Rg. 10.51.1

9. *Ko ma dadarsha katmah sadevo yo me tanvo bahudha paryapasyat. Kvah mitravaruna ksiyantyagner visvah samidho devayanih.*

Rg. 10.51.2

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10. *Aichchhama tva bahudha jatavedah pravistamagne apsvausadhisu. Tamtva yamo a chik chchitrabhano dashantarusyadatirochamanam.*

Rg. 10.51.3

11. *Sa praketa ubhayasya pravidvantsahasradana uta va sadanah. Yamenatatam paridhim vayisyan apsarasah pari jajne vasisthah.*

Rg. 7.33.12

Translation :

1. I, the scientist take to utilize into process the *mitram*, the hydrogen gas which is pure, best purifier and highly heated and the *varuna*, the oxygen which eats up or rusts all the base metals, they perform the demonstration of forming water.

2. Shri Gurudatta Vidyarthi interprets the verse thus : 'Let one who is desirous to form water by the combination of two substances take pure hydrogen gas highly heated and oxygen gas possessed of the property of *risadha*, and let him combine them to form water.

3. The substances, the fire, the air and the sun, respectively produce water in the three localities, the earth, the atmosphere and the heavenly region. Their three offshoots, the *vasus*, the *rudras* and the *adityas* are the noble products and full of lustre. The trio of the brilliant *Agni*, *Vayu* and *Surya* create dawn and dusk. *Vasisthah*, the drops of water or dews have their close contacts with all of them.

4. That is the first birth of *vasistha*, the water in which charged with the current of electricity it is seen produced by the *mitra* and *varuna*, the hydrogen and oxygen gases.

Besides, the heat of earth and sun brings it from its main place for the use of people.

5. This water is the product of *mitra* and *varuṇa*, the hydrogen and oxygen therefore it is called *maitravaruna*. It is produced from the genitive power of the *ur asi*, the electricity and seed-power of *mitra* and *varuna* combined together. It has been upheld in the atmosphere by the air and other forces through their great unique power.

6. Utilized to the activity of forming water and charged with the currents of electricity, the *mitra* and *varuna* dropped the drop of their potential seed-power simultaneously and it reacted to verify quantity and consequently was born *vasistha*, the water which is said to be *rshi*, the source of life for all creatures.

7. The sparks of electricity constituting worldly fire maintain two forms, the first one in the atmosphere which is the place of water and the second one in all the products of watery objects. This worldly fire overcomes the power of other physical forces and is possessed of exceedingly more potentiality amongst other physical elements and is also possessed of the rays of high emission.

8. The cover of fire assuming to which it permeates its essence into the waters, is very much impenetrable. It is only the scientist who sees and knows all the forms and activities of fire.

9. Who is that scientist who does see this *agni*, the fire? What is that physical element or force which is cognisant of all the forms and activity of fire? This is the twinity of *mitra* and *varuna* which is cognisant of the whereabouts of the mediums of combustion of which the luminiferous physical objects (*devas*) are the conductors.

10. We, the scientists, search out by various means the fire which permeates water and medicinal plants and is *jatvedah*, that which is pervasive in all the created objects.

A man of concentration finds out this fire of multi-coloured rays shining out in ten places or things—The earth, the atmosphere, the heaven, the igneous element, the air, the sun, the water, the medicinal plants, trees and the bodies of creatures.

11. The *vasistha*, the water is the sign of both the *mitra* and *Varuna*. It is aware of its being mutable and thousand times mutable. Sticking to the limit established by air (the two gases) the *vasistha* got born from *apsaras*, the electricity.

In the verses quoted above we find a very remarkable description of the formation of water. This description is not only concerned with a demonstration of formula concerning the composition of water but this goes describing the process of composition and maintainability of watery substance in the atmospheric region. The space spreading over our earth is a vast field of various operations of gases, electricity, and magnetism etc. How rainy water is formed in clouds, it has been also made clear in the verses. A very important point has been raised in the verses and it is concerned with the formula of water. Water is not really the product of only two gases. The role played by electricity in formation of water cannot be ignored. This bare and obviously distinct fact makes us—put our houses in order and amend the present formula embraced by the scientists. If the spark of electricity in any form, as the demonstration of the composition of water itself is an eloquent fact, is needed, the part played by electricity should also be added to the formula. One cannot escape the consequence which is incumbent, natural and logical.

Various Preparations :

Soma preparation is described in the vedas. It is a

herbacious plant. To draw out the juice of *soma* and make other preparations thereof is well known in the Vedas. Sometimes milk is mixed in the soma-juice. Without knowing the quantity it is not possible. *Amiksa* (*Yajuh* 19.21 and *Atharvaveda* 10,3, 13.23) has been described at some places in the vedas. It is a preparation which is made out of hot boiling milk by adding sour curd to it. In *Atharvaveda* (10.3.21) we find the description of *madhuparka* which is a mixture of curd, *ghee* and honey. This is prepared very carefully. Mixing *ghee* with honey requires caution in respect of quantities. Otherwise a mixture being nectar may be turned to be poison.

Madhupeya is a mixture made of soma juice by mixing it with other certain things. *Asvinau* have their concern with it in *Rgveda* (1.34—11 and 10.41.3).

Chemistry of Calcination of Gold and other Metals

Gold is reduced to ashes by the chemical process of calcination. This is used as medicine says *Yajurveda* (34.51).

> *Na tadraksansi na pishachastaranti devanamojah prathamajam hi etat. Yo bibharti dakoayanam hiranyam sadevesu krinute dirgha mayuh sa manusyesu krinute dirghemayuh.*

Gold is the first—born essence of vigour of physical elements. Various diseases and germs creating diseases cannot overcome its potential power. One who uses the ashes of calcined gold as medicine restores long-life to organs and restores long-life to body and its parts.

Here the calcination of gold has been elucidated by the term *daksayana*. *Daksa* is the name of fire. Gold burnt

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into *daksa*, the fire through the prescribed chemical process becomes more powerful. It gives vigour, strength and life to a patient if administrated to him.

Atharva veda gives another proof of this. The verse concerned reads thus :

> *Agneh prajatam paryad hiranyam amritam dadhre odhi martyesu. Ya yenadveda sa idenamarhati jaramrityur bhavati yo bibharti.*
>
> *Atharva.* 19. 26.1

Translation :

Gold calcined through fire (if used) ensures immortality to mortals or saves from the death the persons who are about to die. One who knows the process of calcination and the use of gold-ashes becomes benefitted by it and one who uses this as medicine becomes able to make his death old and tattered.

some other verses :

1. *Ayuse tva varchase tvanjase cha balaya cha yatha hiranyatejasa vibhasasi janan anu.*

   Atharva. 19. 26.3

2. *Yadhiranyam suryena suvarnam prajavanto manavah purve isire. Tat tva chandram varchasa sam srijatyayusman bhavati yo bibharti.*

   Atharva. 19. 262.

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3. *Devanam asthi krisanam babhuva tadatmanva chacharati apsvantah. Tat te badhnamyayuse balaya dirghayutvaya shatashardaya karshanastvabhi raksatu.*

Atharva. 4. 10-7.

4. *Vatajjato antariksad vidyuto jyotisaspari. Sa no hiranyaja shankhah krishanah patvanhasah.*

Ath—4. 10.1

Translation :

1. O man ! This calcined gold be for your life, be it for your radiance, be it for your vigour, and be it for your strength so that you shine among men by the lustre of gold.

2. The gold which is formed by the heat of the Sun is used by the wise and accomplished men who are desirous of good generation. May this gold come to your benefit with its lustre as he who uses it gains long life.

3. Conch shell is the lustrous bone of the useful physical elements. This conch having spirit inside lives in the waters. This I (the physician) fasten to you, O man ! for your life, vigour, strength and for long life extendent hundred autumn. May this lustrous substance protect you.

4. Produced from the air of atmosphere and the light of the electricity this conch purified and full of lustre save us from the ills of diseases.

In these verses the use of gold as well as the conch shell and pearl etc. has been advised. By calcination they yield much more potency and the process of turning them to pure calcium is also a chemical process. Though the Ayurvedic literature is full of such kinds of chemical preparation yet

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we don't want to refer to them here. We are here only concerned with four *samhitas*. Now-a-days physicians treat the calcium produced from conch, shell and pearl etc. as a pure calcium product. But their version appears to be wrong. Calcium in great dose cannot be digested while the calcium chemically produced from pearl can be digested even in high doses.

Vasistha is water :

Vasistha of the Veda is known as *rshi* by some persons. The scholars of the East and the West who are beating the line of *sayana* cling to this idea very strongly. But it can be explained on the authority of the Vedic literature that *vasistha* referred to in the previously cited verses is nothing but water. *Vasistha* is not a proper name. In the Vedas there is no history of proper persons, places or things. Commenting on the word *vasistha Skanda Swami* says in his commentary on Nirukta (5.15) "*Vasistha api achehhadita udaksanghatah*" i.e. *vasistha* is the condensed water covered in atmosphere. Thus it is quite distinct that *vasistha* means water whether be it in cloud or within atmosphere or anywhere else. In *Vedic* terminology *vasistha* means water. It has various meanings in accordance with its occurrence in various contexts. But the fact that it means water also is well-established. In the context of *Yajurveda* (13.54) *Prana*, the vital air has been called *vasistha rshi*. *Shatapatha* (8.1.1.6) also recognizes this fact. In *Rgveda* (2.9.1) *Agni*, the fire has been called *vasistha*. The second part of the verse runs like thus.

Adabdha vratapramatir vasisthah
sahasrambharah suchijihvo agnih

i.e. this *agni* is *vasistha* because it gives existence and locality to many things. According to *shatapatha* (14.9.22) the tongue is called *vasistha*. In this way the term *vasistha* in the *Vedas* is not used as proper noun.

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CHAPTER VI

ASTRONOMY

Astronomy is that division of science which deals with the heavenly bodies. In India this branch of science was highly developed. Every minute details were known to Arya Astronomers. But the *Vedas* are the main fountain of this science also. They give the fundamentals of this science. Study of the *Vedas* reveals this fact. The sun, the moon, the earth etc. have been very lucidly described with their essential and original knowables. Stars and other things concerning this branch of science are also found elucidated in *Vedic samhitas*. Here we want to enlighten the readers on necessary and important astronomical facts.

Planets:

1. *Shanno mitrah shamvarunah sham vivasvan sham-antakah. Utpatah parthivantariksah sham no divichara grahah.*

Atharva. 19. 9. 7

2. *Shamno bhunirvepmana shamulka nirhatamcha yat.....Naksatara mulkabhihatam sham-astu nah.....Shamno grahaschandromasah shamadityascha rahuna. Shamno mrityur dhukmke-tuh shamrudras tigmtejasah.*

Atharva. 19. 97—10

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3. *Shatam shvetas uksano divitaro na rochante. Mahna devam natastabhuh.*

Rg. 8. 55. 2

4. *Urum hi raja varunaschakar suryaya pantham anvetava u. Apade pada pratidhatave akarutapvakta hridaya vidhaschit.*

Rg. 1.24.8

5. *Ami ya riksa nihitasa uchcha naktam dadrise kuh chiddiveyuh. Adabdhani varunasya vratani vichakshachchandrama naktameti.*

Rg. 1.24.10

6. *Chandrama apsvantara suparno dhavate divi. Na vo hiranyanemayah padam vindanti vidyuta vittam me asya rodasi.*

Rg. 1.105.1

7. *Yada suryam amum divi shukram jyotiradharyah. Aditte visva bhuvanani yemire.*

Rg. 8.12.30

8. *Ato deva avantu no yato visnur vichakrame. Prithivyah saptadhambhih.*

Rg. 1.22.16

9. *Idam visnur vichakrame tredha nidadhe padam. Samudhamasya pansure.*

Rg. 1.22.17

10. *Pra visnave shusametu manma giriksita urugayayaya vrisne. Ya idam dirgham prayatamek vimame tribhiritpadebhih.*

Rg. 1.154.3.

11. *Abodhyagnirjma udeti suryo vyusaschandra mahyavo archisa. Ayuksatam asvina yatave ratham prasaviddevah savita jagatprithak.*

Rg. 1.157.1

12. *Navonavo bhavati jayamano ahnaketurusasam etyagram. Bhagam devebhyo vidadhatyayan prachandramas tirate dirghamayuh.*

Rg. 10.85. 19

13. *Susumnah suryarasmischandrama gandharvastasya naksatrani apsaraso bhekurayo nam....*

Yajuh. 18. 40

Translation :

1. May the vital air be auspicious for us, may the water be auspicious for us, may the Sun in its various phases be auspicious for us, may all consuming time be auspicious for us, may the calamities taking turn on earth and atmosphere

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be auspicious for us and may the planets moving in the heaven be auspicious for us.

2. May the earth trembling in quake be auspicious for us, may that which is destroyed by the comets be auspicious for us, may the star which is destroyed by comet be auspicious for us.....may the stars of lunar family be auspicious for us, may the planets of solar family with the *Rahu*, be auspicious for us, may the fatal comet be auspicious for us and may the planets having poignant rays be auspicious for us.

3. O King! Hundred white oxen given by you, shine like the stars in heaven. They fill the earth with their glamour just like the stars pervade the heaven with their lustre.

4. *Raja varuna*, the air full of lustre made the path of the sun wide enough for its operations. In reality it has made the sun to have support in the space which is supportless. Even a person highly envious to his enemy cannot undervalue the task of *varuna*, the air.

5. Those these stars which are placed high in heaven appear at night but where do they go during the day time, is not known. Inviolable are the laws of *varuna*, the air (*pravahvayu*) that the moon shining comes out at night.

6. Resident in the middle regions the lustrous moon wanders in the heaven. The brilliant rays of moon do not influence the place below the earth. The heaven and the earth are aware of this.

7. O Almighty God ! When you stabilize this brilliant light, the sun in the heaven, the other planets of yours are put in motion:

8. Let all the luminous objects and physical forces come to our safety because the sun crosses the world by three steps—the dawn, noon and dusk. It sustains the earth with seven rays.

9. This sun crosses the space of the world and fixes its

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foot in three ways i.e. the morning, noon and the sun-set. Its other step in the form of electricity, is not apparent to all in the space full of dust.

10. Let our admirable praise be due to the sun which is placed high in heaven and is the object of various powers and cause of rain. It is this sun which alone measures the long and wide space by its three steps.

11. The fire becomes active on the earth, the sun rises and pleasant and great dawn dispels the darkness of night by its brightness. The pair of day and night yoke their cycle to follow their orders and the sun thus puts all the creatures to their activities.

12. When this moon is born, it is ever new, it is the banner of the day and it does go away before the dawns. It divides their appropriate shares to the worldly things and infuses in the herbs and plants long life.

13. The moon has in its interior the *susumna* rays of the sun as it is named *gandharva* and the lustrous stars are the *apsarasah* of the moon.

Stability :

How these heavenly bodies are upheld, it has been described in the following verses :

1. *Yada suryam amum divi shukram jyotiradharyah aditte visva bhuvanani yemire.*

Rg. 8.12.30

2. *Yada te maruti vishastubhyam indra niyemire. Aditte visva bhuvanani yemire.*

Rg. 8.12.29

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3. *Yada te haryata hari vavridhate divedive. Aditte visva bhuvanani yemire.*

Rg. 8.12.28

4. *Satyena uttabhita bhumih suryenottabhita dyauh. Rtena adityastisthanti divisomo adhisritah.*

Rg. 10.85.1

5. *Somenadittya valinah somena prithivimahi. Atho naksatranam esam upasthe soma ahitah.*

Rg. 10.85.2

6. *Naitadena paro anyadastyuksa sa dyavaprithivi vibhasti. Tvacham pavitram krinuta svadhavan yadim suryam na harito vahanti.*

Rg. 10.31.8

7. *Hiranyagarbhah samavartatagre bhutasy jatah patireka asit. Sa dadhar prithivim dyamutemam kasmai devaya havisa vidhema.*

Rg. 10. 121.1

Translation :

1. O God! When thou upholdest this powerful refulgent sun in the heaven, all the globes like earth are upheld by its attraction.

2. The glorious sun upholds all the other planets of solar family and the other globes like earth are rendered firm and habitable.

3. The glorious sun by putting forth its powerful rays which possess the properties of attraction, illumination and motion, keeps all the world in order through the force of attraction.

4. The earth is upheld in space by eternal *Brahma*, the sun and the air. The sun is the upholder of all lights. The twelve months owe their existence to time; the rays of light are generated and rendered strong by the sun, and the motes and particles are upheld by the air. In the firmament the moon depends on the sun for its light and support. In this verse term *satya* has tripple meanings : God, the sun and the air.

5. *Adityas* are strong by the *soma*, the gravitation, the grand earth is upheld by the *soma*, the gravitation. *Soma*, the gravitation is stationed in the vicinity of the *Naksatras*, the stars.

6. It is not so that only the physical elements producing the earth sustain it but besides this there is a grand power called *hiranyagarbha*, the sun which resists the earth. It is the *uksha*, the sun which upholds the heaven and the earth. Powerful cosmic heat makes the crust of the earth at the beginning of creation when the rays of the sun do not expand its influence on the earth.

7. God who possesses all the luminious worlds within Himself and exists from the very eternity, is the only one Manifest Lord of all the created objects. He is supporting this earth and the heaven, to that All-blissful Divinity we offer our humble worship.

Revolution and Rotation :

1. (*a*) *Kah suiddekaki charati kau svidyayate punah kinsvid himasya bhesajam kim vavapanam mahat.*

Yajuh. 23.9

(*b*) *Surya ekaki charti chandrama jayate punah. Agnir himasya bhesajam bhumiravapanam mahat.*

Yajuh. 23.10

2. *Ya gaurvartanim paryeti niskritam payo duhana vrataniravartah. Sa pravravanah varunaya dashuse devebhyadeshadhavisa vivasvate.*

Rg. 10. 65.6

3. *Ayam gauh prisnirakramid asadanmat arampurah. Pitramcha prayantsvah.*

Yajuh. 9.6

Translation :

1. (*a*) Who does move its own axis ? Who does move round the other ? What is the remedy for the cold and what is the vast field for sowing seeds.

(*b*) The sun moves on its own axis and the moon moves round the sun and the earth. *Agni*, the fire is the remedy of the cold and the earth is the vast field of sowing the seed.

2. The said earth, supplying the people the water gained through rain, revolves round the sun in its orbit and moves on its axis fixed by God under universal law. This earth provides the performers of noble deeds, who give liberally, and the learned, with all their comforts, by its bounty, it is indeed the cause of the audible speech of all living beings.

3. This globe, i.e. the earth as well as the sun, the moon are revolving in *prisnih*, the space (The same is true of the other globes also.) Among them the earth along with the

waters of the oceans which are, as it were its mother, revolves round the sun which is a mass of fire. (Similarly, ether is said to be the mother and air to be the father of the sun, and the fire is said to be the father and water to be the mother of the moon). According to *nirukte gauh* means the earth, the sun, the moon and all the moving globes.

Day and night :

1. *Ahascha krishnam ahararjunam cha vivartete rajasi vedyabhih. Vaisbvanaro jayamano na rajavatirajjyotisa agnis tamansi.*

Rg. 6.9.1

2. *Yasyam krishnamarunam cha samhite ahoratre vihite bhumyamadhi. Varshena bhumih prithivi vritta vritta sa no dadhatu bha-draya priye dhamani dhamani.*

Atharva. 12.2.52

Translation :

1. Night is black and the day is white. Both of them play their part by their different activities on the earth and heaven. *Vaisvanara Agni* like rising sun dispels the darkness with its rays.

2. The said grand earth on which the dark night and lustrous day are correlated to follow them one after another, rotating on orbit round of the sun through the year keep us all in all prosperity and pleasures.

In *Aitreya Brahman* we find a very clear view of the night and day created by the rotation of the earth on its axis. It

(4.29) says that the sun neither sets nor rises. It is the earth which by its rotation on its axis, causes sun-set, and sun-rise or night and day.

The Earth is round :

1. *Iyam Vedih paroantah prithivya ayam yajno bhuvanasya nabhih. Ayam soma vrisno asvasya reto brahamyan vachah parmam vyoni.*

Rg. 1.164.34

Translation :

1. This point (any point) is the centre of the earth (as the earth is round). This *yajna* (performed in *Vedi*) is also centre of *bhuvan*, the space lit up by one Sun. This *soma*, electricity is the powerful potency of the fire and the other is the great source of sound and speech.

Here it has been said that any point of the earth is the centre of it. The earth is round and therefore, it is the case with this. Any point of a ball becomes its centre as it is round. Similarly every point of the earth is its centre as the earth is global.

Uttarayana and Daksinayana :

1. *Vaisvanarasya pratimopari dyauryavad rodasi vibabadhe agnih. Tatah sasthad amuto yanti stoma udito yantyabhi sasthamahnah.*

Atharva. 8.9.6.

Translation :

Whatever part of the space of the complete zodiacal circle is crossed by the *agni* to separate the earth and heaven, thence, from the sixth month, for the duration of six months the day is shortened and in other six months the day is lengthened.

These are the period of *Daksinayana* and *Uttarayana.*

Twelve Signs of Zodiac Months and Seasons etc.

1. *Dvadasha pradhayaschakramekam trini nabhyani kau tachchiketa. Tatrahatastrini shatani shankavah sastischa khila avichachala ye.*

Atharva. 10. 8.4.

