By Prof. B.V Raman – Astrological Magazine

Hindu Attainments in Positive Sciences* Note:eg 8/10 means eight to the power of ten etc

Part One

INDIA AS THE HOME of one-of the most ancient civilisations has contributed not a little to the history of scientific thought and technique. Most scholars, when they think of the genius of the Vedic Hindu, are naturally more attracted to his noble religion, sublime philosophy and the most varied character of the rich literature and charming devotional poetry. The Vedic Hindu in his great quest of the Para Vidya (Supreme Knowledge — Satyasya Satya — or truth of truths) made such progress in the Apara Vidya or the so-called inferior knowledge or relative truths — positive sciences included — with a completeness which is unparalleled in antiquity.

In this evening's talk it will be my endeavour to give a general background of ancient Hindu achievements in some branches of so-called positive sciences and say a few words about the much misunderstood subject of astrology.

The evidence that has been accumulated from the days of Warren Hastings, the first British Governor-General of India, to which every generation of devoted scholars from East and West have contributed, has revealed how hasty and unfounded is the view entertained by a section of oriental scholars — Western and Indian — that all that India could boast of in matters of science was a reflection of early Greek civilisation; that the Indians were only hair-splitting philosophers not conversant with the so-called positive sciences and that ancient India had neither scientific talent nor a scientific outlook.

The Hindus were in the vanguard of civilisation and produced great thinkers in every field of science and art, great astronomers and great mathematicians when the

ancestors of peoples, who now claim to be enlightened, were yet in a primitive condition.

In the domain of philosophy, the Hindus had developed such a variety of systems that we can find a parallel today in them for every phase of European thought, idealist or empirical. At the same time, we find that the Indians had, in addition, certain unique features of their own developed with infinite refinement to which modern Europe has no prototypes. The great French Indologist wrote to Sir P.C. Ray, viz., "It is only through a study of national antiquities, national literature and national ethics, that mental and moral improvement is possible in India."
But the question may also arise: What is the use for instance of subjects like astronomy and astrology as developed by ancient Hindu thinkers, in this age of space-science and space travel?

The answer is: "They can, if properly understood, combat the overwhelming onslaughts of the materialist view of life and the consequent corruption of spiritual and moral ideals so characteristic of today".
A dispassionate study of ancient literature bearing on astronomy and allied subjects will reveal that the vision of the ancient sages was far more deeply based on and intimately correlated to the realities and values of life than dreamt of in modern times.

Western scholarship and its Indian counterpart tend to underestimate the antiquity of Indian culture. It tends to begin its story where it is coming to a close such as the time of the Buddha. They attribute the achievements of Indian sciences and arts to the Greeks or other non-Indian sources. Unable to comprehend the vast time-scale in which Indian culture crystallised through millennia, they transferred much of it to pre-history and mythology and superstition. There were, of course, a few exceptions like Colebrooke and Bailey who caught the spirit of Hindu astronomy and mathematics and sought to extricate themselves from the common Western prejudice of the early origins for culture and civilisation of the Hindus, and of all peoples other than the Hebrews, whose theocratic world view with its restricted geological time-scheme persisted in their minds.

The fantastic suggestion is often made by a section of modern historians that even the

ancestors of the present-day Hindus came from outside India. And, to the word Arya which means respectful, a racial connotation or twist is given. They say that Aryans were once inhabitants of Central Asia and that they invaded India and drove the original inhabitants to the south who are now supposed to be the Dravidans. What an amount of havoc this mischievous theory is capable of playing in the political life of our country becomes evident, if we try to understand the secessional movement resorted to by some political parties.
It can be conclusively established that the Hindus were the original inhabitants of India knocking down the mischievous theory of the so-called Aryan immigration from somewhere else. The earliest Aryans were conscious of the fact that they were natives of India and of no other foreign country. In fact all thought and sciences developed in India, during the past several thousands of years, are purely indigenous.

A study of Hindu methodology which is necessary for a right understanding of Hindu attainments reveals that the whole movement was genuinely and positively scientific though arrested at an important stage due, perhaps, to political convulsions.

Perception, observation and experiment were the main criteria of truth. The scientific method proceeded on the basis of observed instances carefully analysed and sifted. The most signal. example of applied logic or scientific method worked out with systematic carefulness is the logic of therapeutics in Charaka, a logic which adopts the general concepts of cause-effect, energy-operation etc., and the general methodology of science, to the special problems presented in the study of diseases.

It behoves all unprejudiced scholars to study and understand India's ancient scientific heritage and not dismiss their attainments as of no relevance to modern times or modern India.

The science of mathematics saw a high development in the hands of the Hindus. Numbers seemed to have had a special appeal to them. The sacrificial platforms were all designed according to strict geometrical considerations.
They were "the inventors of the decimal system and 'zero' without which arithmetic would be reduced to non-entity.

The Yajurveda Samhita gives an account of numbers in ascending decimal scale unto parardha or 10/27. In this respect the highest terminology used by the Greeks (probably in the 4th century B.C.) was myriad (10/4). In fact the ancient Hindus had developed terminology, to express numbers as high as 10/53. It is interesting to note that it is the Indian numerals that are miss-named Arabic numerals. They had attained a very high degree of proficiency in Algebra — Bijaganita. In fact, as Manning says, Hindu "excellence in algebraic analysis was attained in India independent of foreign aid". The arithmetic of surd roots, the general resolution of equations of the second degree and a general solution of indeterminate problems of the first degree had all received the careful attention of the Hindus. It is indeed with a feeling of respectful admiration that Mr. Colebrook alludes to ancient Sanskrit treatises on algebra. The credit of discovery of the principle of differential calculus generally claimed by the Europeans sh6uld justly go to the great" Indian mathematician Bhaskaracharya who lived about 11 centuries ago.

A rational system of Geometry had been developed by the ancient Hindus. A perusal of the Sulbasutras or the manuals for the construction of-altars (which were necessary in connection with certain religious rites) reveals the construction of squares and triangles, relation of the diagonal to the sides, equivalent rectangles and squares etc. Apastambha describes a square to be the sum of two different squares like 8/2 + 15/2 = I7/2; 12 + 35/2 = 37/2 etc.

According to some Western scholars like G. Milhand, Pythagorean geometry could have been inspired by the Hindu findings.
A scholar by namePingala) in his book Chandra Sutra describes the binomial theorem. The triangular array formed bythe binomial coefficients was known in ancient India as Maru Prasara,

The classical period was known for the array of critical thinkers_it_produced. AryaBhattaT (1st century B.C.) was a mathematician and astronomer of stature. Bhaskara, Brahma_Gupta, Mahavira, Sripathi, Sridhara etc, were all well-known names in mathematics and astronomy.

The rules of extraction of square and cube roots, arithmetic progressions, summation of series etc., were well-known to Aryabhatta. He gave the value of pye as 3.1416. The famous indeterminate equation of the second degree Ny+1 - X/2 was dealt with by Brahma Gupta. One of his researches on indeterminate equations was rediscovered a thousand years later by Euler (1707—1780).
In his monumental works Lilavati, or Bijaganita, Bhaskara the greatest astronomer of the 10th century A.D. has dealt with indeterminate equations of the 1st and 2nd degrees. For rational integral solutions of the indeterminate equation (Ny+1 = X/2) a cyclic method — Chakravata — was discovered by Bhaskara.

One significant feature is that none of these ancient masters claimed originality for their theories. They do not even pretend to make any claim. On the other hand they have often expressly admitted to have taken them from earlier works.
In the geometry of the Hindus,— and we can trace back the antiquity to at least 3000 B.C., the treatment of surds, particularly their addition, multiplication and rationalisation, it noteworthy.

In meteorology, the Hindus used the rain gauge in their forecasts for the year, made careful observations of the different kinds of clouds and their atmospheric phenomena, e.g., heights of clouds, distance from which lightning is visible or thunder is heard, the area of disturbance of different earthquakes and how phases of the Moon and certain mutual geometrical positions of planets caused rains, floods, earthquakes, volcanic eruptions etc.

It might surprise many a modern scientist to learn that the Hindus had developed what was called Vimana Vidva/ or science of aeroplanes. The Yajurveda refers to travel in space or_antqriksha. According to _the_great_law giver Manu, the science of aeroplanes (Vimana Vidva) was part of the more comprehensive science called Vayu vidya or the science of space.

In zoology the enumeration of the species of worms, insects, reptiles, aves etc., was based on the external characters and nature of life. In botany the observations were related to the interests of materia medica. Experiments in metallurgy, pharmacy,

horticulture and making of lenses etc., were freely drawn upon for building up scientific generalisations.