2. *Dvadasaram nahi tajjaraya varvarti chakram pari dyamriritasya. A puttra agne mithunasch [illegible]ra sapta shatani vinshatischa tasthuh.*

Rg. 1.164.11

3. *Pancha padam pitaram dvadashakritim diva ahuh pare ardhe purishinam. Atheme anya upare vichaksanam saptachakre sadar ahurarpitam.*

Rg. 1.164.12

4. *Dvadasha pradhayaschakramekam trini nabh yani ka u tachchiketa. Tasmintsakam trishata na shankavo arpitah shasthirna chalachalasah.*

Rg. 1.164.46

5. *Sakanjanam sapatathamahurekajam shadidyama rshayo devaja iti. Tesamistani vihitani dhamshah sthatre rejante vikritani rupasah.*

Rg. 1.64.15

6. *Veda maso dhritavratah dvadasha prajavatah. Veda ya upajayate.*

Rg. 1.25.8

7. *Veda vatasya vartanisurorrisvasya brihatah. Veda ye adhyasate.*

Rg. 1. 25.8

8. *Ahoratrair vimitam trinshadangam trayodasham masam yo nirmimite.....*

Atharva. 13.3.8

9. *Samvatsarosi parivatsarosi idavatsarosid vatsarosi. Usaste kalpantcm ahoratraste kalpantamardhmasaste kalpantam. Rtvaste kalpantam samvatsaraste kalptam.*

Yajuh. 27.45

Translation :

1. There are twelve months or signs of the Zodiac in one Zodiacal circle and the naves called summer, rainy season and winter are three.....Who is the man to understand this ? Three hundred spokes have been hammered and sixty nails set firmly in their places.

2. The cycle of the year having twelve months or twelve Zodiacal signs moves round the circle of the sun. It is never to decay. O astronomer, there are seven hundred and twenty children, the days and nights of the whole year entwined together.

3. The astronomers say that the year-cycle has twelve months or zodiacal signs and it assumes its place round the sun in the solar region. It has five seasons. Others say that it has seven rays and therein are placed six pokes, the six seasons of the full year.

4. There are twelve months or zodiacal signs in one year cycle and three naves, the summer, rainy season and winter. Who has to know it? Therein are placed together three hundred and sixty nails the days or nights of the year which are moving always.

5. Astronomers say there is the seventh season produced by only one extra (intercalary) month between the seasons created by the same sun. The six seasons are usually created by the sun. The effects and occurrence of these seasons vary for an inhabitant of the globe according to global localities.

6. God (*Varuna*). the upholder of the holy laws knows the twelve months possessed of progeny and also knows the intercalary month which is born afterwards.

7. He knows the course of the wind which blows ever everywhere and is possessed of mighty force and also knows the substances which exist supported by the wind.

8. He who metes out the thirteenth (intercalary) month of 30 units measured by days and nights.....

9. Thou art *Samvatsar*, thou art *Parivatsar*; thou art *Idavatsar*; thou art *Idavatsar*, thou art *Vatsara*.. May thy dawns be prosperous; may be prosperous thy days and nights. May prosper thy half months and months and may prosper thy seasons and years.

The verses quoted on the serial Nos. 1, 2, 4 give the idea of twelve signs and twelve months of the year. Besides, they tell us about summer, rainy season and winter and the 360 days of the lunar year. But in the verse quoted on serial No. 2, there have been given 720 days and nights of a year. Here the days and nights are accumulated together.

The twelve signs are at present named:

1. Aries	..	Mesha
2. Taurus	..	Vrisha
3. Gemini	..	Mithuna
4. Cancer	..	Karka
5. Leo	..	Sinha
6. Virgo	..	Kanya
7. Libra	..	Tula
8. Scorpio	..	Vrischika
9. Sagittarius	..	Dhanuh
10. Capricorn	..	Makara
11. Aquarius	..	Kumbha
12. Pisces	..	Mina

(9) Months are named on the basis of the *naksatras*. It is a decided fact that on the fifteenth night of each month or a little prior to that there comes the *naksatra* by which the month of that fifteenth night has been named. Thus in each month the moon crosses two *naksatras* but there it happens to cross three in some months. But the *naksatra* on which the name of the month is based must happen to fall on the 15th night of that. Suppose the month *Chaitra* has been based on the *naksatra chitra* and this *chitra* without any failure will happen to fall on the 15th or fourteenth night of the month *chaitra*. It is true in all the cases. The name of each month is based on this astronomical fact. The fifteenth

night of each month is called *purnima*. When the *purnima* of month *chaitra* is to be introduced to an astronomer it will be called the Chaitri-purnima, i.e. the purnima which has *chitra naksatra* with it. There are thus twelve *purnimas* in one complete year.

These are:

Chaitri, vaisakhi, jaisthi, asadhi, sravani, uttarabhadrapada, asvini, kartiki, margasirsi, pausi and *maghi purnimas*. On these are based the names of the respective months: *Chaitra, Vaisakha, Jyestha, Asadha, Sravana, Bhadrapada, Asvina, Karitika, Margasirsa, Pausa* and *Magha*.

In the verse No. 3 and No. 4 the seasons of the year have been given. They are variously mentioned. Somewhere there are only five seasons due to regional climate. When there is an additional month called intercalary month, the same has been treated as the seventh season. But normally there are only six seasons in a year. Why are these variations? The 6th verse clears out this mystery. It says that seasons are due to the locality of the points on the path of the earth's annual motion.

In the verses 6th, 7th and 9th the conception of the intercalary month has been given. In the 7th verse it has been mentioned that it is due to the operation of wind that these planets and stars are sustained in the supportless space and they seem to us moving from east to west direction while in reality they are moved by the wind from west to east direction. In the Indian astronomy this wind has been called *pravaha vayu*.

The verse which has been quoted on the serial No. 9 gives the name of the various kinds of years and months, half-months etc...

The Naksattras:

1. *Suhavamagne krittika rohini chastu bhadram mrigasirah shamardra Punarvasu sunrita charu pusyo bhanuraslesha ayanam magha me.*

Atharva. 19. 7.2.

2. *Punyam purvaphalgunyau chitra hastaschitra shiva svati sukho me astu. Radhe visakhe suhvanuradha jyestha sunaksatra marista mulam.*

Atharva. 19. 7.3.

3. *Annam purva rasatam me asadha urjam devyuttara a vahantu. Abhijinme rasatam punyameva sravanah sravisthah kurvatam supustim.*

Atharva. 19. 7.4.

4. *A me mahatchhatabhisag variya a me dvaya prosthapada susharma. A revati chasvayujau bhagam me a me rayim bharanya a vahantu.*

Atharva. 19. 7.5.

In these three verses of the *Atharvaveda* the following *naksatras* have been mentioned :

1. Krittika	2. Rohini
3. Mrigasira	4. Ardra
5. Punarvasu	6. Pushya
7. Aslesha	8. Magha
9. Purvaphalguni	10. Uttaraphalguni

11. Hasta	12. Chitra
13. Vishakha	14. Svati
15. Anuradha	16. Jyestha
17. Mula	18. Purvaasadha
19. Uttara asadha	20. Abhijit
21. Sravana	22. Sravistha
23. Satabhisaj	24. Purvabhadrapada
25. Uttarabhadrapada	26. Revati
27. Asvini	28. Bharni

The names of the Seasons :

Months	*Reference*	*Seasons*
Madhu Madhava	Yajuh 13.25	Vasant
Shukra Suchih	Yajuh 14.6	Graisma
Nabhah Nabhasyah	Yajuh 14.5.	Varsika
Isah Urjah	Yajuh 14.16	Sharad
Sahah Sahasyah	Yajuh 14.27	Haimantika
Tapah Tapasyah	Yajuh 15.66	Shaishira

Eclipse :

1. *Yattva surya svarbhanus tamasavidhyadasurah. Aksetravid yatha mugdho bhuvananyadidhayuh.*

Rg. 5.40.5

2. *Svarbhanoradha yadindramaya avo divo vartamana avahan. Gudham suryam tamasapavratena turiyena brahmanavindadattrih.*

Rg. 5.40.6

3. *Gravno brahma yuyujanah saparyan kirina devanna-maso pashiksau. Atrih suryasya divi chaksuradhat svarbhanurapa maya adhuksat.*

Rg. 5.40.8

4. *Yam vai suryam svarbhanus tamsavidhyadasurah. Atrayastam avindan nahyannye ashaknuvan.*

Rg. 5.40.9

Translation :

1. Since the dark shadow (Lunar shadow) envelops this sun therefore, the world appears darkened and the people become dumb-confounded like a person who is ignorant of the mathematical operations (bearing upon the eclipses.)

2. This Indra, Powerful electricity dispels the influence of the dark shadow resilent below the solar region. The fire inherent in the heavenly region regains the sun, which is enveloped with the thick dark shadow outeclipsed, by the swift dispelling power (*Brahamana*).

3. *Brahma atrih*, the all-pervading heavenly fire through its diffusive power harnessing the winds into operation and energizing the rays by power dispels the darkness of the Shadow and restores the light of the sun in the solar region.

4. These are the igneous forces which merely restore to

normalcy the sun which becomes enveloped with the thick darkness of the lunar shadow, not the other forces can do this.

From all these proofs it is quite obvious that *Rgveda* gives the clue of the calculation of *Sayana* year. In other verse of the *Rgveda* (4.33.7) it has been clearly said that the sun completes the year by a stay of twelve days and twelve nights.

When a very clear and positive idea of eclipse has been given in the *Rgveda*, it cannot be here said that it was without the knowledge of *sayana* rotation. It is also an eloquent fact that the *Rgveda* tells us of the inclination of the ecliptic with the equator. We quote here the utterances of Lokmanya Tilak who quotes professor Ludwig and says that the *Rgveda* mentions the inclination of the ecliptic with the equator (1.12.12) and the axis of the earth (10.89.4) Orion. p. 158.

CHAPTER VII

MEDICAL GROUP OF SCIENCES

Anatomy :

Anatomy is the science of bodily structure. In the body, besides the organic parts and nerves etc. resides the self which is called soul. *Vedas* have a very great concern with the soul. The whole consciousness is due to this soul. Soul is immortal and eternal while body is mortal and perishable. Without accepting the existence of soul medical science cannot be a complete science. This is the *vedic* view. Here are quoted some verses regarding the soul.

1. *Ayam hota prathamah pashyatemamidam jyotiramritam martyesu. Ayam sa jajne dhruva aa nisatto amartya stanva varaniamanah.*

Rg. 6.9.4

2. *Apran praneti svadhaya gribhito amartyo martyena sayonih. Ta shashvanta vishuchina viyanta nyanyan chikyurna ni chikyuranyam.*

Rg. 1.164.38

3. *Apashyam gopamanipadyamanam aa cha para cha pathibhischarantam. Sa sadhrichih sa vishuchir vasana a varivarti bhuvanesvantah.*

Rg. 1.164.31

4. *Ko dadarsha prathamam jayamanam asthanvantam yadanastha bibharti. Bhumya asurasrigadatma kva svit ko vidvansam upagat prastumetat.*

Rg. 1.164.4

5. *Panchasvautah purusa avivesha tanyantah purushe arpitani etattva atra pratimanvano asmi na mayaya bhavasyuttaro mat.*

Yajuh. 23.52

Translation :

1. Behold this individual soul, the first being which enjoys the consequences of his actions, as it is the immortal light placed within the mortal frame, the body. That has manifested itself. This immortal soul is staying in the body while it seems growing with the growth of its body.

2. The immortal soul occupying the same locality with the mortal body attains right and wrong modes of existence being grasped by the subsistence of his life. Both of them ceaselessly move towards all directions and attain various stages. Men fully perceive the one but fail to perceive the other.

3. I behold the indestructible lord of the sense organs, the individual soul which ever walks through the pathways of birth and death, it traverses its path with its body and ever without it and having covered itself with its good and evil actions, it takes birth again and again in the various worlds.

4. Who did behold life when it first arose ? The consciousness is devoid of forms and bones but bears all the forms. From earth, the material cause of the body are composed the vital air and blood but whence the soul that

informs these ? Who has gone to the ultimate knower of all things to put the questions ?

5. The spiritual preceptor says to his disciple "*Purusha*, the soul entered into five elements (which form body) and these very five are given to it (in form of five sense organs and their five objects). I have learnt about this fact actually and you are not over and above me in this subject."

Here in the above referred to verse on serial No. 4 we find the use of the term *purusha* for the soul. Why is it a *purusha* ? Because it fills up the gaps. Diseases caused in the body are a kind of gaps. They are recouped by this soul. Therefore this soul is known as *purusha*. Medical science is based on the theory that there is some healing power which heals the wounds and recoups the losses. Without this healing power medicines are of no use. A surgeon operates the patient and takes away pounds of flesh. The gap caused by operation is filled up by the soul which is the best healing power. As it is a *purusha* so it heals up the wound. Medicines are only aids and the healing agency is this soul. This idea has its meaningfulness in the term *purusha*.

Vital parts of the body :

> *Ya osadhih purva jata devebhyas triyugam pura.*
> *Manai nu babhrunam aham shatam dhamani sapta cha.*

Rg. 10. 97.1

Translation :

I, the physician know the one hundred and seven places of application and one hundred seven kinds of those gray

coloured herbs which spring up three *chaturyugi* (12960000 years) before the emergence of men on the earth.

In this *Rgvedic* verse it has been mentioned that there are one hundred seven places in the human body where these medicinal plants are applied when the need arises out. What are these one hundred seven places ? These are nothing but one hundred seven vital parts which are found in the body. *Sushruta* and the *Brahamana* explain this by counting the vital parts of the body as one hundred and seven.

Hridaya—Heart

Hridaya is a *Vedic* term which means heart. In *Atharva* (10.9.15 and 10.2.26) and in many other places we find the reference of *hridayam*. What is this *Hridayam* ? Says Yajnavalkya in his *Shatapatha Brahamana* (14.8.4.1) explaining the etymological construction of the word—'*tadetat tryaksa ram* etc. i.e. the word *hridaya* is composed of three letters—the first '*hri*', the second '*da*', and the third '*yam*'. *Hri* means taking over while *da* means giving. *Yam* means circulation. It is the *hridaya* which takes over the blood from all over the body to purify and gives it to the body after purification. It is the third function of *hridaya* that it circulates the blood throughout the body. Modern history says that it was Mr. Harvey who first invented the theory of the circulation of blood. But here the *Shatapatha* makes us believe that the said theory was known to Aryans long before and it found a place in the Veda. The Vedic term *hridaya* is the main source from where the theory came into origination.

Mastiska—the Brain

1. *Murdhanamasya sansiyya atharva hridayancha*

yat. Mastiskadurdhah prairayat pavamano adht shirshatah.

Atharva. 10. 2.26.

Translation :

Pavamanah atharva, the perfect God sewing the head and the heart of man rising above the brain went away from the head.

In this verse there are three words used for the head. They all have some similarity in the meanings. These words are—*Murdha, mastiska* and *shirsha.* The head is called *murdha* because all the external objects are presevered in it in the form of image. *Mastiska* points out the brainal aspect of it. *Shirsha* indicates the sensual operation of the head. Thus all these three words are meaningful and purposeful here.

In the verse we find the verbal form of word "*sansivya.*" means 'having sewn'. It gives an idea that the cranium of the brain is sewn. It is not an ordinary sewing. If it is really sewn it would make us know that cranium has some parts. If there are some parts, what are they ? They are cerebrum, cerebellum and medula oblongata. They are three in numbers. They have been sewn by God. Thus it is obvious that the head which we call head has three divisions and these divisions are known as cerebrum, cerebellum and medula oblongata. This is the real idea of *mastiska* which we can draw from the above quoted verse of the *Atharvaveda.*

System :

In the *Atharvaveda* from the verses fifteen to eighteen of

the 9th hymn of the 10th *kandam* we find the following mentions of the parts of the body. 10.9.15-18

1. *Kloma*	*Lungs*
2. *Hridaya*	*Heart*
3. *Sahakanthika puritat*	*Small intestines*
4. *Plashih*	*Intestine which takes the diet etc.*
5. *Vanisthuh*	*Intestine which divides food, blood etc.*
6. *Kukshi*	*Sides of stomach*
7. *Charma*	*Skin*
8. *Yakrit*	*Liver*
9. *Matasney*	*Kidneys*
10. *Antram*	*Intestines*
11. *Guda*	*Anus*
12. *Majja*	*Marrow of bones*
13. *Asthi*	*Bones*
14. *Mansam*	*Flesh*
15. *Lohitam*	*Blood*

The second hymn of the 10th *kandam* of *Atharvaveda* (verses 1 to 8) gives the following information: 10.2.1-8

1. *Parsni*	*Heals*
2. *Mansam*	*Flesh*
3. *Gulphau*	*Ankles*
4. *Angulih*	*Fingers*
5. *Khani*	*Organs*
6. *Utslankau*	*Bottoms of the feet*
7. *Adhar gulph*	*Lower ankles*
8. *Uttarau asthivantau*	*Upper knees*
9. *Janghe*	*Thighs*
10. *Janunoh sandhi*	*Joints of legs*

11. *Kabandha*	*Trunk*
12. *Urah*	*Chaste*
13. *Grivah*	*Neck*
14. *Stanau*	*Nipple*
15. *Kapolau*	*Cheaks*
16. *Skandhau*	*Shoulders*
17. *Pristih*	*Bones of the shoulders*
18. *Bahu*	*Arms*
19. *Ansau*	*Shoulder—blades*
20. *Sapta khani*	*Seven holes of the head—two ears, two nostrils, two eyes and mouth.*
21. *Hanuh*	*Jaws*
22. *Jihva*	*Tongue*
23. *Mastiska*	*Brain*
24. *Lalatam*	*Forehead*
25. *Kakatika*	*Hind part of the head—cerebellum*
26. *Kapalam*	*Cerebrum.*

Besides, we find the mention of the following in *Atharvaveda* (10.2.31).

1. *Astachakra*=eight plexuses.
2. Nine doors=the holes of ears, eyes, nose, mouth, phalus and anus.

It is also mentioned here that the *puri*, the body of a man is called *Ayodhya*. *Ayodhya* means that which is fortified with iron. What is this fortification ? This is nothing but the fact that there is played an important role by iron in the blood of the body. The blood is full of iron. It is why this does not entirely condense. Had not been there iron in the blood it would have got completely condensed

Liquidity of blood is maintained by the presence of iron in it in proportionate required quantity.

In the 13th verse of the *Atharvaveda* hymn 10, *kandam*, 10 it has been said that *prana, apana, vyana* and *samana* are the vital airs which are playing their respective roles in the body. In the 11th verse the colours of blood have been mentioned as red, blue and copper-dark.

The hundred sixty third hymn of the book 10th of the *Rgveda* gives a very detailed description of the parts of the body.

Vein, Artery, Nerve etc.:

1. *Amurya yanti yoshita hiralohitavasasah. Abhratara iva jamayas tisthantu hatavarchasah.*
Atharva. 1.17.1

2. *Tisthavare tistha para uta tvam tistha madhyame. Kanisthika cha tisthati tisthadid dhamanir [illegible]ahi.*
Atharva. 1.1[illegible]

3. *Shatasya dhamaninam sahasrasya hiranam. Asthaurinmadhayaman sakamanta aransata.*
Atharva. 1.17.3

4. *Ima yaste shatam hirah sahasram dhama niruta. Tasam te sarvasam aham ashmana bilamapyadham.*
Atharva. 7.35.2

Translation :

1. Those tubular vessels of the body which are serving the body and are covered with blood be powerless in their flow of blood like the girls who have no brother.

2. May the flow of blood from lower nerves be stopped, may the flow of blood from upper nerves be stopped, may the flow of blood from central nerves be stopped, may the flow of blood from small nerves be stopped and may the blood from the large nerves be stopped.

3. Hundreds of large nerves and thousands of the branches of the nerves and the central nerves are stopped by the effect of medicine (at the time of medical operations) and afterwards all the nerves do their normal work simultaneously.

4. O ye patient ! I close the holes of all the small and large nerves of your body which are hundreds and thousands in number respectively (to stop the blood-flow) by the use of *ashama*, the calcium product of *ashma*.

In these verses the use of word *sira*, *hira* and *dhamani* appears to signify, the tubular vessels of the body like Veins, arteries and nerves etc. They are hundreds and thousands in number, it has been also very clearly described. The word *snava* is also used for them in some verses.

In the last verse the method of stopping the flow of blood has been mentioned. *Ashma* is used as medicine. What is this *ashma* ? It is the calcium product of stone. Blood flow may be stopped by using the calcium injection intra-venously.

In *Atharva* (20.[illegible]0.22) we find a mention of *asthi*, the bones; *majja*, the marrow of bones; *snava*, the sinews; and *dhamani*, the muscles.

Intestine etc :

In *Yajurveda* 25.7 there have been described some parts of the body and they are as follows :

1. *Vanisthu*
2. *Sthul guda*

3. *Guda*
4. *Intestine*
5. *Vasti*
6. *Vrishanau*
7. *Shepah*
8. *Retas*
9. *Pitta and*
10. *Payu.*

Seven formative elements of the body :

(*Yajurveda* 39.10)

Lohita	*blood*
Medas	*fat*
Mansam	*flesh*
Asthi	*bones*
Retas	*semen*

Rgvedic verse (8.28.5)

1. *Saptanam sapta rstayah saptadyumnanyesam. Sapto adhi sriyo dhire.*

Translation :

In this body the seven formative elements have seven kinds of powers. They have seven kinds of strength. These seven elements maintain all kinds of lustre and beauties.

Here this verse very clearly gives the description of seven formative elements of body. These elements are : Chyle, blood, flesh, fat, bone, marrow and semen. These are called *dhatus* because they maintain the body.

Jatharam (stomach) :

In *Rgveda* 3.47.1. word *jatharam* has been used for stomach. It receives and contains the eaten things therefore it is *jatharam*.

Embryo (in female)

1. *Reto mutram vijahati yonim pravishadindriayam garbho jarayuna vritah ulvam jahati janmmana.....*
Yajuh. 19.76

Translation :

Generative organ releases urine, but when it enters the womb, it releases semen. The embryo covered with caul leaves by delivery of the external skin cover.

Again *Yajurveda* (8.28) reads :

2. *Ejatu dashamasyo garbho jarayuna saha. Yathayam vayurejati yatha samudra yejati. Evayamdashmasyo asrijjaryuna saha.*

Translation :

Let the ten-months old embryo move with the secundines just as the wind moves, as the ocean moves, uninterruptedly, so may this ten-month old take its birth with the caul.

Body in motion :

1. *Vato va mano va gandharvah saptavinshatih. Te agre asvamayujanste asmin java-madadhuh.*
Yajuh. 9.7

Translation :

The vital air, delibrate activity, and twenty seven physical-cum-spiritual elements primarily harnessed them to the *asva*, the body and they generated the swiftness in it.

Vital air is the *prana-shakti*, vital energy and *manas* is the delibrate cherished purpose.

Twenty seven *gandharvas* are as follows :

1. *Matter*	
2. *Mahat*	*the resolution*
3. *Ahankara*	*the differentiation*
4. *Shabda*	*sound*
5. *Sparsha*	*touch*
6. *Rupa*	*form*
7. *Rasa*	*taste*
8. *Gandha*	*smell*
9. *Manas*	*mind*
10. *Karna*	*ears*
11. *Chaksuh*	*eyes*
12. *Tvacha*	*skin*
13. *Rasana*	*palatal organ*
14. *Ghrana*	*nose*
15. *Hasta*	*hands*
16. *Pada*	*legs*
17. *Upastha*	*generative organ*
18. *Payu*	*rectum*
19. *Vach*	*organ of speech*
20. *Prithvi*	*the earth*
21. *Apah*	*water*
22. *Tejas*	*fire*
23. *Vayu*	*air*
24. *Akasha*	*ether*

25. *Soul*
26. *God*
27. *Destiny*

Diseases

Fever :

1. *Yadagnirapo adahatpravishya yatrakrinvan dharmadhrito namansi. Tatra ta ahuh parmam janitram sa nah vidvan parivringdhi takman.*

Atharva. 1.25.1

2. *Yadyarchiryadi vasi shochih shakalyesi yadi va te janitram. Hudurnamasi hari tasya deva sa nah samvidvan pari vringdhi takman.*

Atharva. 1.22.2

3. *Y[illegible] shoko yadi vabhishoko yadi va rajno varunasyas putrah. Hudurnamasi haritasya deva sa nah samvidvan parivringdhi takman.*

Atharva. 1.22.3

4. *Namah shitaya takmane namo rusaya shochishe krinomi. Yo aneyedyurubhayedyue abhyeti tritiyekaya namo astu takmane.*

Atharva. 1.22.4

5. *Agnistakmanam apabadhatamitah somo gravanah putadakshah. Vedirbarhih samidhah shoshuchana apa dvesansi amuya bhavantu.*

Atharva. 5.22.1

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6. *Ayam yo vishvan haritan krinosi utchhochayannagnir ivebhidunvan. Adha hi takmannarso hi bhuya adha nyenndharan ya parehi.*

Atharva. 5.22.2

7. *Yah parushah parusheyo vadhvansa ivarunah. Takmanam visvadha viryadharancham para suva.*

Atharva. 5.22.3

8. *Adharancham prahinomi namah kritva takmane. Shakambharasy mustiha punaretu mahavrishan.*

Atharva. 5.22.4

9. *Oko asya mujvanta okosya mahavrishah. Yavajjatastakman stavanasi balhikesu nyocharah.*

Atharva. 5.22.5

10. *Yat tvam shitatho rurah sah kasavepayah. Bhimaste takman hetayastabhih sma pari vringdhi nah.*

Atharva. 5.22.10

11. *Tritiyakam vitritiyam sadandimut shardam. Takmanam shitam ruran graishman nashaya varshikam.*

Atharva. 5.22.13

12. *Gandharibhyo mujvadbhyo angebhyo magadhebhyah. Praisyan janamiva shevadhim takmanam pari dadhmasi.*

Atharva. 5.22.14

13. *Ayam yo abhishachayisnu vishva rupani harita krinoshi. Tasmai te arunaya babhrave namah krinomi vanyaya tekmane.*

Atharva. 6.20.3

14. *Namo ruraya chyavanaya nodenaya dhrisnave. Namah shitaya purvakamkritvane.*

7.106.1

15. *Yo anye dyurubhaye dyurabhyeti mandukamabhye-tvavratah.*

Atharva. 7.116.2

16. *Yasya bhimah pratikashah udvepayati purusham. Takmanam vishvasharadam vahir nirmantraya mahe.*

Atharva. 9.8.6.

Translation :

1. The stomach in which the living things contain the eaten matter is the place of fevers' creation. Heat which causes digestion, being disturbed enters the chyle and causes fever. May this fever be away from us.

2. If this fever creates large amount of heat if it causes the rise of high temperature, if it gets access in digestion system, let it be away from us.

3. If it heats the body, if it produces much more heat by rise, if it is created by dirty water etc. let it be away from us.

4. I use this medicine to remove the fever be it due to cold, be it due to excessive heat, be it extended for two days, be it extended for three days and be it intermittent.

5. May this fire be able to remove the fever, may the herb *soma*, cloud and water be able to cure fever, may *yajna vedi*, *kusha* and *yajna samidhah* be useful for this purpose.

6. Let this fever which makes the body of the patient green, which makes the body hot and troubles the patient, be weak and may it flee away from us.

7. That fever which is dry and is the creation of dryness and is red like dust be thrown away by the administration of the *visvadharvirya*, *kustha* plant.

8. I, the physician throw away the fever by giving it heavy jolt. It is found in the places of heavy rains and is fatal to him who is used to work with cow-dung.

9. The fever (Malaria) from its very inception is found in the locality of heavy and excessive rains and moisture and dampness.

10. This fever is sometimes due to cold and sometimes to heat, it creates cough and trembles the body. Its attacks are very dreadful. Let it be away from us.

11. The fever is of the kinds viz. Intermittent fever, that which leaves after two days; continuous fever; that which emerges in the autumn; cold and hot fevers, that which come in the summer season and the rainy fever.

12. Fever finds its prevalence in the places—dirty place, *Munja* jungles or mountainous locality, damp places and the rainy places.

13. To jungle, fever which heatens the whole body and makes the patient to see every thing green, and is red and yellow, I throw away.

14. The fever which is dry, which brings out perspiration, which creates trembling, which makes the patient laugh and which brings cold before it attacks, be thrown away.

15. The fever which is intermittent, which is continuous and which has no fixed time, be thrown away.

16. I, the physician throw away the malarial fever the dreadful attack of which makes body of the patient shiver.

In the above quoted verses a very detailed and vivid picture has been drawn. Here it needs not give more verses for further elucidation.

Piles :

1. *Arayamasrikpavanam yasch sphatim jihirasti. Garbhadam kanvam nashaya prishniparni sahasva cha.*

Atharva. 11.25.3

Translation :

The herb *Prishniparni* quell and destroy the *arayam*, piles which drinks the blood and takes away the growth and also the germ which eats the foetus.

Leprosy :

Naktam jatasyosadha rame krishne asikni cha.
Idam rajani rajay kilasam palitan eha yat.

Atharva. 1.23.1

Translation :

The plant which springs up at night and is dusky, dark and black and hue in colour restores to the normal colour these ashy spots of leprosy.

Sciatica :

1. *Dashvriksa munchemam raksaso grahya adhi yainam jagrah parvasu. Atho enam vanaspate jivanam lokmunnaya.*

Atharva. 2.9.1

Translation :

Herb *Dasha vriksa* removes the disease which has entered in the joints of the patient and makes him to rise up again in life.

Here in this verse rhumatism, sciatica and other rhumatic diseases are clearly mentioned.

Skin diseases :

1. *Vidadhrasy balasasya lohitasya vanaspati vislapakasyosadhe mochchhisah pishitam cha na.*

Atharva. 6.17.1

Translation :

1. This Banian tree cures the abscess, declines inflamation of the eyes and does not leave an iota of them in body.

Haemorrage :

Aruh sranamidam mahat prithivya adhyudbhritam.
Tadasravasy a bhesjam tadu rogam aninashat

Atharva. 2.35

Translation :

The herb which has been produced from the earth is mighty in healing the wound. This is the cure for morbid flow and this driveth the disease away.

Tuberculosis :

Vidma vai te jayanya janam yatijayanya jayase.
Katham ha tatra tvam hano yasya krinmo havir grihe.

Atharva. 7.76.5

Translation :

I, the physician know the origin of the tuberculosis and know whence it is born. How can this kill the patient in whose house we perform *yajna.*

Scrofula :

a graivya apachitotho ya upapaksyah. Vijamni ya apachitah svayam srasah.

Atharva. 7.76.2

Translation :

Pustules that rise upon the neck, pustules upon the shoulder joints, pustules, that falling of themselves spring upon every two-fold limb, should be removed.

Insanity :

1. *Devainasad unmaditam unmattam raksaspari.*
   Krinomi vidvan bhesajam yadanunmadito asati.

   Atharva. 6.111.3

Translation :

I, the physician by the application of medicine restore the sanity of the insane person who has become insane either by his sins against the learned or has become mad through disease.

Eye-diseases

> *Tisro divastisrah prithivih sat chemah pradishah prithak. Tvayaham sarvabhutani pashyani devy-osadhe.*
>
> *Atharva.* 4.20.2

Translation :

Through the powerful herb may I behold all creatures that exist, three earth, three heavens and six directions one by one.

Hair diseases :

1. *Devi devyamadhi jata prithivyamasyosadhe. Tam tva nitatni keshebhyo drinhanaya khanamasi.*

   Atharva. 6.136.1

2. *Drinha pratnan janaya ajatan jatam varshiyaskridhi.*

   Atharva: 6.136.2

3. *Yaste kesho avapadyate samulo yascha vrischate. Idam tam vishva bheshajya abhi sinchami virudha.*

   Atharva. 6.136.3

Translation :

1. I, the physician for strengthening the hair dig out the powerful herb which is produced in the earth and which creeps downward.

2. This herb makes the old hair firm, makes the new hair spring and makes the already grown strengthened.

3. I administer the powerful curative medicinal herb to patient whose hair is falling off and is torn away with the roots.

Contageous diseases :

Shyavadata kunakhina bandena yat sahasim.
Apamarga tvaya vayam sarve tadapmrijmahe.
Atharva. 7.65.3.

Translation :

With the *apamarga*, the disinfectant plant we wipe all that infection away, if we live with a deformed person whose teeth are black and whose nails deformed.

Bacteriology :

Germs create diseases, is not a new idea. It was observed by the Arya physicians long long ago. *Yajurveda* in its first verse makes us know of *amiva* and *ayaksama*. *Amiva* is a germ which creates diseases. Particularly this germ creates the pthisis and lung's diseases. *Ayaksma* means the negativity of consumption. In the verse it has been prayed that our cows should be *anavmiva*, without germs of consumption and *ayaksoma*, without consumption. Generally there is a great possibility of infection of consump-

tion in the cow flesh. The possibility of *amiva*, the germs of pthisis is also there.

Rgveda says :

1. *Yastc garbham amiva durnama yonimashaye. Agnistam brahamana sahaniskravyadam aninashat.*

Rg. 10.162.2

Translation :

O ye woman ! 'The physician by the administration of antibiotic medicine destroys the disease-creating germs like *amiva* and *durnama* which respectively affect your foetus and your womb by their infectious presence.

Yaska in his *niruktam* (6.13) describes *amiva* and *durnama* as germs. *Amiva is* signified a germ of disease. *Durnama* is also a germ of disease. Thus, it is obvious that *Amiva* and *durnama* are the germs of diseases.

2. *Yadasya hritam vihritam yat parabhritam atmano jagdham yatmat pishachaih. Tadagne vidvan punara bharatvam sharire mansamaasumeryamah.*

Atharva. 5.29.5

Translation :

O Physician ! you examine to know the disease of the patient and fill up again whatever have been taken, plundered born off or eaten from his body by the *pishachas*, the germs of disease. We, the medical persons give back flesh and new life to his body.

Atharvaveda (6th hymn of 8th canto) gives the description of following types of germs of disease :

1. *Alinsha—that which reduces strength.*
2. *Vatsapah—that which destroys the productivity of women.*
3. *Durnama—that which affects the womb or ovary.*
4. *Palala—that which obstructs the growth of flesh.*
5. *Anupalala—that which hinders the vitality.*
6. *Sharkuh—that which causes great trouble.*
7. *Kokah—that which steals away the strength like wolf.*
8. *Malimmlucha —that which reduces every thing of the body.*
9. *Palijakah— that which kills the activity.*
10. *Ashresah—that which creates great burning.*
11. *Vavrivasah—that which affects the form.*
12. *Rksagrivah—that which creates pain in the throat.*
13. *Pramilin—that which causes drowsiness in the eyes.*
14. *Sunama—that which creates female disease.*
15. *Krishnah—black germ*
16. *Keshi—that which has hair on body.*
17. *Asurah—that which causes obstruction in the vital airs.*
18. *Stambajab—that which affects the knees etc.*
19. *Tundikah—that which has trunk in mouth.*
20. *Anujighra—that which constrains its body frequently.*
21. *Pramushan—that which is highly infectious in touch.*
22. *Kravyadah—that which consvmes up the flesh.*
23. *Rerihah—that which attacks violently.*
24. *Svakishkni—that which troubles like a dog (hooping cough etc.)*
25. *Certain germs which affect the sleep etc.*
26. *Gardabhanadinah—those which dance like an ass.*

27. *Kusula—that which affect skin.*
28. *Kuksila—that which has big abdomen.*
29. *Kakubha—those which possess curbed bodies.*
30. *Karumah—those which at once affect the mind.*
31. *Srimah—those which produce virus.*
32. *Kukumatha—that which makes bad sound.*
33. *Kukurabha—that which is of grey colour.*
34. *Germs which have scissor-like organ in their mouth*
35. *Germs which make sounds and dance like impotent persons.*
36. *Bastavasin—that which has the goat-like mouth.*
37. *Durgandhinah—those which release bad smell.*
38. *Lohitasyah—those which have red mouth.*
39. *Makakah—those which have reverse movements.*
40. *Shronipratodinah—those which trouble the hips of women.*
41. *Germs having hornlike needlepipe in their hands torchers newly married women.*
42. *Apakeshthah—those which stay in the mess.*
43. *Germs which inflict pain in the rectum.*
44. *Germs which have their forefoot behind their heals and their mouths in front.*
45. *Khaljah—those which are born in the grain-husking ground.*
46. *Shakdhumjah—those which are born of the smokes of animal dung.*
47. *Urundah—those which are produced in plenty.*
48. *Matamatah—those which are very much pain—inflicting.*
49. *Kumbhmuskah—those which have jug-shaped testicles.*
50. *Ayashavah—those which bites creepingly.*
51. *Dvasya—that which has two mouths.*
52. *Chaturaksha—that which has four eyes.*

53. *Panchpad—that which has five limbs.*
54. *Anangurih—that which has very little movement.*
55. *Germs which consume raw flesh.*
56. *Germs which consume human flesh.*
57. *Germs which eat foetus.*

Raksah, yatudhana, pishacha etc. are the various names of the different kinds of germs which produce diseases.

Surgery and some other factors :

1. *Yatha nakulah vichchhidya sandadhatyahim punah. Eva kamasya vichchhinnam sandhehi viryavati.*

Atharva. 6.139.5

2. *Ajohavin nasatya kara vam mahe yaman purubhuja purandhih. Shrutam tachchhasuriva vadhrimatya hiranya hasta ashvinavadattam.*

Rg. 1.116.13

3. *Charitram hi verivachchhedi parnam aja khelasya paritakmyayam. Sadyo jangham ayasim vishpalayai dhane hite sartave pratyadhattam.*

Rg. 1.116.15

4. *Atharvanaya ashvina dadhiche ashvayam shirah pratyairayatam. Sa vam madhu pravochadritayan tvastram yaddasravapikakshyam vam.*

Rg. 1.117.22

5. *Yadantresu gavinyor yadvastavadhi samsritam.*
Eva to mutram muchyatam varhinvaliti sarvakam.

Atharva. 1.3.6

6. *Prate bhinadmi mehanam varatra veshanti a iva.*
Eva te mutram muchyatam varhinvaliti sarvakam.

Atharva. 1.3.7

Translation :

1. As the mongoose divides the snake into parts and joins together again so the herb *viryavati* joins the cut parts of the patient.

2. O *Ashinau,* the physician and surgeon you are the protector of people, inspired with righteous motive and skillfull in your art. In the important work of medical treatment you are called by the intelligent disabled woman (for her treatment). You attend this call like a disciple attending to his teacher and fit artificial hand of gold to her.

3. O *Ashvinau,* the physician and surgeon, you, for participating in and to win the battle, fit at once an artificial iron leg to the queen whose leg like the wing of bird has been struck in the battle of horse-mounting forces.

4. O *Ashvinau,* the physician and surgeon, you transplant active head to the doubtless intelligent person in such a way that he becomes able to speak to you of the topics of metaphysics through his recollection. O *Ashvinau* ! this feat of transplantation is due to your skill.

5. O ye patient ! just as the matter accumulated in your intestines, in the arteries of both the sides and in the urine-vessel is taken out in the same manner the trouble-creating

urine dropped in your urine pipe be taken out. This is all that is required for you.

6. I, the physician, open the normal way of your urinal organ in such a manner as the let-out of a bund is open for the swift flow of water. This is all that is required for you.

Here in these verses we have a mention of some tubular instrument to relieve retention of urine. In modern surgery we know Catheter and tubal instruments for dilation of urethral structure. In the *Rgvedic* verses quoted above there is mention of artificial hands and legs and also the transplantation of the head-skulls.

Medicine

Defining *bhisag*, the physician *Rgveda* says—

Yatrausadhih samagmata rajanah samitaviva:
Viprah sa uchyate bhisag raksohamivachatanah.
i.e. *Rg.* 10. 97.6.

He whom the medicines surround like kings in their parliaments, is called physician as he is killer of the germs creating diseases and the destroyer of all kinds of diseases. The same verse with some different readings is found in *Yajurveda* and its other branches, somewhere the term *bhisag* has been read as *kavih*. But the meaning of the terms *bhisag* and *kavih* are the same. These are used as equivalent terms in *samhitas* according to their context.

Atharvaveda mentions the animals and birds from whom the knowledge of medicinal plants and their use can be gained. These verses are quoted here with their English translation :

1. *Varaho veda virudham nakulo veda bheshajam.*

Sarpa gandharva ya vidusta asma avase huvey.

Atharva. 8.7.23

2. *Yah suparna angirsirdivya ya raghato viduh jvayansi hansa ya vidur yascha sarve patatrinah. Mriga ya vidurosadhista asma avase huvey.*

Atharva. 8.7.24

3. *Yavatinam osadhinam gavah prasnantyaghnya yavatinamajavayah. Tavestubhyamosadhih sharma yachchhantva bhriteh.*

Atharva. 8.7.25

Translation :

1. The boar knows medicinal plant, the mongoose knows the herbs of remedy. What the venomous reptiles and the other ferocious creatures know, those I collect to our aid.

2. What herbs of *angirasas* nature, the eagles know and what very effective and important ones the *raghatas* know, what ones the birds the swans know and what all the winged creatures know and what herbs the wild beasts know, I collect all of them to our aid.

3. How many herbacious plants the inviolable kines partake, how many the goats and sheep, let so many herbs being known to us, to extend protection to you.

Classification and identity :

1. *Atharvanirangirasir daivirmamushyaja uta oshadhayah prajayante yada tvam prana jinvasi.*

Atharva. 11.4.16

2. *Puspavatih prasumatih phaliniraphala uta sammatarah iva duhramasma aristatataye.*

Atharva. 8.7.27

3. *Yah phalinirya aphala apuspa yascha puspinih. Brihaspatiprasutasta no munchatvanhasah.*

Rg. 10.97.15

Transtation :

1. *O Prana*, the Lord controlling the universe from within, *Atharvani*, *Angirari Daivi* and *Manusyaja* remedial herbs flourish in exuberance when you work out your power.

2. Those remedial herbs which have flowers and which have no flowers, those which have fructification and those which have no fructification give protection to us from diseases like the mothers.

3. Those which are fructiferous those which are not fructiferous those which have flowers and those which have no flowers, be of our protection from disease when prepared and administered by the able physician.

Here in the first verse there is mention of four kinds of drugs—*Atharvani Anugirasi*, *Daivi* and *Manusyaja*. The herbs used as remedies are of four categories—

Fructiferous herbs, non-fructiferous herbs, those which have flowers and those which are flowerless.

Atharvaveda gives the mention of many kinds of herbs. A few are given below :

Sahassaparni —6.139.1
Sahasraksa—4.20.4
Dashbriksha—2.9.1

Prishniparni—2.25.1
Prasha—2.27.1
Rohini—4.12.1
Tauvilika—6.16.3
Pippali—6.109.1
Lakṣa—5.51.9
Apamarga—4.17.8
Arjuna Kanda—2.8.3
Ashvattha shamisthe—6.2.1
Ajashringi—4.37.2
Anksagandhih—4.37.3
Gugguluh—4.37.3
Audumbarah—83.31.2
Haridrava—1.22.4

Waters :

Water itself is a best medicine as well as the medium of remedial administration. There are various forms of water and they are described in the *Vedas*.

1. *Sham ta apo haimavatih shamu te santutsyah.*
   Sham te sanisyada apah shamu te santu varshyah.

   Atharva. 19.2.1.

2. *Apamah divyanamapam srotasyanam.*
   Apamah pranejane asva bhavath vajinah.

   Atharva. 19.2.4

Translation :

1. Auspicious be the streams from the hills of snow, aus-

picious be spring waters unto thee, Auspicious be swift running waters, and auspicious be to thee rainy waters.

2. Waters from rain and waters from fountains are endowed with the power of electricity and they make the body elastic like that of horse.

The following is the remark given for water in the *Vedas* :

1. *Rg.* 1.23.9.	Water contains medicinal properties and it has in it the nectar.
2. *Rg.* 1.23.20	Within the waters dwell all balms.
3. *Rg.* 1.23.21	Waters bear medicine.
4. *Rg.* 10.9.2	Waters are most auspicious and they protect us like mother.
5. *Atharva* 1.5.2	Water is the most auspicious essence.
6. *Atharva* 1.5.1.	Water is useful and beneficial.
7. *Atharva* 1.4.4.	Water contains nectar.
8. *Atharva* 1.6.2.	Water contains all sorts of remedial properties.

Various kinds of waters

1. Waters received from rain —*Daivih apah.* *Atharva.* 1.4.3.
2. Sea water —*Sindhuh.* *Atharva.* 1.4.3.
3. Water obtained in water regions—*Anupyab apah.* 1.6.4.
4. Waters obtained from desert—*Dhanvanya apah.* 1.6.4.
5. Well water—*Khanitrima apah.* 1.6.4.
6. Waters from rains—*Varshikah apah.* 1.6.4.

7. Water from mountains—*Haimavati XIX.* book 1.
8. Fountain water—*Atsyah.*
9. Stream water—*Sanisyadah.*
10. Water stored in jugs—*Kumbhebhirabhrita.*

Use of Manis :

The *Atharvaveda* mentions the following *Manis* in various context. These are the medicines but seem to have no connection with gems. It seems that they are tied to the body in a prescribed shape and form:

Name of manis	*Atharvaveda*
Anjanmanih	4.9.1
Shankhamanih	4.10.1
Astritamanih	1.46.1
Jangidamanih	2.4.1
Parnamanih	3.5.1.
Shatwarmanih	19.36.1
Odugdhamanih	19.31.1
Abhivartamanih	1.29.1
Pratisarmanih	8.5.1
Dorbhamanih	19.28.30
Audumbarmanih	19.31.1
Varanamanih	10.3.1
Phalamanih	10.6.1

Use of metals in medicine :

The *Atharvaveda* (19.26.1) and *Yajurveda* (34.51) say that gold may be used as medicine when calicined in fire. The ashes of gold are very much useful and can be administered in various diseases as medicine. This system may be applied in other metals for the medical purpose. Metals and minerals may be used in various forms. The *Yajurvedic* verse (18.13) gives name of some metals. The knowledge of using metals and minerals in medicine developed in the latter period, has its original source in the *Vedas*.

Other department :

The *Atharvaveda* (6.59.1.; 2.26.1.; 1.11.1 and 1.14.1) give rise to the idea of Veterinary science and *vriksa yurveda*.

Treatment of venomous reptiles :

Bites of venomous reptiles can also be treated and *Atharvaveda* gives the description of such treatment. Eighteen varieties of snakes are referred to in the *Atharva*. Their medicine are *tabuva* and *tastuva* but these medicines are not known to us. There seems necessity of further research in this matter.

The eighteen varieties of snakes according to *Atharra*, *Kanda* 5, *Sukta* 13, are as under:

1. *Kairatah*—living in forest
2. *Prishnih*—having spots
3. *Babhruh*—of brown colour
4. *Asitah*—of black colour
5. *Alikah*—bad in looking

6. *Taimatah*— living in wet place
7. *Apodakah*—avoiding water
8. *Satrasahah*—attacking any way even from distance
9. *Manyuh*—extremely wrathful
10. *Upatrimyah*—living in grass
11. *Aligi*—coiling round the body.
12. *Viligi*—remaining away
13. *Urugula*—having enormous body
14. *Asikni*—black female serpent
15. *Dadrushi*—causing itch after bite
16. *Karna*—having ears
17. *Shvabit*—one whom the dog follows
18. *Khanitrama*—one who lives in wholes

Increasing medicinal potencies :

Potencies of medicines may be increased by the scientific processes. *Atharva* gives an idea of the subject in the following verse :

Ishanam tva bheshajanam ujjesha aa rabhamahe.
Chakre sahasraviryam sarvasme oshadhe tva.
Atharva. 4.17.1

Translation :

We know and process the medicine which conquers the diseases and is the powerful among others. This medicine is potentiated thousand times powerful for the use of every one.

Sun's Rays in medical treatment

The twenty second hymn of *Kanda* one and eighty third

of *Kanda* six of the *Atharva* make us conversant with the idea of treating heart, kidney, lever etc. by means of Sun's Rays. For an instance one verse from *Atharva* is quoted here.

> *Shirshaktim shirshamayam karna shulan vilohitam.*
> *Sarvam shirshanyam te roga vahir nirmantraya-amahe.*

Atharva. 9.8.1

Translation :

Sun's rays cure all pains and aches that rocks the head, earache, erysipelus and all the malady that wrings the brow.

Here is being given a short data of the use of Sun's Rays in various pains and diseases :

1. Rising sun destroys the worms. *Atharva* 2.32.1
2. These worms cannot bear the sun. *Atharva* 8.6.12
3. Sun-rays are effiacious in heart diseases and jaundice. *Rg.* 1.50.11
4. Rising sun cures the brainal diseases and limb-pains. *Atharva* 9.8.22

CHAPTER VIII

MISCELLANY

Ships :

1. *Yaste pushannavo antah samudre hiranyairantarikshe charanti. Tabhiryasi dutyam suryasya kamena krita shrava ichchhamanah.*

   Rg. 6.58.3.

2. *Aritram vam divasprithu tirthe sindhunam rathah. Dhiya yuyujra indavah.*

   Rg. 1.46.8

3. *Anarambhane tadaviryethamanasthane agrabhane samudre. Yadashvina uhathurbhujyumastam shataritram navamanathivansau.*

   Rg. 1.116.5

Translation :

1. O protector of the subject, by those attractive shining ships which are plied in the sea and in the air you accede to the sphere of the sun. Oh, you desiring wealth are eulogized by the subjects.

2. O king and scientist ! You both have your enormously heavy ships on the shores of the seas and all the means and knowledge visit you.

3. O king and scientist, it is the heroic deed of yours in the ocean which is unfathomable and supportless, that

you carry the people sailing in the ship of hundred oars to their home.

Airship :

1. *Somapushana rajaso vimanam saptachakram rathamavishva-minvam. Vishuvritam manasa yujyamanam tam jinvatho vrishna pahcha rashmim.*

Rg. 2.40.3

2. *Anashvo jato anabhishurukthgo rathastrichakrah parivartate rajah. Mahattadvo devyasya pravachanam dyamribhavah prithivim yachcha pushyatha.*

Rg. 1.4.36.1

3. *A vam ratho ashvina shenapatva sumridikah svavam yatvaryan yo martyasya manaso javiyan tribandhuro vrishana vatranhah.*

Rg. 1.118.1

Translation :

1. O king and learned man, you are the doers of good of people and you give the people for their benefit the airship which is *Vimanam* and is seven wheeled and measures out the whole region of the earth and space and moves everywhere and which does not stir anything, which is in reality the form of materials harnessed by the mind equipped with five artifices.

2. O men of wisdom, the ship under your possession is without horses, without reins, three-wheeled, laudable and

it moves in fermament. It is a very glorious and self-eloquent skill of yours that you give comfort to people on earth and in heaven.

3. O king and scientist, the artificial craft under your possession is falcon-shaped, comfortable, speedier than the mind of mortal, three-engined, and it moves hither and fleets like wind. Ye fulfil the need of people.

Here the mention of two old treatises dealing with the construction and operation of aircraft seems very indispensable. These two are the *sama-rangana sutradhara* of Bhoj's time and the *Viman Sutra* of *Bharadwaja* of which few *sutras* with the commentary of Bodhanands are available.

There were written some other treatises on various subjects concerned with airship but they are not available in the present. The dates of the writers of these treatises are prior to Bharadwaja. They are as follows :—

1. *Vimanachandrika* by Narayana
2. *Vyomayanatantra* by Shaunaka
3. *Yantra kalpa* by Garga
4. *Yanavindu*, by Vachaspati
5. *Khetayana dipika*, by Chakrayani
6. *Vyomayanarka prakasha* by Dhundhinatha

Vimana means that which is of the shape of bird. *Bharadvaja* has accepted this basis in his *Vimana Sutra*. He has described various types of *Vimanas*. The word *shenapatva* of *Rigveda* occurring in the third verse quoted above, is extraordinarily remarkable.

In the aeroplane in ancient time mercury was used in the place of petroleum. This fact has been brought to our notice in the commentary of *Yajurvedic* verse (1-15) by great Swami Dayananda. It is not merely a fancy of his own. It has been very unequivocally accepted and described in

the *Samarangana Sutradhara*. The mercury has been called as *rasraja*. The chapter of the author's Hindi Book "*Shikshana Tarangini*" pertaining to this subject may be referred to for knowing more on the subject.

Minerals :

1. *Ashma cha me mrittika cha me giryascha me parvatascha me siktascha me vanaspatayascha me hiranyanchame ayascha me shyamancha me lohancha me sisancha me trapucha me yajnena kalpantam.*

Yajuh. 18.13

Translation :

May stone be for my use, may clay be for my use, may hills be for my use, may mountains be for my use, may sand be for my use, may trees be for my use, may gold be for my use, may bronze be for my use, may the copper be for my use, may the iron be for my use, may lead be for my use and may tin be for my use. All these serve my purpose through the knowledge and practical processes of *Yajna*, the mineralogy.

Agriculture :

1. *Yunaktu sira viyuga tanudhvam krite yonau vapateh bijam. Gira chasrustih sabhara asanno nediya it srinyah pakvameyat.*

Yajuh. 12.68

2. *Shunam suphala vikrishantu bhumim shunam kinasha abhiyantu vahaih. Shunasira havisha toshmana supippala oshadhih kartanasme.*

Yajuh. 12.69

3. *Vrihayascha me yavascha me mashascha me tilascha me mudgascha me khalvashcha me priyangavascha me anavascha me shyamakascha me nivarascha me godhumascha me masurascha me yajnena kalpantam.*

Yajuh. 18.12

Translation :

1. Harness the yokes and fasten well the traces. Sow seed in the formed furrow. With sweet song may we find hearing fraught with plenty and ripened grain approach near the sickle.

2. Let the ploughshares turn up the plough-land in happiness and let the hard-working ploughers go with the oxen in happiness. Air and sun nourishing the earth with water, cause our plants bear abundant fruit.

3. May the rice be for me, may the barley be for me, may the pulses and beans be for me, may *sesamum* and grains be for me, may kidney beans be for me, may vetches be for me, may milet be for me, may *Panicum Milliaceum* for me, may *Panicum frumentaceum* be for me, may wild rice be for me and may wheat and lentils be for me. May all these grains prosper me and be procured through the skill and process of agricultural science.

Botany and Zoology :

1. *Agnischa ma apaschame virudhascha me oshadhayascha me kristapachchyascha me akristapachchyascha me gramyascha me pashavascha aranyascha me.*

Yajuh. 18.14

2. *Vasantaya kapinjalanalabhate grishmaya kalvinkan varshabhhyastittirin chharde vartika hemantaya kakaranchhishiraya vikakaran.*

Yajuh. 24.20

Translation :

1. May fire be for my use, may water be for my use, may creepers be for my use, may plants be for my use, may the product of ploughed land and product of unploughed land be for my use, and may the domestic animals and wild animals be for my use. May we receive the advantage from them through knowledge of plants and knowledge of animals.

2. An expert in the knowledge of animals finds *kapinjalas* in the spring, sparrows in summer; partridger in the rains; quails in autumn, *Kakaras* in winter, *vikakras* in the Dewy season.

In the chapter 24th of the *Yajurveda* there is a vast list of animals wild and domestic, birds and those creatures which live in water. In *Atharvaveda* (12.1.49) there is mention of wild animals including lion and tigers. Elephant and *Asva* etc. are described in *Atharva* 14.49.4.

Architecture :

1. *Ya dvipaksa chatuspaksa shatpaksa ya nimiyate. Astapaksam dashapaksam shalam manasya patnim agnirgarbha ivashaye.*

Atharva 9.3.21

2. *Shatamashmanmayinam puramindro vyasyat. Divodasaya dashuse.*

Rg. 4.30.20

3. *Vrajam krinuddhvam sa hi vo nripano varma sivaddhyam bahula prithuni. Purah krinuddhvam ayasiradhrista ma vah susrochchamaso drinhta tam.*

Rg. 10.101.8

Translation :

1. Like animal heat in the body and foetus in the womb I, the householder live in the houses which are built with two wings, four wings, six wings, eight wings and ten wings and are planned in appropriate measurement.

2. The ruler captures from enemies hundred fortresses of stone for deserving learned person.

3. O ye people, prepare the cowstal which be for your men's safety, stitch your coats of armour wide and many, make iron forts, secure from all assailants, your *yajna* be not disturbed at all, make that strong and firm to continue.

Science of Telegraphy :

1. *Yuvam pedave puruvaramashvina spridham shvetam tarutaram duvasyathah. Sharyarabhidyum pritanasu dustaram charkrityam indramiva charshanisaham.*

Rg. 1.119.10

Here we quote the full portion of the commentary of Swami Dayananda Saraswati on this verse from his *Rgvedadibhashyabhumika.*

"You should make the telegraph apparatus of a pure white metal which is a good conductor of electricity possessing the qualities of fire and it should be charged with electricity. It should possess the qualities of the *ashvins.* It has many excellent properties and most of the learned put it to their use. In military operation of the state it is a source of strength which it is most difficult to overcome. It should be employed most frequently in all the things. It possesses this property that when it is struck it transmits the current and brings success in all great and good undertakings. It is most helpful in defeating the opposing forces of the enemy and in securing victory to the home forces. It helps forward the operations of human armies. Like the sun it brings to light events happening at great distances. Becoming well versed in the use of the *Ashvins*, the terrestrial substances and electricity, always make use of the telegraph apparatus."

Irrigational Means :

1. *Eko vo devo apyatisthat syandamana yathavashasham. Udanishur mahiriti tasmad udakmuchyate.*

Atharva. 3.13.4.

2. *Apo bhadra ghritamidap asan agnisomau bibhratyapa it tah. Tibro raso madhupricham arangama aa ma pranena sahvarchasa gamet.*

Atharva. 3.13.3

3. *Idam va apo hridayamayam vatsa rtavarih. Ihetthameta shakvarir yatredam veshayami vah.*

Atharva. 3.13.7

Translation :

1. One illuminous substance (fire) flowing everywhere became the agent of elemental sustenance (in the beginning of creation) and great liquescent vapour heaved and it is why it has been called *udakam.*

2. Waters are auspicious and they are like *ghritam,* the essence. They feed up energy to the sun and moon and create strength in us having been used in agriculture for producing grains.

3. This flowing *rasa* is the heart of river water. Canal is like their *vatsa.* This must come to us and we take these river waters in our use.

The *vedic* term *kulya* is also used for canal. Here in the above quoted third verse *vatsa* has been used for canal. *Kupa* is used for well. Other *vedic* terms like *avata, sarsi, sarah* etc. are used to denote various pools of water. Besides rain there are mentioned many other irrigational means in the *Vedas.*

Cosmogony :

For the subject underheading readers should refer to my book "The Arya Samaj Its Cult and Creed". Here we do not want to repeat the subject which once has been dealt with in my another book which is in prominence for a long time.

Electricity

Apsaras :

Vedic literature is enriched with various sciences. The subject of knowledge being generally dry and ununderstandable by all is difficult to be grasped by all. To remove this difficulty and to create interest of the common people towards this myths and legends were invented. By imagination of an *akhyana* an incomprehensible subject can be made easily intelligible and this, no doubt, is an art. This was in common practice in ancient time. *Vedic* literature is not anyhow devoid of it. The imaginary actors of such *akhyanas* are not the entities of proper individuality, but they are the various objects of creation. They are described as individuals with the aptitude and love of imagining an *akhyana*.

Vedic literature is full of such descriptions and it is really under that influence that certain histories connected with various individuals got their practical shape and found eminence in the practical world. It is a very very difficult task to consider all the *Vedic akhyanas* and put their real essence before the public. It is a subject which requires more time and energy. It is but pertinent here to consider the *apsaras* of the *Vedas* in their different aspects and the other objects connected with them.

This word has been used in the *Vedas* in different meanings. All these meanings are not shown here. Only an extraordinary aspect of *apsaras* will be given here.

In *Yajurveda* (18.39) the sun has been described as *Gandharva* and its rays as *apsara*. In the previous and subsequent verses of this context fire, the moon, air, *yajna* and mind have been called *gandharva* and medicinal herbs, stars, water, *daksina Rg and saman* respectively their apsaras. This whole context when considered thoroughly

gives to understand that the sun and fire etc. are called *gandharva* and the objects concerned with them are called *apsaras*. As a close and nearest congruence is found between imaginary *gandharva* and *apsaras* similarly so is the case with the objects described here as *gandharva* and *apsaras*. In *these* referred to verses terms—*rtasad*, *sanhata*, *susumnah*, *isira*, *bhujyu* and *prajapati* have been used as adjectives of the word *agni*, *surya*, *chandrama*, *vayu*, *yajna* and *manas*. All these terms are attributive. *Agni*, the fire is called *rtasad* because of its being utilized as a medium in formation and dissolution of water. Sun which conjoins the day and night is called *sanhata*. Air gives comfort to all therefore it is known as *isira*. *Yajna* gives protection to all hence it is *bhujyu*. *Manas*, the mind is the source of the protection of *praja*, therefore it has been described as *prajapati*. There is a similar close relation in fire and sun etc. with herbs and rays etc. like the close relation of fancied *gandharva* and *apsaras*. The relation of rays with the sun is inseparable. These verses are applied to the marriage ceremony to instruct the importance of close and delicate relations of married couple. To describe fire and the sun etc. as *gandharva* and the objects connected with them as *apsaras*, is to show and establish the flexibility of *yaugic* sense of terms. As the application of term *gandharva* in fire and the sun is *yaugic* in the same manner the use of term *apsaras* for their connected objects are also *yaugic*. Here seems no connection of *apsaras* with any *akhyana* or historical narration.

In another context in the *Yajurveda* we find a respective description of the twin of the *apsaras* called *punjikasthala*, *kratusthala*, *sahajanyas*, *pramlohanti*, *visvachi*, *ghritachi*, *urvasi* and *purvachittih* with the fire, the sun, *yajna* and the cloud respectively. What are these *apsaras*. And what are their relations with fire etc. These are the

questions which require a serious consideration. This consideration will no doubt, lead to satisfactory conclusion. Similarly we find a general and particular description of *apsaras* at other places in the *Vedas*. Before plunging into a thorough examination of the matter concerned it is needed first to know the meaning of the term *apsarás*. Etymologically the terms *apsaras* is constructed from the root sri by placing word *ap* previous to it by the method of *unadi* (4.237) by adding suffix *asi*. In the *Nirukta* (5.13) Yaska has taken the term *apsaras* as *apsarini* dealing with *yaugic* method. He has given various meanings but this has been also given as one. According to *Yaska* it seems here quite clear that *apsaras* is *apsarini* which means that which moves and is found in water. It very distinctly means here electricity. The verses referred to by *Yaska* also give the same indication.

Apsaras is really electricity and it has been shown and established before. Now the relation of *apsaras* with water is to be considered. In the fancied stories *apsaras* is described to be related with water. If *apsaras* is taken as electricity its connection with water is also inevitable. The affinity of electricity with water is well known to every one who has even a very little knowledge of science. They have a very close relation. Electricity is used in the formation of water as well as in the analysis of it. In the composition of water electricity plays the part of combining hydrogen and oxygen and in decomposition of water it disintegrate the molecules of hydrogen and oxygen. Besides, the water is also a conductor. This also shows relation of electricity with water. Says Mr. John Gall 'Among conductors are metal, charcoals, acids, water, animal etc.' (Royal Hand Book of Popular Science, P. 58). *Vedic* literature also maintains this affinity of electricity and water. In *Satpatha Brahmana* (7.5. 2.49) electricity has been

called 'the light of water'. *Aitareya* (2.41) says that it is electricity that causes rains. *Jaiminiya Brahmana* reveals that electricity has its place in water. *Taittiriyopanishad* (1-3) says that electricity is the media which integrates the elements of water. *Jaiminiya Brahaman* in one context has declared that there is very close connection of *yajnayajniya saman* with electricity as the water itself is *yajnayajniya*.

In *Yajurveda* (15.18) there is a description of two *apsaras* named as *visvachi* and *ghritachi* and water has been described as their weapon. In *Rgveda* (9.78.3) in the context of *apsaras* we find the terms '*samudriya apsarasah*, which indicate the *apsarasah* of ocean. Again in *Rigveda* (10.15.10 and 10.10.4) the terms *apya* and *apya yosah*, are used respectively for *apsarasah*. These terms give the meaning of females of water'. In *Vedic* mythology (p. 134) these are called as 'water nymph'. In *Atharvaveda* (2.2.3) it has been described that ocean is the home of *apsarasam*. Further in the verse of *Atharva* (2.2.6) *apsaras* has been termed as *abhriye didyut* used in vocative case meaning 'full of flashes and moving in clouds'. Griffith in his notes says that it is that which transpires the lightning.

Original references occurring in the above passage are given here in Roman character as follows :—

1. *Vidyudva apam jyotih*

   Sat. 7-5-2-49

2. *Vristirvai yajnya vidyudeva, vidyudhidam vristim annadyam sam prayachhati.*

   Ait. 2-41

3. *Agnih prithivyam vayu antarikse adityo divi chandrama naksatresu, vidyudapsu.*

   Jaimini B. 1-292

4. *Agnih purva rupam, aditya uttar rupam, apah sandhih, vaidyutah sandhanam.*

Tait. 1-3

5. *Vidyudyajnayajniyam apo hi yajnayajniyam.*

Jaimini. 1.292

6. *Visvachi cha ghritachi cha apsarasah vayo hetih.*

Yajuh. 15-18

7. *Samudra asam sadanam.*

Atharva 2-23.

In the verse of *Atharva* (4-3-73) it has been said "*apsarasah* move towards the bank of river or water." On the strength of these proofs it can be easily established that *apsaras* means electricity and it has its affinity with water. As an instance we take here the word *ghritachi*. It is the name of an *apsaras* which, if very carefully examined and analysed gives the idea of electricity which gives rise to water. *Ghrita* of Sanskrit is used for water and therefore it stands for water in *Nighantu* (1.18). The grammatical construction of the word *ghritachi* (*ghritam anchatiti ghriachi*) shows that it is electricity because it produces water. It has been already said that electricity is the cause of water. In his Sanskrit Dictionary Mr. Monier William says (Going in the waters or the waters of clouds)....they are said to have been produced at the churning of the ocean. The author of the Students English Dictionary, 1911, giving the meaning of nymph says, "one of the inferior divinities

of the Greeks and Romans imagined as beautiful maiden haunting the mountain, forests, meadows or water." In the context wherein *Mahasveta* in the *Kadambari* tells her full story to Chandrapida, she says that amongst the fourteen geneological order of *apsarasas* one is said to have descended from the water (*anyajjalajjatam*). In some places of mountainous regions iron *trishulas* are posited on the mountain peaks. Inhabitants of such regions believe that the green places and high peaks are hunted by *achhari* (*apsaras*). They have this belief also that there should not go red clothes and bands etc. The fixation of iron *trishula* in such places is meant to save from the destruction of thunder-bolt. This is a scientific method. *Apsaras* is lightning and to avoid the possibility of damage from the fall a lightning *trishula* is fixed on the peaks. Iron rods are fixed also on magnificent buildings to save them from damage caused by lightning. In this connection says Mr. Gall in his 'Royal Hand Book of Popular Science, on page 70, "To avoid the destructive effects of lightning large buildings are provided with lightning conductors. These consist of strong pointed metalic rods which rise into the air some distance above the highest points of the building and are sunk into moist earth at the lower end. Lightning in passing between the clouds and the earth will by preference travel by the best conductor and as the lightning rod conducts better than the building. Lightning travels by that instead of striking and shattering the building." Therefore it is quite clear that *apsaras* is electricity and it has its close affinity with water.

It has been previously shown that *apsaras* means electricity. Now particular cases and names of *apsaras* are considered here. When it has been laid down that *apsaras* is electricity it should be deemed on that strength that particular or individual *apsaras* will also be something like that.

These particular *apsaras* are also electricity. s a fact which we are going to establish hereunder.

Mr. Macdonell in his *Vedic* Mythology (p. 134) referring to *Atharvaveda* 2.2.4 says that *apsaras* are connected with cloud, electricity and stars. The same idea has been expressed by the *apsaras* described in the *Rgvedic* verses (10.15.6). In this context of *Rgveda* there are found the terms like—*sajurni*, *sumna-apih*, *charanyu*, *grathini*, and *hradechaksuh*. Mr. Griffith commenting on this says in his notes. "The *Apsarasas* were the companions of *Urvasi* after her flight. They are compared to red line, meaning perhaps bright flashes of lightning followed by the lowing or bellowing of the thunder. Here it is quite clear that these companions of *Urvasi* are the flashes of lightning. On the same strength it may be easily inferred that this *urvasi* is also something of the same nature. It is either electricity or some object connected therewith. In *Yajurveda* (15-19) we find a statement in which the *apsaras*, *Urvasi* and *purvachittih* have been enjoined and the thunder and flash of lightning have been respectively called as weapon and grand weapon. This statement shows that there is some close connection of *Urvasi* with electricity. Besides, there is found the description of *Urvasi* with *pururava* in the nintyfifth hymn of the book tenth of *Rgveda*. *Satpatha* (11-1-5-1) also gives the same idea. The etymological construction of *pururava* shows that it means cloud.

The statement that *Urvasi* is the wife of *pururava* is also meaningful here in conveying the idea of her being electricity. If the affinity of *Urvasi* and *pururava* is examined carefully, it will lead to a very convincible conclusion in this connection.

Pururava is cloud, it has been mentioned above. Now the references and proofs found regarding him are critically examined. If it is established that *pururava* is cloud there

will be an easy going with the subject that *Urvasi* is electricity. Grammatical construction of word *pururava* shows that the same is derived from the root *ru* by method of *unadi* (4.232) by prefixing sanskrit word *puru*. It means "thundering". *Nirukta Samuchchaya* of *Varuruchi* (4-14) and *Nirukta* of *Yaska* (10-46) also create the same impression. In the *nirukta* (10-11) the objects of the atmospheric region which are treated to be the subject-matter of some *Vedic* verses, have been explained and the objects of solar region in *Nirukta* 12-1. These two chapters respectively give the explanation of the objects of atmospheric and solar regions. *Nirukta* 10-46 and *Nirukta* 11-35 give the description of *pururava* and *Urvasi* respectively. This description makes one believe that these two are the objects residing in the atmospheric region, and not the historical persons. Commenting on this part of *Nirukta Skand Swamin* says, "*Pururava* is an object of atmospheric region as it produces multifarious sounds of thunder." This reveals the fact that *pururava* is cloud. In the *Nirukta* the chapter eleven begins with the remark that now we would explain the female gods of the *antariksa*. In this connection *Yaska* has explained the names of the *Vedic* godesses beginning from *aditi* and ending with *rodasi*. *Yaska* explains the term *Urvasi* in *Nirukta* 11-35. Residing in atmosphere and making thunder *pururava* can be said as cloud. *Urvasi* known as his wife is also lightning but nothing something like a historical female. In *Yajuh* (26.10) and *Shatpatha* (6-7-3-2) cloud has been called a thunderous object. In *Rgveda pururava* has been named as *aila*. This name it has got from his mother *ILA*. He is born from *ILA* therefore he is called *aila*. The subject-matter of this *Rgvedic* verse is also *pururava aila*. In the sanskrit literature the difference between letters *da* and *la*, and *ra* and *la* is sometimes very negligible. Therefore they are interchanged. In commentary

of Amarkosa by Maheshwara (3-3-42). *Ida* and *ila* are treated as the same. The meaning of these two besides other meanings is water also. Commenting on the word *Ira* in his commentary on *Nighantu Devaraj Yajvan* took the word in the sense of grain and on strength thereof assumed it to convey the meaning of water which is the cause of grain. In *Amarkosa* (3-3-175) and in *Vaijay- anti Kosa* of *Yadava* (1.8) word *ira* has been described meaning water. It has various meanings but water is one of them. At these places it is read in the sense of water also. In his commentary on *Nirukta* (10.8). *Skand Maheswhara* writes "*Ira* is grain". On the ground of waters' being cause of grain, *Ira* means water also. "The author of *Sidhanta Kaumudi* on *unadi* (2-28) says that *Ira* means *vari*, the water. In *Nighantu* (1-1) rivers are called *iravatyah* because of their being full of water. *Bhanuji Diksit* who is a commentator of *amarkosa* (1.1.46) says "*Iravan* means ocean. Being born of *iravan*, the ocean *airavata* is called *airavata*. This *airavata* is really *abhramatanga*, the cloud-elephant. *Airvati* being the wife of *Airvata* is nothing but electricity. *Abhramatanga* is a cloud bearing the form of elephant. It is a folk-belief that *airavata* is the elephant of *Indra* and it came out of ocean and is one of the fourteen *ratna*. But this comes equally true with cloud. In *Amarkosa* (1.1.46) *Ksirswami* accepts this fact and says "*Abhramantanga* being present in clouds bears this name meaningfully. Some one says that it is nothing but cloud." *Iravan* thus means ocean, *airavata* cloud and *airavati* electricity, it has been accepted in the *Vachaspatya Kosa*. The author of *Vaijayanti Kosa* in its *Meghadhyaya* (*sloka* 4) has called *airavati* electricity. Gustava Apte in his dictionary gave the translation of *airavati* as lightning. It is well established on the ground of these proofs that *ila* is water and being off-shoot of the water *aila pururava* is cloud. *Shatapatha* (11.5.1.17) says

that *pururava* is one of the *Gandharvas*. *Gandharva* signifies cloud. Being one of the *Gandharvas pururava* is no doubt, cloud.

References concerned with the above statement are given here as under :

1. *Pururava madhyasthanah. Sah Kasmat bahudha roruyate, anekvidham attyartham stanayitnu laksanam shabdam karotiti pururava.*

2. *Kanikraddenah parajanyah.*

Yajuh. (26.10)

3. *Krandativa parjanyah.*

Sh. (6-7-3-2)

4. *Dalayoraikyat ida ilascha.*

Amar. (3-3-4-2)

5. *Ila annam atrannahetubhuta udaka vartate.*

Nighantu (4-3)

6. *Ira annam tena sambandhat tadhetubhutam udakam laksyate.*

N. (10-8), *Skand C.*

7. *Pururava gandharvanam eka asa.*

Sh. (11-5-1-7)

Commenting on the last verse of the chapter 20th of the *Samveda uttararchika Sayana* says that *Gandharva* signifies that who contains water. In *Rgvedic* commentary (10-123-7) *Sayana* has further exposed that *Gandharva* is the sustainer of water. In the same context on the 4th verse he again took *gandharva* in the same sense.

It has been elucidated enough that *Gandharva* is cloud. But now it is to be shown that *apsarasas* are the wives of the *Gandharvas*. In *Atharvaveda* (4.37.7) *Gandharva* has been addressed as *apsarapati*, the husband of *apsaras*. In the same place in 4.37.12 it has been said "O *Gandharvas*" *apsarasas* are your wives and you are their husbands. The similar statement is found in another place of *Atharva*. These statements prove the fact that *Gandharva* is cloud and *apsaras*, the lightning is his wife. The relation of husband and wife or male and female between cloud and lightning is very clear in the description of *Taittiriya Aranyaka* (3.9.2.). Says *Kalidas* in his fancied mood in the *Meghduta* (54)addressing the *megha*, "O *megha*, you wander in desired places freely but there be your separation from *Vidyut* (lightning) even for a minute". Mallinath in his note explaining the word *vidyuta* adds as "*Kalatrenetisesah*" i.e. from your wife, *vidyut*. In *Taittiriya samhita* (3.4.7.2.) *parjanya* has been described as *gandharva* and *vidyut* his wife. *Mahashveta* reciting her story to *Chandrapida* in *Kadambari* says that there are fourteen geneological group of *apsarasas* and one of them has descended from *Saudamini*, lightning of cloud. She further adds that one group came into existence from churning of *amrita*. What is this *amrita*? In *Nighantu* (1.12) *amrita* has been read in the names of water. To say that *apsarasas* descended from *vidyut*, gives clue to another scientific fact. This fact is that *apsarasas* in the form of lightning make rainy water and water in its turn churned out by scientific means gives electricity. Or the electricity passed through the

molecules of hydrogen and oxygen creates water and water in pools and rivers create electricity. This statement of *Kadambari* might not be of some original value but it clearly shows that *apsarasas* are connected with electricity. Exposing the *Rgvedic* Verse (10.95.10) commented in *Nirukta* (13.36) *Durgacharya* says "Like *vidyut*, or the same as *vidyut* *Urvasi* moving again and again in the clouds in atmospheric region shines in them and makes the rain fall and gives long life to people." At the same place *Skanda Swami* commenting says "Thunder sound of cloud is *Urvasi* and it is some thing like *vidyut* or the *vidyut* as the same. *Durga* and *Skanda* both in this context accept that *na* is used here either in the sense of resemblance or similarity or in the sense of 'now'. When the simile is explained as similarity *Urvasi* would mean some thing like *vidyut* but when it is taken in the sense of 'now' it would mean *vidyut* itself. All the statements connected with *Urvasi* are meaningful and purposeful in *vidyut* also. To move in clouds, to flash again and again, to cause rainfall from the clouds and to prolong the life of the people, are the functions of *Urvasi* and these are, no doubt, the operations of electricity. The verse describes that *Urvasi* gives long life to creatures. This is a fact. Electricity causes rain which produces grain to protect all people and creatures. In *Aitareya* (2.41) this fact has been made quite clear. The statement that *Urvasi* gives long life, reveals another important scientific fact. Ozone which is a condensed and concentrated form of oxygen is a very powerful germicide. Says W.W.H. Cormicks in his 'Electricity' page 23, 'Ozone—oxygen in a condensed or concentrated state (see page 248) is also a powerful germicide, capable of killing the germs which give rise to contageous disease. During a thunderstorm ozone is produced in large quantity by the electric discharges and thus the air receives as were a new lease to life and we feel the refreshing effects when the storm is

over."

In sanskrit literature *ashani* is an equivalent of *Vajra*. *Ashani* is electricity. At the time of thunderstorm the germs producing disease are destroyed. This truth has been dealt with in *Vedic* literature which is exceedingly more ancient than the modern science. *Shatpatha Brahman* elucidates that *Vajra* is the lightning and this destroys the germs which create disease. Says *Rgveda* (5.83.2) that cloud thundering in the sky destroys the trees and destroys the germs of disease and infection. It gives pleasure and delight to the creatures of the earth. The verse contains in it the word '*stanayan*' which expresses the sound of the lightning. In *Nighantu* (2.20) the word *vidyut* seems to have been used as the synonym of *Vajra* and *Sayana* in his commentary of *Atharva* (2.2.4) has taken it to mean radiant *apsaras*. In the same verse the *apsaras* has been called *abhriya*, that which remains in clouds. It is thus crystal clear that the terms—*ashani*, *vajra* and *vidyut* signify electricity. This is real *Urvasi*. This at the time of fall destroys germs of disease. For clearing the point more and proving the fact that *Urvasi* is electricity here we give some other clear-cut proofs. *Skanda* in his commentary of *Nirukta* says, "In the permanent *vedic* sense Urvasi is electricity. *Acharya Varuruchi* in his *Nirukta Samuchchaya* (4.14) described that *Urvasi* is *vidyut* as it has its place in atmospheric region. Skanda on another occasion described *Urvasi* as atmospheric *vidyut*. In *Laugaksi Grihyasutra* (52.18) electricity hasbeen called *Variv arsnya apsaras* and the atmospheric region has been described its locality: *Kathak Grihyasutra* (4.-10) also agrees with this description. This is sometimes called *saudamaini*. *Sudama* is the name of *megha*, the cloud. It comes out of *sudama*, the cloud therefore it is known as *saudamani*. In *Amarkosa* (1.3.9) Commentator *Bhanu* Dīksit says that being in the *megha*, the cloud, *Saudamini*

reading has also been seen somewhere. In the same place the *apsaras* has been accepted as a variety of *vidyut*. Thus, it is explicit that *apsaras* is electricity and this is expressed by the names of *Urvasi* etc. *Shatapatha* (3.4.1.22) says that *Urvasi* is *apsaras* and *pururava* her husband. The couple give birth to a son who is known *ayu*. *Ayu* is not a person but is really water which is born in the form of rain from *Urvasi* and *pururava* who are respectively proved electricity and cloud. In *nirukta* (10.41) *Ayu* means *ayana*, *manusya*, *jyoti* and *udaka*. These different meanings are due to the various aspect of the meanings of *Urvasi* and *pururava*. Avoiding further details and coming to the conclusion in this matter we establish here that *Urvasi* is electricity and *pururava* is cloud. It should also be noted here that the terms used as *devata* in the verses have multifarious meanings in various contexts. *Vedic* literature is full of such details. Our concern here is only with a limited sense. In that sense the terms yield the meanings of electricity and cloud respectively.

Now we come to examine here the aspect of their being twin or couple. Why are the *apsarasas* twin ? It is a question to be answered. It has been established that *apsaras* is electricity. Electricity always remains in two forms known as positive and negative. Therefore it is reasonable that the *apsaras* should be twin or couple. The *Vedic* literature makes this fact very clear in many places.

The connection of *Urvasi* and *mitravarunau* is a very important factor on which there seems a necessity to enlighten the readers. In *Vedic* literature we find many instances where *mitravarunau* are described as having a very close connection with *Urvasi*. In the *Nirukta* it has been stated that *mitravarunau* discharged their potential seed seeing *Urvasi apsaras* in the *yajna* of *Daksa*. *Vasistha* is the offshoot of *Urvasi* and *mitravarunav*.

Urvasi is electricity, it is quite clear. What are the *mitra* and *varuna*? What connection have they with *urvasi*? These are the questions which require satisfactory answers. *Urvasi* is no doubt, electricity. *Mitra* and *varuna* are *udana* and *prana*. These are nothing but two gases. These two gases charged with spark of electricity produce water. *Rgveda* (7. 33. 11—16) gives the description of the birth of *vasistha*. There *vasistha* has been addressed as 'O *vasistha*" and told 'you are the son of *mitra* and *varuna* and have got birth from the mind of *Urvasi*.' Throwing light on this theme *Yaska* in his *Nirukta* (5.13) created an imaginary story and said "The fluid of *mitra* and *varuna* dropped down when they saw *Urvasi apsaras*" *Retas* is read in the names of water in *Nighantu*. Therefore the whole myth presents a scientific idea before us.

Shatapatha inculcates in many places (1.8.3.12; 3.6.1.16: 5.3.5.34; 1.5.16.6; 3.2.2.13) that *udana* and *prana* are *mitra* and *varuna* respectively. In modern science these are the gases known as oxygen and hydrogen. Oxygen is very necessary for life. All living beings are alive on account of it. It has no taste, no smell and no odour. It is helpful in preserving life as well as cumbustion. The word oxygen is a combination of Greek 'oxdeys' and verb 'gen' which means 'to produce'. In the Hygiene by Notter and Ferth (1.1914. P. 2) oxygen has been described like this. 'Oxygen—this gas is necessary for all forms of life, all animals, if deprived of it, dying at once." Word hydrogen is a formation of Greek word hydor meaning water and verb gen. This means the gas which forms water. When these two gases in their required proportions are combined by the spark of electricity they form water. This fact has been accepted by modern science. In formation of water their quantity is $2^{H}+1^{O}$. Between these *prana* and *udana*, *udana* has been accepted as the lightest gas by *Vedic* literature and present day

science. In the commentary on *yoga* (3.39) *Vyasa* described *Udana* as that which raises the things above. *Vachaspati* has expressed the same idea regarding *Udana*. Says E.C.C. Baly (1922) "In the formation of water we know that two atoms of hydrogen are combined with one atom of oxygen (Inorganic chemistry). We find in 'Hygiene' by Notter and Ferth, (1914, page 4) that hydrogen is the lightest of all gases. Says Mr. J. Gall in his 'Royal Handbook of Science,' page 22 Baloon—"a large bag made of silk and filled with light gas, so that it takes a globular form. Its general appearance and use are well known from familiar observation. It rises in the atmosphere, because its weight is less than the weight of air which it displaces. It was invented by the two brothers Montgoalfaer. They used ordinary air made lighter than the surrounding atmosphere by heat, afterwards hydrogen gas was used which is only about one fourteenth the weight of air, bulk for bulk."

Inorganic Chemistry of Baly 1922 on page 30 gives another account. It reads "Two volumes of hydrogen and one volume of oxygen combine together form water, it is simple enough to make the oxygen and hydrogen enter into combination with one another by passing an electric spark through the mixture. Combination takes place explosively, that is to say, with evolution of large quantities of light and heat." Thus conclusion may be easily drawn that *mitra* and *varuna* are the gases named as hydrogen and oxygen respectively. When they are in contact of *Urvasi*, the spark of electricity, water is formed. This water is named as *vasistha*. It may also be clearly proved by the commentary of *Skanda* Swami on *Nirukta* 5.14. When *mitra* and *varuna* are compounded together it becomes one compound word —*mitra varunau*. Added with suffix *an* caused by *laddhita* the word *Maitravaruna* becomes formed. *Maitravaruna* is the patronymic of *vasistha*. He is the son of *Mitravaru-*

nau therefore, he is *maitravaruna*. This is description of formation of water which has its root in the *Veda* allegorically. It is undoubtedly a scientific formula. Water is *vasistha* and it being the production of *Mitravarunau* is called *maitravaruna*. In *vedic* language the patronymic suffixes may be added to non-living objects also. *Vedic* literature is full of the mentions of close and remarkable affinity of water with *mitra* and *varuna*. These are the two great powerful forces working in the structure of the Universe. In *Rgveda* (1.152.7) *mitra* and *varuna* have been stated as the agents of rainfall. In his note on this verse Griffith says "God *mitra varuna*.... may have rain from heaven to make us prosper." In *Rgveda* (5.69.2) again it has been emphasized that *Mitra* and *varuna* make the waters of cloud and rivers sweet. *Sayana* has expressed his views likewise at this place. In another place of *Rgveda* (5.68.2) *mitra* and *varuna* have been named as *ghritayoni* which means the causes of water. In *Nighantu* (1.12) *ghrit* has been assigned the name of water. Being the causes of water they are *ghritayoni* in true sense. *Sayana* says that they are the creators of water therefore, they are *ghritayoni*. In another place in *Rgveda* (5.62.3) *Mitra* and *varuna* have been described as the expeller of water towards the region below *Rgveda* (5.62.4) and (7.64.1) again says very clearly that water follows the course of *Mitra* and *Varuna* and rivers also follow their track for smooth flowing. *Yajuh* (2.16) says that they protect us by rain. *Atharva* (5·19·15) declares that they are the producer and lord of rain. According to *Rgveda* (1.2.7) they perform the formation of water. Therefore it is a well established fact that *mitra* and *varuna* are the producer of water. Likewise *Urvasi* is also the creator of water. In *Rgveda* (10.95.17) *Urvasi* has been known as *rajasovimani*. *Rajas* signifies *loka* and water. Here in this context the water may be taken as meaning or *rajas*, not the *loka*, the regional demar-

cation of the universe. *Nirukta* (4.19) stands in agreement with this view. Thus *rajasovimani Urvasi* is the creator of water without any doubt. *Sayana* also agrees with this interpretation of the word.

Thus it is concluded that *apsaras* in *adhidaivika* sense is electricity and *urvasi* and others are also the various forms of electricity. *Pururava* is cloud and *it has* a direct connection with electricity. *Gandharva* is also cloud. *Mitra* and *vauna* are the two gases and they create water coming in to contract with *Urvasi*.

References are given below :

1. *Gandharvasya apsarapateh*

Atharva. 4.37.7

2. *Jaya idvo apsaraso gandharvah patayo yuyam.*

Atharva 4.37.2

3. *Tabhyo gandharva patnibhyorabhyah.*

Atharva. 2.2.5

4. *Tan deshan jalad, vichar maa bhudevam chate vidyuta viprayogah*

5. *Parjanyasya vidyut (patni)*

Tait. 3.9.3

6. *Parjanyo gandharavah tasya vidyuta apsarasah.*

Taitti Sam 3.4.7.2

7. *Tasam chaturdasha Kulani, anyadamritamanthanat utthitam, anyadsaudamnibhyah pravrittam.*

8. *Vidyunna vidyudiva sampratyarthe nakarah, ya patanti gachchhantyantarikse meghadare-sudavidyot, punah punah dyotate, bharanti haranti me mama svabhutani apyani Kamyani udakani yorvasi sa yadaivam udakani haranti meghebhyah patanti bhrisham svayam vidyotate, prorvasi pravardhayate dirghmayuh.*

9. *Vidydiva ya urvasi stanayitnulaksanayah vacho adhidevata, Vidyunna ya na shabda upamarthattvat sampratyarthe athava svarthe eva.*

10. *Vidyuddhidam vristimannadyam cha prayachchhati.*

11. *Vidyudva ashanih.* *Shat* 6.1.4.14.

Amarkosha 1.1.47

12. *Vajrenaitad raksansi nastra apahanti*

Shat 7.4.1.4.

13. *Vivriksan hantyuta hanti raksasah parjanyah stanayan hanti duskritah.*

14. *Nityapakse tu urvasi vidyut vasisto apyachchadita-udaksanghatah.*

N. 5.14

15. *Visesena dyotate iti Vidyut urvasi*

N. 5.14

16. *Urvasi vidyut uru Vistirnam antariksam asnute iti.*

Kalp. 4.14

17. *Urvasi madhyasthana vidyut.*

N. Skanda 10.40

18. *Ya sa upari tisthati vari varsnye apsarah. Bhasyam Varivarsnya tadit, apsarascha tah ityahuh.*

Laugaksi 25.18

19. *Kathaka Grihya sutra by Caland.*

Appendix 5.14

20. *Saudamini apsaro bhede tadittadbhedayoh striyam. Amarkosha* 1.3.9., *Sudamni meghe bhava Saudamini ityapapathah.*

Bhanu

21. *Urvasi apsarah, pururavah patiratha yattasmat mithunaat ajayata tadayuh.*

Shatpatha 3.4.1.22

22. *Ayorayanasya, manusyasya jyotisa Vodakasya.*

N. 10.41

23. *Vijnayate hi vayuh prana eva pururavah iti.*

Nirukta Skanda 10.46

Urvasyasiti Vagva urvasi pururava asiti prana eva (maitrayani 39.5) *mata va urvasi ayurgarbhah pita pururava.* (*Kathaka* 26-7; *Kapisthala* 41.5.).

24. *Punjikasthala cha kratusthala cha apsarah yajuh* 15,5; *menaka cha sahajanya cha apsarasau-Yajuh* 15.18; *Urvasi cha purvachittischa apsarasah-Yajuh* 15.49; *ugrampasya rastrabhrichcha apsarasau—Taittiriya aranyaka* 2.4.2.; *devapath apsarasau—Atharva* 6.118.3; *ugrampasya ugrajitah apsarsau—Atharva* 6.118.1; *apsaraso muskabhyam—Taittiriya samhita* 5.7.15.1.; *urvasyapsarah, urubhyam asnute Nirukta* 5.13; *dve ashani—Valmiki Ramayana, Balakanda sarga* 27.9.

Vidyutah kaninakabhyam.

Taittiriya samhita 5.7.12.1. etc.

25. *Utasi maitravaruno vasistha, brahman manasoadhijatah.*

Rgveda 7.33.11

26. *Tasyah (urvasyah) darsanan mitravarunayoh retas chaskanda.*

Nirukta 5.13

27. *Pranodanau vai mitravarunau—Shat* 1.8.3.12.; *pranodanau mitravarunau—Shat* 3.2.3.13

CC-0. Panini Kanya Maha Vidyalaya Collection.

28. *Unnayanad udanah v. bh.* 3.39,
Unnayanad urdhvanayanat
Vachaspatih.

29. *Vasistho apyachchbadita udaksanghatah*

N. 5.15 *Skanda.*

30. *Mitravaruna asmakam vristir divya supara*

Rgveda 1.152.7

31. *Varuna ! madhumadva sindhavo mitraduhe*

Rg. 5.69.2

Sayanabhasyam, he varuna, he mitra yuvayorajnaya sindhavah syandanshila megha nadyova madhuman madhurasam udakam duhe duhanit.

32. *Ya ghritayoni mitraschobha varunascha—Rk.* 5.68.2; *Sayanabhasyam—yau mitrascha varunascha ubha ubhau ghritayoni udakasya utpadakau.*
Ava vristim srijatam jirdanum.

Rk. 5.62.3

33. *Ghritasya nirning anuvartate vam up sindhavah pradivi ksaranti—Rk.* 5.62.4; *Sayanabhashyam*—he *mitravarunau vam yuvam ghritsya udakasya nir nik upa vam anuvaratate anugachchha.*

34. *Mitravarunau tva vristya avtam.*

Yajuh. 2.16

35. *Varsam maitravarunam*

Atharva 5.19.15

Mitravarunau vristyadhipati

Atharva. 5.24.5

36. *Mitram huve putadaksam varunancha risadasam. Dhiyam ghritachim sadhanta.*

Rk. 1.2.7

37. *Antariksapram rajaso vimanim*

Rk. 10.15.7

38. *Udakam raja uchchyate.*

Nirukta 4.19

CHAPTER IX

WHAT DO THE OTHERS SAY ?

Here are a few opinions of various scholars :

Says Jacolliot in his 'Bible In India'.

I. "Astonishing fact, the Hindu Revelation (*Veda*) is of all revelations the only one whose ideas are in perfect harmony with Modern Science, as it proclaims the slow and gradual formation of the world."

Bible In India, Vol. II, Ch. I

II. Mrs. Wheeler Willox says—

We have all heard and read about the ancient religion of India. It is the land of the great *Vedas* the most remarkable works containing not only religious ideas for a perfect life, but also facts which all the science has proved true. Electricity, Radium, Electrons, Airships all seem to be known to the seers who found the *Vedas*.

III. Shri N.B. Pavagee in his, *Vedic* India—Mother of Parliaments, describes the *Veda* as the fountain-head of knowledge. He says, "The *Veda* is the fountain head of knowledge, the prime source of inspiration, nay the grand repository of pithy passages of Divine Wisdom and even eternal truths."

Vedic India—Mother of Parliaments, Page 136.

IV. In his 'Vedic Gods' Dr. V. G. Rele speaks of the *Veda* in the following terms :

"Our present anatomical knowledge of the nervous system tallies so accurately with the literal description of the world given in the *Rgveda* that a question arises in the mind whether the *Vedas* are really religious books whether they are books on anatomy and physiology of the nervous system, without the thorough knowledge of which psychological deductions and philosophical speculations cannot be correctly made."

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V. The author of the 'Introduction to the Message of the 20th Century says—

Containing a new method for the systematic interpretation of the *Vedas* and experimental data proving that the *Vedas* are treatise on the exact sciences.

VI. Says the great German Critic Schlegel—"the decimal cyphers, the honour of which next to letters the most important of human discoveries has, with the common consent of historical authorities been ascribed to Hindus."

In accordance with Mrs. Manning it is said "to whatever encyclopaedia, journal or essay we refer, we uniformly find our numerals traced to India."

Sir Monier Williams pointed out that for Algebra also the Arabs were indebted to the Hindus.

Dr. Thibault has shown that the geometrical theorem of the 47th proposition of the first book of Euclid which is

ascribed to Pythagoras, was solved by the Hindus at least two centuries earlier. "Elphinston has pointed out that 'the geometrical skill of the Hindus is shown among other forms by their demonstrations of various properties of triangles, some of which were unknown in Europe till published by Clavius." Prof. Monier Williams has pointed out—"To the Hindus is due the invention of Algebra and Geometry and their application to Astronomy".

Mr. Colebrooke pointed out, "the application of Algebra to astronomical investigations and geometrical demonstrations is also the invention of the Hindus and their manner of conducting is even now entitled to admiration."

The credit of the discovery of the principle of Differential Calculus is generally claimed by the Europeans, but it was known to the Hindus centuries ago as it has been referred to in various places by Bhaskaracharya, one of the greatest mathematicians of the world."

Professor Macdonell observes in his book 'A history of Sanskrit Literature' (page 424)—

> "In science too, the debt of Europe to India has been considerable. There is in the first place, the great fact that the Indians invented the numerical figures used all over the world. The influence which the decimal system of reckoning, dependent on those figures has had, not only on Mathematics but on the progress of civilization in general, can hardly be over-estimated. During the eighth and ninth centuries, the Indians became the teachers in arithmetic and algebra of the Arabs, and through them of the nations of the West."

In fact, in its historical perspective, the discovery of Zero by the Indian scholars is the greatest triumph in the history

of Mathematics. Number ten is the basis of the universally recognised system of numerology, in which the nine figures derive their value from their positions.

VII. Shri P.C. Ray (History of Hindu Chemistry, Vol. I. P. 2) observes refering to Kanada, the notable author of Vaishesika system that he has given us the atomic theory and his exposition of properties of matter is remarkable. His theory of the propagation of sound cannot fail to excite our wonder and admiration even at this distant date. No less remarkable is his statement that light and heat are only different forms of the same essential substance.

Says Dr. Seal 'The astronomy and mathematics were not less advanced than those of Tycho Brahe, Carden and Fermat. Astronomy was equal to that of Vasalius, the Hindu Logic and methodology more advanced than that of Ramus and equal on the whole to Bacon's; the physico-chemical theories as to combustion, heat chemical affinity, clearer, more rational and more original than those of Von, Helmont or Stahl; and the grammar whether Sanskrit or Prakrit, the most scientific and comprehensive in the world before Popp. Rask and Grimm.

Here this fact should not be anyhow ignored that *Nyaya* of *Gautama* and Vaisheshika of Kanada do not deal only with the methodology of Science but also elaborately dwell upon the concepts of Mechanics, Physics and Chemistry.

This should be unhesitatingly accepted that the Sankhya system deals with the principles of cosmic evolution not merely as a matter of metaphysics but explains so many concepts of evolution in terms of principles of conservation, transformation and dissipation of energy and over and above this, the elucidation of pre—atomic states of matter

which, in reality has been treated as an undifferentiated manifold, and indeterminate infinite continuum of infinitesimal reals, the three substances-cum-qualities.

It is asserted by Western scientists that the phosphorescence of diamond was first observed in 1663 A.D. by the celebrated Robert Boyle. But it is not so. This property of the diamond was already known to the Indians. According to P.C. Ray (History of Hindu Chemistry Vol. II, P.40) Bhoja (11th century A.D.) mentions this property of *Andhakare cha dipyate.*

VIII. Sir William Hunter has pointed out that the Astronomy of the Hindus has formed the subject of excessive admiration. Proof. of very extraordinary proficiency is found in their astronomical writings. As pointed out by Mr. Weber—"Astronomy was practised in India as early as 2780 B.C." Bailly makes the following observations, "The motion calculated by Brahmins during the long space of 4383 years (the period elapsed between these calculations and Bailly's) varies not a single minute from the tables of Cassini and Meyer; and as the tables brought to Europe by Laubere in 1687 under Louis XIV, are older than those of Cassini and Meyer, the accordance between them must be the result of mutual and exact astronomical observations."

Then, again "Indian tables give the same annual variation of the moon as that discovered by Tycho Brahe, a variation unknown to the schools of Alexandria and also to the Arabs, who followed the calculations of this School." The Hindus had discovered the motion of the earth round its axis in the 5th century B.C. They had calculated the length of the year to be 365 days, 5 hours, 50 minutes, 35 seconds while long afterwards the French Astronomer Callie put it down 365; 5; 48-49. Prof. Wilson says, "The originality of Hindu astronomy is at once established, but it is also proved by intrinsic evidence and although there are some remarkable

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coincidences between the Hindu and other systems, their methods are their own." Prof. Weber says that the Arabs extolled the Hindu astronomers as during the 8th and 9th centuries, the Arabs were the disciples of Hindus. Mr. Davis calculates that the celebrated Hindu astronomer Parasar judging from the observations made by him must have lived 1391 years before Christ, and consequently, says Bjornstjerna, "had read in the divine book of the heavenly firmament long before the Chaldees, the Arabs and the Greeks."

Mr. Golebrooke says: "Aryabhatta affirmed the diurnal revolution of the earth on its axis. He possessed the true theory of the causes of solar and lunar eclipses and disregarded the imaginary dark planets of mythologists and astrologers, affirming the moon and primary planets (and even the stars) to be essentially dark and only illuminated by the sun. Even as late as 1702, Raja Jai Singh II was an expert in Hindu astronomy. He built five observatories at Jaipur, Muttra, Banaras, Delhi and Ujjain. He was proficient in astronomy for he was able to correct the astronomical tables of La Hire published in 1702."

IX. Lord Ampthill, at one time Governor of Madras Presidency, said in 1905:

> "Now we are beginning to find out that the Hindu *shastras* also contain a sanitary code no less correct in principle, and that the great law-giver, *Manu*, was one of the greatest sanitary reformers the world has ever seen. They can lay claim to have been acquainted with the main principles of the curative and preventive medicine at a time when Europe was still immersed in ignorant savagery. I am not sure whether it is generally known that the science of medicine originated in India, but this is the case,

and the science was first exported from India to Arabia and thence to Europe. Down to the close of the seventeenth century, European physicians learnt the science from the works of Arabic doctors; while the Arabic doctors many centuries before had obtained their knowledge from the works of great Indian physicians such as *Dhanvantari*, *Charak*, and *Sushruta*.'

In the opinion of Professor Wilson—

"The ancient Hindus attained as thorough a proficiency in medicine and surgery as any people whose acquisitions are recorded." Says Sir William Hunter on the Indian Medicine: "Indian medicine dealt with the whole area of the science. It described the structure of the body, its organs, ligaments, muscles, vessels and tissues. The Materia, Medica of the Hindus embraces a vast collection of drugs belonging to the mineral, vegetable and animal kingdoms, many of which have now been adopted by the European Physicians. Their pharmacy contained ingenious process of preparation, with elaborate directions for the administration and classification of medicines. Much attention was devoted to Hygiene, regimen of the body, and diet."

As regards surgery, Mr. Weber has pointed out that "the Indians seem to have attained a special proficiency, and in this department, European surgeons might, perhaps, even at the present day still learn something from them, as indeed they have already borrowed from them the operation of Rhinoplasty (making artificial noses and ears). Elphinston,

the great historian says—

> "Their surgery is as remarkable as their medicine"
> In 'Ancient and Medieval India' Mrs. Manning has stated :
> "The surgical instruments of the Hindus were sufficiently sharp, indeed, as to be capable of dividing a hair longitudinally."

It has been pointed out by Sir William Hunter that—

> "The surgery of the ancient Indian physicians was bold and skilful. They conducted amputations; practised lithotomy; performed operations in the abdomen and uterus, cured hernia, fistula, piles; set broken bones and dislocations. A special branch of surgery was devoted to rhinoplasty, or operation of improving deformed ears and noses and forming new ones, a useful operation which European surgeons have now borrowed."

Considerable advances were also made in veterinary science and monographs exist on the diseases of horses, elephants etc. According to Shushruta the dissection of dead bodies is a *sin qua non*. According to Dr. Seal, "The Hindus practised dissection on dead bodies, postmortem operations as well as major operations in obstetric surgery. were availed of for embryological observations.

The Hindus were also the first nation to establish hospitals and for centuries they were the only people in the world who maintained them. The Chinese traveller Fahein speaking of a hospital he visited in Pataliputra says :—

> "Hither come all poor and helpless patients suffer-

ing from all kinds of infirmities. They are well taken care of, and a doctor attends them : food and medicine being supplied according to their wants. Thus they are made quite comfortable, and when they are well, they may go away."

Mr. Vincent Smith pointed out that the earliest hospital in Europe was opened in the tenth century. As regards Materia Medica used in these hospitals it may be noted that Hindus were the first to have employed minerals internally, and they not only gave mercury in that manner but arsenic and arsenious acid, which were remedies in intermittents. They have long used cinnabar for fumigations. They have long practised inoculation and also vaccination. They cut for the stone, couched for the cataract and extracted the foetus from the womb, and in their early works enumerate not less than 127 sorts of surgical instruments.

X. As regardings architecture Prof. Weber says—

"A far higher degree of development was attained by architecture of which some most admirable monuments still remain." Colonel Tod has pointed out that "the Saracen arch is of Hindu origin."

CHAPTER X

ADDENDA

NO. 1

Here are given few *vedic* terms which have an extraordinary importance in being susceptible to scientific interpretation and treatment :—

1. *Agnayi*: is the power of *Agni-Agnayi* is metaphorically called the *patni* of *Agni*. Etymologically *patni* means the accompanying power. Power and qualities always accompany permanently the substance which they belong to. Interpreting the word *patnivantah* of *Rg*. VIII 93.22 *Yaska* takes it to mean *apah*, waters. Therefore, *Agnayi* is here taken to mean the power of *Agni*. In *Rgveda* I. 22.12 this meaning is quite fit.

2. *Agni* : It means fire. But it is not the only meaning of the word. It refers to other luminaries also. The electricity and the Sun are also called *Agni*. *Rgvedic* verse (IV 58.8. and IV. 58.1) may be referred to here for this purpose. According to *Rgvedic verse* (1.164.46) *Agni* means Indra, the electricity; *mitra*, the hydrogen; *varuna*, the Oxygen; *Surya*, the Sun; *Suparna*, the individual soul; *garutman*, the Universal soul; *yama*, the time; and *matrishvan*, the air.

3. *Angiras*: These are the various properties of *Agni*. Seven Zones of fire are also called *angirasah*. Sometimes the rays of Sun which create heat and combustion are known *angirasah*.

4. *Ajaekapat*. It is the setting Sun. It has been vir-

tually described in the *Atharva* XI. 4.21 and *Rg.* X. 85.13. As the Sun moves on its axis only and does not rotate round any other planet, therefore, it is called *Ajaekapad*. This is the cause of creating spatial electricity, therefore, it is also known as *pavirvan*.

5. *Atharva*: It means sun. But which phase of the sun is called *atharva* should be traced out. In plural form it means the rays and various operations of the sun. This *atharva* is also called *dadhyan* and *manuh*. These terms are used to connote physical objects.

6. *Aditih* : *Aditih* is the matter, the mother or material cause of all the physical forces participating in forming the phenomena of the universe. *Aditih* being the materia eradica of the universal forces is called *devmata*. *Aditih* sometimes means *agni* and sometimes it means dawn and dusk. In *Rgveda* there are many verses read to mean these various things.

7. *Apamnapat*: Literally it means the grandson of the water. But it is interpreted in a very comprehensive way. Water creates currents and currents in their turn create electricity, therefore, this electricity has been called *apamnapat*. *Rgveda* (X. 30.4) metaphorically describes this in the following manner.

Offspring of waters, who shines within the waters without fuel, whom priests implore in the yajnas; give the rain of sweet waters with which the vigour of *Indra*, the all pervading electricity becomes increased.

8. *Ashvah* : This word signifies *Agni* when exposed to scientific interpretation and treatment. *Ashvah* is the plural form of *ashva* meaning sun-beams.

9. *Ashvinau* : This word has been used in the *Vedas* in a

pair. They are always two. Sometimes it means heaven and earth, sometimes, day and night, and sometimes, the sun and the moon. The breaths of the two nostrils are also called *ashvinau*. In the vedas *ashvinau* are sometimes found to mean positive and negative forms of electricity. Their duality is also responsible for it. These two entities, according to *Yaska*, pervade everything, one with moisture, the other with light. Their time is after midnight which, in consequence is an impediment to the appearance of light. The part in the dark is the atmosphere, and the part in the light is the sun. *Ashvinau* have many other meanings in their *adhidaivat* contexts.

10. *Ahih* : Means cloud. *Ahirbudhnya* is the cloud moving in the sky.

11. *Apah* : It is used for waters. Sometimes taken to mean sun rays, and sense limbs. The term is also used to describe primary state of tenacious matter. Nebulous state of worldly elements is also known as the state of *apah*.

12. *Aptyah* : This term gives the meaning of those elements which are main co-operant of Indra, the all-pervading electricity. Indra assumes many forms viz. *Agni, mitra, varuna, Vishnu, aditya* etc. These *aptyas* are closely connected with Indra in his performance. See *Rg*. X 120.6.

13. *Indrah* : Indra in very general term is the all-pervading electricity. Its operations and performances are manifold. According to the *Rgveda* (V. 32.1) the performances of Indra are known as follows :

I. It tears asunder the thicket of clouds.
II. It penetrates the solidity of clouds by making holes in them.
III. It integrates and disintegrates the vapours of cloud.
IV. It moistens the density of clouds.

V. It creates currents in the waters.

Besides, all the powerful actions are due to *Indra*. It is the most powerful physical force.

14. *Indrani* : Is the power of *Indra*.

15. *Urvashi* : Urvashi is the electricity having two forms, the positive and negative. It plays an important part in the formation of water which is technically called *Vasistha*. In this performance it has a very close connection with *mitra* and *varuna*, the hydrogen and oxygen.

16. *Rtah* : Rtah signifies the law eternal. It has various meanings. It sometimes stands for water and sometimes for light. But its extraordinariness conceals in it the law eternal and moral law. For this one should refer to the chapter concerned.

17. *Rbhavah* : Rbhus are generally three. Their names are *Rbhu*, *vibhva* and *vaja*. They create fertility in soil. They are the productive forces. They are identified as the sons of *Angirasa*. *Angiras* itself is the name of *agni* and its various properties. Therefore these *Rbhus* are also some physical elements connected with them. Sometimes *Rbhus* are used to mean the rays of the sun. To make the soil fertile and to provide the vegetable kingdom with energy are also the function of them.

18. *Keshinah* : In singular number it means the Sun (*Aditya*). *Rgveda* (*X*. 136.1) gives the following description of the functions of *keshi*.

1. *Keshi* bears the fire.
2. *Keshi* bears the water.
3. *Keshi* sustains the earth and the heaven.
4. *Keshi* makes the creatures able to see this world by giving light.
5. *Keshi* is the light which is present before us.

But *keshinah* is the plural form of *keshi*. In plural form they mean God, Soul and Matter. Sometimes they mean the Sun, Air and Fire.

19. *Jatavedah* : It is the name of fire (*Agnih*), Etymologically it means that it permeates all the produced objects. Therefore, it is called *jatavedah*. It is the heat which permeates all the objects. This is known as *jatavedah*.

20. Three *Devis* : *Bharati*, *Ida* and *sarasvati* are the the three *devis* (goddesses) who are described in the *Veda*. The light of the Sun is called *Bharat*. Therefore, the lustre may be called *Bharati*. In *Rgveda* (X. 110.8) these are known as three kinds of fire. They sometimes mean speeches articulate and inarticulate. They are used in various senses, in the *Veda*.

21. *Tvasta* : Tvasta sometimes means *agni*, sometimes *vayu* and sometimes the particular phase or the light of the sun.

22. *Devapatnyah* : They are named as follows :

1. *Gna*
2. *Indrani*
3. *Agnayi*
4. *Ashvini*
5. *Rodasi*
6. *Varunani*

These are the powers of the *devas*, the physical elements.

23. *Devah* : It is the plural form of *deva* which in its various contexts means the various objects and elements of the universe. *Yajurvedic* verse (XIV.20) gives the following names of *devatas* :

Agnih, *Vatah*, *Suryah*, *Chandramah*, *Vasus*, *Rudras*, *Maruts*, *Vishvedevah*, *Brihaspati*, *Indrah* and *Varunah*.

According to *Atharva devas* are thirty three. They are as follows :

Vasus	8
Rudras	11
Adityas	12
Prajapati	1
Indra	1
	33

For detailed discussion on the subject the readers may refer to the author's book entitled "The Arya Samaj Its Cult And Creed.

24. *Dyavaprithivi* : The earth and heaven are called *dyavaprithivi*.

25. *Pitarah* : *Pitarah* in the scientific sphere are connected with *yama*. *Yama* is an atmospheric object. Therefore these are also some objects or natural forces of atmosphere. If *Yama* is meant as the Sun they will be their rays or other operations. If the *yama* is meant as *Vayu* they would mean something connected with that. Mystery surrounding them becomes more and more impenetrable when they are taken to mean *Ribhus*, *Angirasas*, *Bhrigus* and *Atharvas*. These are the physical elements or forces working in the atmosphere. They are sometimes called *Pitarah*, sometimes *Devah* and sometimes *Rshayah*. These terms are interchangeable according to their operations.

26. *Pururavah* : This term means cloud and sometimes the Sun. *Pururava's* connection with *urvashi*, the electricity is well known. In both the cases whether it is the Sun or it is the cloud electricity will have its connection and affinity unbreakably.

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27. *Pushan* : The sun after rising and before meridian is called *Pushan* : Dr. Rele in his *vedic* Gods has given other meanings of *Pushan* and other *devas*. He interprets them physiologically.

28. *Brihaspatih*: The wind which protects the clouds in the atmospheric region, is called *Brihaspatih*,

29. *Brahmanaspatih* : It is another name of wind which has its connection with clouds. It becomes instrumental in causing rain which produces crops. Though *Brihaspatih* and *Brahamanaspatih* both are winds, but their functions are different.

30. *Bhrigavah* : These are the flames of fire in a very limited sense. But heat that permeates the heavenly and atmospheric region is known as *bhrigu*. Since they are in plural form therefore they mean various forms of heat.

31. *Marutah* : These are the variegated names of winds. They are varied and classified according to their operations. They are enumerated as fourtynine. In *Yajurveda* they have been described by their names and functions.

32. *Mitrah* : This means a kind of gas which is required in formation of water. It can be identified as hydrogen. *Agni* and the *Surya* in some stages of them are also known as *mitra*.

33. *Yamah* : The Sun is called *yama*. But being in atmosphere *vayu* is also called *Yamah*. *Yama* is also the name of the day.

34. *Rudrah* : In singular form it means *agni*, electricity etc. But in plural form it means eleven *rudras* of which ten are vital airs and one is the individual soul.

35. *Varunah* : The word *varunah* means sometimes the Sun, surrounded by its beams. It is an equivalent of oxygen also.

36. *Vishvanarah* : *Vishvanara* means somewhere as the controlling *dhananjaya vayu*. This is known by other names

also. It is really *trita* or ether. Somewhere *vishvanarah* means wind. In *Rgveda* (VII. 76.1) *Savita* has been called as *vishvanara*. *Agni* is also *vishvanara*. It is the source of digestion and for this purpose it works in the system of living beings. It circulates blood and becomes the source of vision. That is why it has been called *vishvanara*.

37. *Vishvedevah* : It is always in plural form. This term includes in all the physical elements and energies. They are known to be eleven in number. The beams of the sun are also *vishvedevah*.

38. *Vishnu* : It is the Sun at the time of meridian. Besides, this term has many other meanings of scientific importance.

39. *Vrishakapih* : It is the Sun. When the Sun appears covered with trembling rays, then it is called *vrishakapih*. *Vrishakapayi* is the activity of *vrishakapih*.

40. *Sapta rshayah* : These are the seven rays of the sun. They are called as *saptarshayah*. The seven limbs or seven vital powers are also called *saptrshayah*.

41. *Saranyu* : At the time of sun-set the sun is called *vrishakapih* and its activity as *vrishakapayi*. When the lustre of the sun at all disappears and there emerges a little darkness this is the time of *saranyu*. *Saranyu* is the name of that darkness.

42. *Sarma* : *Sarma* is the dawn. The rays of the sun are concealed in the darkness of night. These rays are called *gavah*. *Sarma*, the dawn returns all the concealed rays to the sun. This restoration is the main operation of *sarma*. Sarma has two sons whose names are *Shyama* and *Sbabala*. These two are nothing but night and day.

43. *Sarasvati* : *Sarasvati* is the speech. This speech has two phases, the articulate and inarticulate. This is the sound therefore it has been placed in the middle region, the atmosphere. Storming etc. of the clouds are due to

sarasvati. Sound has its source in space or ether. Therefore *sarasvati* is stationed in space and ether.

44. *Savita* : In the early morning when there is darkness on the earth but light appears in the sky that is the time of *savita*. It begins with the emergence of dawn.

45. *Sadhyah* : These are the elements of universe. In the beginning of cycle of creation these elements work together to create cosmos.

46. *Suryah* : *Surya* means the rising sun. The functions of the sun in the universe are indescribable.

47. *Surya* : It is the light of the Sun.

48. *Somah* : *Soma* ordinarily means the moon and in an extraordinary sense herbacious plant. But *soma* is the energy. All the matter and energies may be classified between two categories and these are *Agni* and *Soma*. Dryness is *Agni* and moistening is *Soma*. *Suskata* is *Agni* and the *ardrata* is *soma*.

49. *Trita*: *Trita* means triangle as well as the tridimensional space. Space has three dimensions. Therefore it is known as *trita*. The fourth dimension belongs to time.

50. *Vasistha* : *Vasistha* is the water which is formed from *urvashi* (electricity) and *mitravarunau*, the hydrogen and oxygen.

51. *Kala* : We here refer to a verse of *Kala* hymn of *Atharvaveda* (IXXX. 53.1) and proceed on further to interpret it. The verse runs as thus :

Kalo ashvo vahati saptarasmih sahasraksa ajaro bhurireta. Tmarohanti Kavayo vipaschitah tasya chakra bhuvanani visva.

Being the cause of six seasons with the 7th as extra lunar month; possessing powers of multifarious operations; very strong in its nature; never decaying *kala*, the time moves fast. Wise and learned persons ride on that. All the worlds are its wheels.

This *mantra* speaks of time. Time is flowing in all the created objects and hence it has been called *asva* which means 'pervasive'. No created object can ever be devoid of time. It is always penetrated by time. There are six seasons in a year. But the *adhimasa*, the extra-month has been taken as the seventh. Time flows in momentary process. These moments cannot be counted. They are innumerable. Therefore, *Kala* has been called *sahasrarasmih*. *Sahasra* here denotes many, or incapable of enumeration.

Time makes others old or decayed but it itself is never old, and never decayed. When we give the subject under consideration a philosophical tinge it becomes very much complicated. But there is no go. Without entering into philosophical thinking true justice cannot be done with the subject. Indian philosophers of the past laid down their philosophical notions about time on the facts of this verse referred to.

Astronomy of India is based on the fact that time is alone and seasons etc. are due to it. From moment to an year there is time which flows throughout. Had not there been any existence of time, the moments, months and years would not have however happened. Change of seasons is due to the operation of time. Time is *saptarasmi* as well as *sahasraksa*, therefore, the facts and phenomena of astronomy are dependent on it.

All the bodies which have mass-forms are limited by the spatial relations. In the same manner all sorts of thoughts or mental tendencies are limited under the conditions of time. Space has its influence in massiveness of objects while time plays its part in creativeness and changeability of the objects. All the ideas taking place in mind, feel the pressure of time. If otherwise, no change can even take place. Schools of *Mimansa* accept this truth and they base

their conviction of time on the basis that time is *asva*, permeant one.

Kala, the time has no influence of decadence over it. It is causing decay to every created object by its flow in them, but itself remains undecayed. All the bodies or phenomenal objects of this world are proceeding towards decay at every moment. They are subject to this change and deterioration. But time is always immortal and therefore eternal. Kanada, the founder of *Vaisesika* system of philosophy accepted *kala*, the time as the cause of created objects and declared unequivocally that *Kala* is eternal. It never lasts. It is everlasting. This very fact has been disclosed by the term *ajarah*, undecaying.

Time is generally, the system of relationships which involves, change such as before, after and contemporary. All events have temporal relations. In this sense *Kala* is *bhuriretah*, very strong.

A very important factor of time disclosed in the verse is that learned persons ride on it. Time rules all whether they be kings or beggars, old or young. It is time which reduces all to dust and ashes. This flows fast and eludes all. It is wise alone that can control it. He takes time by fore-locks. Those who follow in the footsteps of the wise, gain their objects and those who do not, fail to achieve any success. Persian poet Shekh Sadi is quite true in his remark when he says "Oh Sadi, Yesterday is gone. Tomorrow is not present. Take today to be your opportunity between the three."

Man's yesterday never returns and his tomorrow does not ever come. He always complains against time and circumstances. He has accommodated time in all his matters and has become the slave of time. He postpones every thing for tomorrow, but to him tomorrow never comes. Thus the bulk of people has been flowing under

the tide of time but it does not realize. Case is quite different with the wise. He makes time suitable to him. He is never sailed by time. He always moulds time to his own convenience. He believes that it is not time that makes man but it is man that makes time. Persons who created history behind them believed in and adhered to this dogma.

The wise rides on the time, this has another factor also. *Yogis* do not feel handicapped by the pressure of time. A *yogi* when concentrates in the momentary process of time, overcomes all the temporal obstacles. Time, in that position cannot present any hindrance to him. He can surmount the barriers of time and know the objects of past and future also. He through this concentration on the three-fold modifications which all objects constantly undergo, acquires power of surmounting all the detrimental reactions of time.

All the worlds are wheels of *Kala*, forms the subject of very high consideration. It would not be impertinent here to realise the distinction between time and space. Space deals with co-existence, time with successions. More accurately space deals with visible objects while time deals with things 'produced and destroyed.' Here it should also be realised that relations of time are constant or irreversible, while those of space are not irreversible. Things move by virtue of time and hold together by virtue of space. While space and time cover the most comprehensive kinds of relations, transition from place to place, or state to state, spatial locomotion and temporal alternation, they are only formal and imply real things which move and change.

The form of time is essential to the concrete changes of nature, such as production, destruction and persistence of things. It is the force which brings about changes in non-eternal substances. It is not the cosmic power which causes the movements, but is the condition of all move-

ment. All perceptible things are perceived as moving, changing, coming into existence and as passing out of it. Discrete things have no power of self-origination or self-movement. If they had, there would not be that mutual relation of things, which persist in spite of all changes. The movement is ordered, which means that there must be a reality which has a general relation to all changes. Time is regarded as the independent reality pervading the whole universe and making the ordered movement of things possible. It is the basis of the relations of priority, and posteriority; simultaneity and non-simultaneity, and of the notion of soon and late. There is only one time which is omnipresent in dimension, individual in character, and has the qualities of conjunction and disjunction.

Conventional notions, as moment, minute, hour, year etc., are derived by abstraction from concrete time. Time is an eternal substance and the basis of all experience. Though we do not know what time is in itself, but our experience is cast in the form of time. It is the formal cause of relations like priority and posteriority while their material cause is the matter. Time is one but appears multifarious on account of association with the changes that are related to it. The pressure which time puts on things is not realised through time itself but things under its pressure. Time moves to change them and they realise this and move like wheels. This truth has been exposed in the verse by wordings "All the worlds are like its wheels."

52. *Indra* : The *Vedas* are the treasure of various sciences. They contain in them the knowledge of various subjects some-where by the description of spiritual theme and at other places by the method of physical and positive sciences. All these things are blended together in *daivata*, the subject-matter of the *Vedic* hymns. These *devatas* are nothing but the subject-matter dealt in the *Vedic* verses. The subject-

matter of the *vedic* verses reflect the various aspects of the knowledge through the method of interpretation known as spiritual method, physical method and positive method. For example term *Agni* used in many verses of the *Veda* may be taken here to elucidate the fact. This term is a *daivata* term, the term used as the subject-matter of the *Veda mantras*. According to the context of the three-fold method the term *agni* would give the meanings as—fire, king, learned man, soul and God etc. Why is it so ? Because the meaning has been termed as the *puspa* and *phala*, the flower and fruit of the *vedic* speech. This *puspa* and *phala* find its meaningfulness in the terms called *devatas*. Indra is one of the *daivata* terms used in *vedic* verses to denote the subject-matter.

This Indra as described by *vedic* verses is not any historical person. It is one of the substances which play their part in the grand panorama of the world. According to the context there may be different meanings of Indra.

A careful consideration of the etymological aspect of Indra will lead to unique result. We find it in the *Nirukta* which is one of the six limbs of the *Vedas*. This treatise deals with varied aspects of *vedic* terms etymologically. All the terms are analysed and considered thread-ware in this treatise. Etymological treatment, their details and methods given and applied in the *Nirukta* are generally based on the *Brahmana granthas*. In *Nirukta* we find frequent use of sentence "*tatra cha brahamanam*', which means a direct reference to the *Brahmana* scriptures and this shows clearly that etymological method of *Yaska* is founded on the *Brahamanical* method. Frequent use of Sanskrit word *va* in the examples viz. *vartaterva* and *vardhaterva*; also points out the method of manifold interpretations adopted by the *Brahmanas*. The word *va* is not to signify dubiousity but it has been used to make one understand that there are multifarious meanings of the words. Taking this word *va* used

by *Yaska* in his Nirukta some scholars dare in vain say that *Yaska* was doubtful about the meanings of the words under his etymological treatment, therefore, he used this word to express his doubt. But this is absolutely wrong. They themselves are in doubt, not the author of *Nirukta*. *Yaska* is entirely accurate in his thought afid expression. The word *va* is used for *samuchchaya*. This joins the stated things together. The etymological operations of *Yaska* give rise to this belief that these are applicable in all the three methods of interpretation. In some rare cases it is possible that *Yaska* did not mean to refer to the meanings in three methods but generally he followed the way to reconcile all of them.

In treating the term *Indra* this method seems to be clearly followed. *Yaska* in his *Nirukta* (10-8) treated the term *Indra* by various etymological operations. He says :—

1. *Iram drinatiti va.*
2. *Iram dadatiti va.*
3. *Iram dadhatiti va.*
4. *Iram darayatiti va.*
5. *Iram dhrayatiti va.*
6. *Indave dravatiti va.*
7. *Indau ramat iti va.*
8. *Indhe bhutaniti va.*
9. *Idamkaranad ityagrayanah.*
10. *Idamdarshanad ityaupamanyavah.*
11. *Indaterva aisvaryakarmanah.*
12. *Indanshatrunam darayita va dravayita va.*
13. *Adarayita cha yajvanam.*

They respectively mean as follows :

1. That which explodes the earth.

2. That which gives sounds.
3. That which sustains the earth or one who creates sound.
4. That which cleaves the soil.
5. That which sustains and maintains the earth.
6. That which goes to *Indu*, the moon.
7. That which remains *Indu*, the moon.
8. That which transpires the creation and creatures.
9. That which creates this creation, is the opinion of *Agrayauacharya*.
10. That which observes this world, it is the opinion of *aupamanyava*.
11. That which is full of all effulgence.
12. That which destroys enemies or makes them run away.
13. That which gives respect to them who perform *yajanas*.

These *niruktis* of *Yaska* are based on the meanings of the word *Indra* variously found in use in the *Brahmanas*. These meanings of *Indra* are befitting to the term Indra in all contexts where the term has been used in the *rks*. *Yaska* doing so had in his mind the *Rgvedic* hymns ending with the sentences *sajanasah Indrah* and *sasyukthah* etc. These *niruktis* of *Yaska* yield the following meanings of the term *Indra*.

"Volcanic fire, speech; Air, the Sun ; the electricity the ruler; the *susumna* ray of the moon; the moon-light; the fire, God; the soul who is observer of the worldly sights; any one who has power and might etc. commander and *yajmana* who performs *yajnas*.

These are the meanings which the term *Indra* signifies.

Brahmanas generally divide the *vedic* words in multifarious ways to interpret them according to their etymolo-

gical flexibility. They give many meanings of a term in different contexts. All repercussions of etymological operation regarding words cannot be described here. A few especialities are shown here. *Indra* occurring in *Brahmanas* gives the following meanings.

(a) *Indho vai namaisa yoauyam daksine aksan purusastam va etamindhan santam indra ityachakasata paroksenaiva.* *Shat* 14.6.11.2.

(b) *Svasmin va idamindriyam pratyasthaditi, tadindrasy indratvam.* *Jai.* 2.2.10.4

(c) *Esa va indro ya esa tapati.* *Shat.* 2.3.4.12

(d) *Uchchairdhumah jutya balbaliti tarhi haisa bhavatindrah.* *Shat.* 2.3.2.11

(e) *Atha ya indrah sa vag.* *U.J.* 1.33.2
tasmadahuh indro vagiti *Shat.* 11.1.6,18

(f) *Yo vai vayuh sa indro ya indrah sa vayuh* *Shat.* 4.1.3.19

(g) *Yo ayam chaksusi purusa esa indrah.* *J. up.* 1.43.10

(h) *Pran indrah.* *Shat.* 6.2.28

(i) *Hrdayam eva indrah.* *Shat.* 12.9.1.15

(j) *Mana eva indrah.* *Shat.* 10.4.1.6

(k) *Rukma eva indrah.* *Shat.* 10.4.1.6

(l) *esa va etarhindro yo yajati.* *Tai.* 1.3.6.3
indro vai vaimanah. *Shat.* 2.1.2.11

(m) *Indro vai rajanyah.* *Tai.* 3.8.23.2

(n) *Yadesashanih indrastena.* *Kan.* 6.9
stanayitnurevendrah. *Shat.* 11.6.3.9

(o) *Yatparam bhah prajapatirva sa indro va* *Shat.* 2.3.1.7

(p) *Indra valam valapatih.* *Shat.* 11.4.3.12

(q) *Viryam va indrah.* *Tand.* 9.7.5.8

(r) *Sisnam indrah.* *Shat.* 12.9.1.16

(s) *Sa yassa indrah samaiva tat.* *Jai up* 1.31.1

(t) *Indra asit sirpatih satakratih.* *Tai.* 2.4.8.7

According to sentences referred to above the term Indra signifies: soul, the sun, fire, speech, the air, the *purusa* of the left eye, vital air, the heart, the mind, force, *yajmana*, *ksatriya*, lightning, lowing and bellowing of thunder-bolt, Lord of the creatures; the master of powers, semen, man's organ, *saman*, and peasant.

Thus a very minute thought over the meanings given by *Yaska*, would lead one to arrive at the conclusion that all these are synthesized here in *Brahmanic*, meanings. According to *Yaska* and *Brahmanas* these are variegated meanings of *Indra* in context of three methods of interpretation. To verify these meanings the verses may be traced out very easily.

Maharshi Dayananda Sarasvati has interpreted the word *Indra* according to above referred to meanings in many places in his commentaries on the *Vedas*. For example we quote here a few. Commenting on the *Yajurvedic* verse (20.26) he says that Indra means all-pervading electricity (*Indrah sarvatrabhivypata vidyut*). Interpreting the *Rgvedic* verse (1.17.50) he further says that Indra there means the fire or the electricity or the sun (*Agnir vidyut suryova*).

Further in the *Rigveda* (6.48.14) he takes Indra meaning as 'the man of high penetration like electricity' (*Indram vidyudvattibra-buddhim*). Among all these meanings the fire and the sun are taken in accordance with *Nirukta* and *Brahmanas*. We take here into consideration the meaning *vidyut*. it is known commonly that Indra is the deity of force. Electricity is the most powerful entity among all the physical forces. *Aitareya Brahmana* (7.16 and 8. 12) describes Indra as the most powerful of all the *devas*. The similar description regarding Indra is found in *Kausitaki* (6.14) and *Gopatha* (*Uttar*. 1.3.). *Yaskacharya* himself in his *Nirukta* (6-10) has accepted this fact and has declared whatever activity is concerned with physical strength or force is the act of Indra (*Ya ka cha balktih Indrakarmaiva tat*).

Says Taitiriya aranyak (9.10.2), power remains in electricity, (*Balamiti vidyuti*). *Stanayitnu and Ashani* are the names of Indra, it has been said clearly in the above references. What is *stanayitnu* ?Says *Shatapatha* (11.6.3.8) *ashani is stanayitnu*, *Kausitaki* (6 9) declares that '*ashani*' is the term used for Indra, Further we find in *Shatpatha* (6.1.3.14) that electricity is called *ashani*. Thus the term Indra and *vidyut* are equivalent in many respects. *Kadambari* of *Vana* describes the fourteen categories of *apsaras*. Those *apsaras* are electricities and they are of fourteen kinds. I have proved this in my article captioned *apsarah*. Similarly in the *Brahma purana* (Anandasrama Poona edition 51.31) Indras have been described as being of fourteen kinds (*yavadindraschaturdesa.*)

The story of Indra reveals this fact that he has two horses. *Asvini* are said to be connected with two asses and in the similar manner Indra has been linked with two horses. Why is it so ? Because Indra means electricity which is of two kinds—the positive and negative. This fact has been described in the following quotations :

1. *Hari Indrasya.* — *Nighantu* 1.15
2. *Yunjanti asya kamya hari rathe* — *Rg.* 1.6.2.
3. *Indro hari yuyuje.* — *Rg.* 1.161.6
4. *tadindra bahu* — *Rg.* 6.47.8
5. *yunjano harita* — *Rg.* 6.47 19
6. *yoja nu indra te hari* — *Yajuh* 3.52
7. *Indrasya tva bahubhyam udyachchhe.* *Maitrayani* 1.1.2, *Kathaka* 1.2, *Taitiriya* 1.12.

In the quotation under serial No. 7 *bahu* has been used instead of *hari*, (*Kathaka* 27.1) which describes that the two rays are the hands of Indra (*tasya hastau gabhasti*). Again *Maitrayani* (2.2.9) says that *arka* and *asvamedha* are

the *yajna* forms of Indra.

We find an account of strife of Indra and *vritra* in the *vedic* literature. What is *vritra*, it should be traced out. Says *Yaska*, then what is *vritra*? It is *Megha* (cloud) is the opinion of the followers of the *Nirukta*. When clouds overwhelm the sky there prevails darkness all over. The etymological formation of term *vritra* and the activities assigned to it prove exclusively it to be loud. *Devas* are called *devas* because they are by their nature beneficial to others by giving and are full of light. Clouds which do not give any benefit by their activities to others and are of the nature of darkness are called *Asuras*. Here *Brahmanas* (*Tai* 2.3.8.2) describing that the Lord of creature created *Suras* (*devas*) from *su* and *asuras* from *asu* are quite relevant and correct. Destruction of *vritra* is one of the most important acts of Indra. Electricity in the form of heat melts the clouds and thus make them rain. *Tandya Brahmana* gives an indication of the thundering roar which takes place at the time of *Vritra-badha*. This is nothing else except the thunder which generally is found at the time of heavy rains.

Says Durga, in his commentary of *Nirukta* (2.16) that the waters remaining condensed in clouds frequently hit and disturbed by air-covered Indra, the lightning, melt and flow and become capable of raining. (*Tena hi vaidyutena jyotisa Vayavavestitena indrakhyena uptadyamanah apah prasyandante, varsabhavaya Kalpante.*) It is also remarkable that '*maruts*' are known as main co-operators of Indra in *Vritrabadha*. It is described that they play with Indra when he returns back after killing *vritra*. These *maruts* are 49 in number. They wander everywhere and play their part. Electricity without cooperation of air does not find itself capable to turn clouds into rain. In *Taitiriya* (1.3.12) it is

said that atmospheric air spreaded the heat by vapours and operated its inner substance and came out *ashani*, the electricity. (*Maruto adbhih agnim atamayan, tasy tantasya hridayam achchhindan sa ashanirabhavat*). These *maruts* are described having an army. This is nothing but division and sub-division of air. It is a kind of allegorical description. *Maruts* are sometimes classified as—*Kridi*, *santapana* and *svatavas*. *Santapana maruts* heat up the *vritra*, the cloud with the electrical spark taken from Indra. *Vritra* being thus heated turns, itself into pieces. *Satapath* gives the description of this point. *Svatavas maruts* are called *ghora*. They are known to be very dreadful. *Ashani* is also a synonym of *vajra*. *Vajra* is the weapon of Indra. He holds this weapon therefore he is called *vajri*. The Hindi word *Bijali* for electricity is the corrupted form of *Vajri*. Here *va* has been changed as *ba* and the difference between *ra* and *la* is negligible. By changing the letter *va* of *vajri* into *ba* and *ra* into *la vairi* becomes *bajli*.

This *bajli* was pronounced later as *Bijali*. *Vayavavestitena* words used by Durga indicate the cooperation of *maruts* with the activities of Indra.

The story of Indra is connected further with the fact that he struck the head of *namuchi*. What is *namuchi*? It is also a cloud. It has been already expressed that *suras* or *devas* are of giving nature and *asuras* of non-giving nature. *Namuchi* is also a cloud of this kind. *Namuchi* means that which does not leave. The cloud which retains water and does not yield it, is called *namuchi*. Swami Dayananda in his commentary on *Yajurveda* (19-34) says that which does not leave the water is *namuchi*. Interpreting word *asurat* (*Yajuh.* 20-67) he remarks that it means 'pertaining to *asura*, the cloud. *Jalnndhara* also signifies the same meaning. *Jalandhara* has been called *asura* in *Amarakosa* (1-3-7). The word *asura* is quite relevant

when it stands for the cloud which does not leave out water to rain and thus causes great calamity to people by causing failure of crop. In *Nighantu* (1.10) the term *asura* has been read in the names of cloud. The very grammatical construction of Sanskrit *megha* also gives the clue of its being of an irrigational nature. Those clouds which rain are called *payomuk*, *payoda* and *vrisa*. But that which does not rain is called *namuchi*. *Kavandha* also seems to be of the same nature. According to *Nighantu* (10.4) *Kavandha* is also a cloud. *Ka* means water and it is well known to all those who know Sanskrit. The use of word *Kahara* in U.P. for drawer of water is based on this ground. Thus it is quite clear that *namuchi*, *jalandhara*, and *kavandha* are the names of such clouds as do not yield water for rain. In this connection the following words are worth-considering:—

(*a*) *Apam ksayah.*
(*b*) *Apam jyotih.*
(*c*) *Apam pathah.*
(*d*) *Apam purisam.*
(*e*) *Apam bhasma.*
(*f*) *Apam yonih.*
(*g*) *Apam sadanam.*
(*h*) *Apam sadhastham.*
(*i*) *Apam sandhih.*
(*j*) *Apam oa.dm*

The most of these words are used in *Yajuh* (13.53). *Shatpatha Brahmana* gives the following meanings :

(*a*) *Chaksurva apam ksayah.*
(*b*) *Vidyudva apam jyotih.*
(*c*) *Annam va apam pathah.*

(d) *Sikta va apam purisam.*
(e) *abhram va apam bhasma.*
(f) *samudro va apam yonih.*
(g) *Dyaurva apam sadanam.*
(h) *Antariksam va apam sadhastham.*
(i) *Srotram va apam sandhih.*
(j) *Osadhayo va apam odma.*

These meanings are shown here for general knowledge. But *apam bhasma* requires a cursory thought over it. It is correct to describe cloud *(megha) apam bhasma*. By the operation of the sun, water of the earth has got evaporated. It is just like the ashes of water, nothing else. Kalidasa defining the *megha* remarked that it is the jumble of smoke, light, vapour and air. Indra cuts this cloud by means of *apam phena*, the mist of water. When the watery clouds over-cast the sky air mixed with mist makes them wet. This is due to heat. Indra cut the head of *vritra* by his weapon called *vajra*. *Vajra* is also a kind of *apam phena*. *Vajra* has three forms and they are named as—*apah*, *saraswati*, and *pancha desarcha* (*Kausitaki* 12.2).

Saraswati is sometimes used for the thunder. Really this is the *vajra* of Indra. This has three sharp edges and Indra destroys the clouds by it. Therefore, having been dispersed the clouds fall on the earth in the form of rain. The time of *vritra badha* seems very dreadful. Says *Rgveda*, (*dhunot kastha abhinat parvatanam*). That Indra makes the direction tremble and axes the clouds. Indra, in *pauranic* fables, has been called *parvatpaksashatana*, he who cuts the wings of mountains or clouds. He is also named as *gotrabhid*. *Gotra* means *megha*, the cloud. The term *parvata* is used for cloud in *vedic Nighantu*. Since he destroys the clouds therefore he is *gotrabhid* and *parvat-paksashatama*. Indra is known as the deity of heaven. This statement seems

correct as the electricity places itself in *antariksa*, the atmospheric region. *Antariksa*, is called svah in *Brahmana* literature. *Taitiriya* (2.4.8.7) describes Indra as *sirpatih* and *shatakratuh*. But the names are meaningful with reference to electricity. This electricity serves multifarious purposes and the agricultural activities are dependent on the clouds which originate electricity, therefore it is *shatakratu* and *sirpatih*.

Thus it is distinctly clear that the term Indra signifies all those meanings which have been quoted previously. But here it has been purposely interpreted to mean electricity. This casual consideration of Indra as electricity is meant to enlighten the readers regarding the scientific aspect of the term. Swami Dayananda Sarasvati interpreted Indra as electricity. This attempt of ours was aimed at to clear the point.

In spiritual sense Indra may be called individual soul as well as universal soul. *Aitareya Upanishad* throws much light on the subject. In the beginning only one Universal Spirit was engaged in His work of activating atoms of matter to work out the universal creation. None else except Him was working out the plan.

Though the souls and material cause were also present yet they were not active. Only God was engaged in His constructive activities. He created three lokas, *marichi*, *ambhah*, *mara* and *apah*. Afterwards He gave birth to *lokapalas*, the protectors of various regions. Thereafter came out *virat* and consecutively came into existence the human body. Various kinds of grains and things were produced for the protection of human body. Individual soul entered in to the created human body and hunger and thirst made their way to afflict him. The individual soul observed this grand phenomena of universe but he found everywhere the grandeur and activity of Divine Spirit. *Atma*, the individual soul exclaimed 'Oh I realized this'. Therefore he is Indra.

Though he is *Idandra* yet he is called Indra esoterically. He saw *idam* the phenomenal world pervaded by the universal spirit, therefore, he is named as Indra. The *Upanishad* proves this idea and says that exoterically he is *idandra* but esoterically he is Indra (*tadidantdram santam indram ityachaksate paroksena*). This is the idea which has its backing by *Agrayana* and *Aupa manyaya* as has been described previously. Indra is soul because he is the observer of (*idam*) this world. Indra is Divine Spirit because He is the maker of (*idam*) this world.

Here are presented a few opinions of Western scholars regarding Indra.

1. The mythological struggle between the God of the lightning, Indra and the serpent '*Ahi*' is transferred to '*Atar*' (the fire) (vide page 102 of the Introduction to the Zendavasta. English translation by Darmasteter S.B.E.

2. We find Indra and *Agni* the most prominent. The former is the deity of the visible firmament the god of lightning and rain. (History of India by Elphinston 9th edition, 1911).

3. The thunderbolt is the weapon exclusively appropriate to Indra. It is the regular name of the lightning stroke. (*Vedic Mythology* by Macdonell page 55).

NO. 2

Cosmology of the Vedas

Some scholars of the West have alleged that the Cosmology of the *Vedas* is not one connected narrative. In their opinion it has many narratives. They say that in the *Vedas* these narratives are found in the following forms :-

(i) Creation is the work of an Intelligent Being.

(ii) Creation out of nothing.
(iii) Creation from pre-existing Matter.
(iv) Creation is a Phenomenal Emanation from the Deity.

We consider over these points in the above stated order.

(i) *Vedic* philosophy is based on the trinity of the causes lying at the root of the universe. They are known as God, Soul and Matter. One who knows this fact cannot have the courage to utter any thing against *Vedic* Cosmology. One who is quite ignorant of this fact cannot be able to understand the system of creation described in the *Vedas*. Of these three eternal substances God is the efficient cause of the universe. Matter is the material cause and soul can be treated as an ordinary cause. As an efficient cause God is the creator of this world and without His will, wisdom and planning no creation can ever take place. Material cause is the substance out of which the world is to be created. Neither efficient cause can ever play the part of the material cause nor the latter can serve the purpose of the former. Soul is neither efficient cause of this world nor the material cause. It is the observer of the wordly phenomena.

So far as the idea of the creation being a work of an Intelligent Being is concerned, it is quite true and is, at the same time, irrefutable. The creation has an order and purpose and these are not possible without being worked out by an Intelligent Being.

At every step in the world, we find the reign of law and order. This cannot be without an intelligent creator. This narrative does neither deny the utility and existence of matter nor of the soul, it simply emphasizes the activities of the efficient cause without which any thought of creation is ruled out. This efficient cause has been described

in the Vedas as *Hiranyagarbha*, the Lord of all luminous worlds, *Visva Karman* the Supreme Architect of the universe, and *Prajapati*, the Lord of all creatures. The *Nasadiya hymn* of *Rgveda* is quite sufficient to throw light on the subject. In this hymn it has been very explicitly expressed that "there were productive energies and mighty powers working under the will and wisdom of God." It also says "*Svadha*, nature beneath, and *prayaih*, God's power above."

(ii) Creation out of nothing is not only impossible but also entirely unthinkable. The world which is something can never come out of nothing. To say that *Vedas* inculcate this view is incongruous and incompatible. There would not be found any verse in the *Vedas* which could corroborate this statement. *Vedas* accept three eternal substances at the root of the universe. This idea of the creation out of nothing, if it becomes any how plausible, would lead to contradiction. Creation and 'nothing' both are contradictory to each other. In the *Nasadiya* hymn of the *Rgveda* the terms like *asat* and *sat* are used. But they do not denote nothing or anything similar to that. They only communicate to us the inexplicability of the chaotic state of the world. In that very state a complete naught was not as there were God, souls and *svadha*, matter. An aught was not because the world was in its chaotic state. It was not in manifestation. Every thing then remained unmanifested. So, to contradict *asat* is meant to say that there were substances like God, soul and matter and to contradict *sat* is meant to express the causal state of manifested objects. If the *Nasadiya* hymn be taken as giving the idea of total negation of the substances, there can then be no answer as to why the verses thereof used the words *salilam*, *ekam*, *svadha*, *retodhab* and *mahimanah*. These words signify existence, not the non-existence. Thus this theory of

the creation of the world out of nothing finds no place in the *Vedas*.

(iii) Creation of the world from pre-existing matter has been held throughout in the *Vedas*. The *Vedas* describe the creation, the work of an Omniscient Being from the pre-existing matter. God who is Supreme Intelligent Being created the world out of its material cause, the pre-existing matter. He neither created this world out of nothing, nor created the same out of Himself, but created it out of its material cause.

Here it should be borne in mind that the world is not a reflection of what is not. It is not also a mere idea. The world exists in its eternal material cause, the *prakriti* and passes away in its transitory manifestations. This has phenomenal reality as undergoing transformation. Cosmic process is two-fold in character, creative as well as destructive. Creation is the unfolding of the different orders from the original matter and destruction is the dissolution of them into the original matter. As a result of disturbance of the condition of equilibrium, caused and initiated by the efficient cause, the universe is evolved with its different elements and at the close of the world period the products return by a reverse movement in the preceeding state of development, and so finally into the pre-existing matter. This fact has been described in the *Vedas*.

(iv) Creation is a phenomenal emanation from Diety is not a *Vedic* view. This idea has no place in the *Vedas*. *Upanisads* are not the part of the *Vedas*. They are the treatises of spiritual science. But they are not the *Vedas*. To describe them *Veda* and base on them this idea of world's phenomenal emanation from one Diety is totally wrong and absurd. *Vedas* give no trace of such a philosophical notion in which all the existences material, mental and spiritual are reduced to one philosophical unity *Atma* or *Brahman*. It is

not only against the teachings of the *Vedas* but it is also quite contrary to the philosophy of *Upanishad*. The creation, as we have previously expressed, is not a phenomenal emanation or illusory manifestation of the one great reality. It has a reality .It is not phantasmal. If the creation be treated as illusory manifestation of one Diety the whole philosophical background of the one philosophical unity would fall down. By embracing the principle of emanation one is apt to make Diety material. That is not the philosophy of the *Vedas*. In this conception the other defect that is irremovable is that the world becomes part and parcel of God. This is contrary to the facts present to our eyes. The world which we see is not the part of God. An object which comes into existence on the basis of causal affinity cannot be regarded as a phantasm. The world is evolved out of its material cause and hence it is not illusory. Thus the idea of the world emanating from one Diety is baseless and it has no place in the *Vedas*.

The *Vedas* do not accept that this creation is the result of nothing or non-entity. They also do not share with the view that this creation is a phenomenal emanation from one Diety. The *Vedic* cosmology is totally dependent on this conception that God, soul and matter are the eternal substances, and the world is real and is evolved from its material cause, the matter, by the perseverance of the Supreme Intelligent Being known by the names of *Purusa, Hiranyagarbha, Prajapati* and *Visvakarma* etc.

NO. 3.

The List of the Books dealing with the Vedic Sciences.

1. *The four Vedas* : They are the repository of all true knowledge. Being so they contain therein the elements of

all true sciences. For their thorough study the *Nirukta* of *Yaska* is the most helpful treatise.

2. *Brahmanas* : These treatises are the commentary on the *Vedas*. They deal with the miscellaneous sciences. *Shatapatha* is the most important of all these *Brahmanas*. There were many Brahmanas but they are not surviving to our times due to the cruel cycle of time.

3. *Charak and Shushruta* : These are the treatises of medical branches of *vedic* sciences with special reference to alcoholic and calcinating chemistry.

4. *Samkhya Nyaya* and *Vaisheshik* are the treatises on philosophical thoughts. But they deal with physics and chemistry. Atomic theory was made known to people first by Kapila, Gotama and Kanada.

5. *Suryasidhanta* : It is one of the six limbs of the *Veda*. It deals with astronomy and mathematics etc. This branch of science flourished to its highest peak in India in ancient time. Many valuable works were produced by the scientists at different times.

6. *Dharma Sutras* or *Smritis* : Some of them are concerned with the sciences of chemistry and physics. Cosmology has been also dealt with in them.

7. *Katyayana Shulba Sutra* and some *shrauta Sutras*: These *sutras* are the parts of one limb of the *veda* which mentions the application of the *vedic* hymns into performance of *yajna*. For performance of such *yajnas* there stands the need of *yajna Kundas*. These are made of various shapes. For their shapes exact measurement is required. This requirement made the priests to invent various formulae of mathematics especially of Geometry. These are the *shulba Sutras* which gave those formulae of Geometry which were later known to Greek geometricians. 47th theorem of the Euclidian geometry has been borrowed from the *Katyayana shulba sutra*.

8. *Gobhila Grihya sutra*: It is a treatise on homely sacraments. But in one chapter we find a mention of the names of fire in confirmity to its various operations.

There was a long list of treatises on the various branches of science, which were lost in course of time and now are not available. The under-mentioned list will speak of that fact:—

1. *Shakti sutram* by *Agastya* : The subject of the book is quite clear from its name. What is power or energy was purely and exclusively discussed in the book.

2. *Saudamini Kala* by *Ishvar* : Saudamini is the name of electricity having its position and origination in cloud. For the operation of airship in the space knowledge of this subject was treated most necessary. The book dealt with this subject.

3. *Shuddhividya Kalapam* by *Ashvalayana* : The method of purifying metals seems to be the subject dealt with in the book. This appears quite distinct from the name of the book.

4. *Brahmanda Sarah* by *vyasa* : The term *Brahmanda* signifies the whole universe with an especial reference to heavenly bodies and the vast space. The book dealt with this subject and it may be easily guessed and grasped from the title.

5. *Anshumattantram and Anshujnanam* by Bharadwaja : These were the treatises on the subject concerned with luminous bodies, light and its expansion in the space etc.

6. *Chhandah Kaustubha* by *Parashara* : This treatise was concerned merely with meters.

7. *Kaumudi* by *Sinhkotha*—Subject of the book is not known.

8. *Rupashakti Prakarnam* by *Angirasa* : This treatise was mainly concerned with the science of various forms presented by the light waves in the space as well as the ope-

ration of energy the knowledge of which was taken to be necessary for the pilots of the planes.

9. *Karaka prakarnam by Angirasa* : How the hail storms originate and how the water freezes in the cloud were dealt with in the book.

10. *Akashashastram* by *Bharadwaja*: This book treated with subject of vast interstellar space and cosmic rays etc.

11. *Lokasangrah* by *visarana* : This book seems to have dealt with secular affairs. More exclusively it was concerned with the Government, and administration and social matters.

12. *Prapancha Lahari* by *Vasistha* : This treatise seems to have its concern with worldly affairs including diplomacy, trade etc.

13. *Agatattva Lahari* by *Ashvalayana* : It was mainly concerned with the various kinds of diseases and their treatments.

14. *Yantrasarvasvam* by *Bharadwaja* . It was concerned with the science of airships and their operations e .

15. *Lohashastram* by *Shaktayana*. The name of the book is itself eloquent of its subject. The knowledge about the purification etc. and the various use of the steel was described in this treatise.

16. *Jivasarvasvam* by *Jaimini* : The subject of the book is not known. But it might have dealt with the problems of humanity.

17. *Karmabdhiparah* by *Apastamba* : This was the treatise on the subject of the law of action and its fructification.

18. *Dhatusarvasvam* by *Bauddhayana* : This book was concerned with the various process, names, forms and uses of metals and minerals.

19. *Ruk hridayam* by *Atri* was mainly concerned with mortal diseases and their treatment.

20. *Namartha Kalpah* by *Atri* : This seems to be the treatise on grammar.

21. *Vayu-tattva prakarnam* by *Shaktayana* : The subject of the book was wind and its operations in atmosphere

22. *Vaishvanar tantram* by *Narada* : This was concerned with the science of fire. Electricity heat and magnetism are the subjects which come within the ambit of *Vaishvanara*, the fire.

23. *Dhuma prakarnam* by *Narada* : The knowledge of smokes flames and monsoon etc. was the main subject of the book.

24. *Aushadhi kalpah* by *Atri* : Exclusive concern of the treatise seems to be the medicine.

25. *Valmiki ganitam* by *valmiki*. Mainly concerned with mathematics.

26. *Dhanurveda* was compiled by *Aushanasa*, *Jamadagni* and *Bharadwaja*. *Rathacharya*, *Padaticharya*, *vyuha shastra*, *Rathasutra* and *Ashva sutra* were available in the time of *Mahabharata*. *Nakula* was the author of the treatise dealing with horses while *shalihotra* produced the treatise on treatment of horse diseases. *Hastisutra* and *Hastyayurveda* were the treatises concerned with elephants, their species, diseases and treatments etc. *Svayambhava* wrote the book entitled *yantramalika* which dealt with machines, planes etc. Treatise on the subject of perfumery was available in the time of *Mahuka*, the writer of *Harmekhamala*.

Scientific treatises on agriculture were compiled by *Parashara* and *Briddhapa*. Cattle, animal farming including domestication and animal husbandry was dealt with in the book whose authorship was assigned to Gautama. There were also treatises on Veterinary sciences, plant treatments etc. Treatises on architecture were written by 18 authors at various times. *Bhrigu* wrote his book on handicarft.

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