Ancient works on (metallurgy deal with metallurgical and chemical processes, metallic salts, alloys, amalgams and mixtures. The great Nagarjuna__was know for his vast knowledge in these matters.

VaraHamlhira speaks of many kinds of cements — such as vajralepa or 'cement" which is strong as the "thunderbolt". They were used in the temple architecture. Ruins of temples and Chaityas still reveal the quality of cement employed. Varahamihira also discusses the manufacture of synthetic substances. He arranges compound scents in a sort of scale, according to the proportions of certain ground essences. Applied chemistry gave India her premier position in the so-called Middle Ages and earlier. Geological speculation and investigation are not foreign to ancient India. The earth is called Vasundhara for it contains minerals. It is spoken of as Ratnagarbha Vasundhara as it contains many minerals, precious stones etc-

The Atomic theory, of the Vaiseshikas points out that one Paramanu (sub-atom) is l/349525th of an inch. The "cohesion and separation of these atoms makes up the world. The laws of motion observed and verified in astronomy had been taken into the analysis of motion. Prasastapada speaks of the instantaneous motion, impressed motion etc.

And the sacred Bhagavata holds that Anu or Atom is the basis of both Time and Space.The Rigveda speaks of the seven rays of the Sun.
The Mimamsakas speak of three variehes of sound - Nada, Dhwani and Sphuta. The Nyaya system employs the Vichitavarganyasa according to which sound vibrations occur in circles. This is more or less the wave theory of sound. Matter is said to have three Gunas or constituents or properties: Sattwa or essence, Rajas or energy and Tamas or mass or inertia.

The science of medicine or Ayurveda is indeed a rich heritage for us. It is a vast scientific system. But its very vastness makes it a sealed book.
While Ayurveda, as the name implies, is the Veda or knowledge of ayu or life aiming

at maintaining the physical, mental and spiritual health of a person, and also showing the methods of prevention and treatment of disease,, (when it occurs, modern allopathy is concerned only with treatment and not prevention.
Famous in the science of Ayurveda are the great Dhanwantari — the physician to the gods, said to have been sent by the celestial Indra to the earth to impart knowledge of medicine and surgery, and his disciples ,Susruta Vagbhata/ Atreva and Charaka. It is said in some quarters that our great Susruta was known in Greece as Hippocrates.

What is remarkable about ancient Indian medicine is that is covers the entire field of modern medicine — therapeutic, materia medico, surgery, physiology and anatomy. Whatever the inconsistencies of Ayurveda, it cannot be denied that the system, through all the vicissitudes of time has stood alone entirely by virtue of its own intrinsic value and stable scientific foundations.

One is indeed astounded to find the theory of circulation of blood referred to in ancient works on Ayurveda, though even now this theory is attributed to the English physician, Harvey who lived in the 16th century. A statement by the great surgeon — Susruta — refers to the re-entry of blood into the heart.
If we go by the statement of Mrs. Plunket,a great orientalist,surgery had a brilliant past in India. According to Mrs. Plunket the Hindus were so advance in surgery that their instruments could cut a hair 'longitudinally. Ordinarily, Ayurvedic surgery though lost and forgotten by Ayurvedic doctors, can be said to be practised by modern doctors, via Western countries. The Aswins were surgeon gods. And surgery forms an integral portion of Sushruta Samhita. The Aswins are said to have effected wonderful cures — the healing of the lame and the blind, the rejuvenation of the _aged_Chyavana, and Purandhi's husband, and the giving of iron leg to Vispala — a mare, etc. Sushruta describes 125 kinds of surgical instruments which include scalpels, lancets, needles, catheters, rectal speculums, and various other instruments. Sushruta lays stress on an accurate knowledge of anatomy and lays down rules for preparing a dead body for dissection in no dubious language.

The plastic and rhino-plastic surgery is another gift of India bestowed upon the world. "Now I shall deal with the process of affixing an artificial nose" — so goes a statement giving details of repairing damaged noses. All surgical operations were

grouped under 8 heads: And they are amputation, exorcising, scraping, puncturing, paroling, extracting, evacuating fluids and suturing. They had their own processes. In fact, post-mortem operations as well as major operations in obstetric surgery (the extraction of foetus) were availed of for embryological observations. Sammohana and Sanjivana powders are mentioned to make the patient insensible and then restore him to consciousness after the operation was over. In practical midwifery, the evidence is still more astonishing. The application of forceps in cases of difficult labour, different obstetric operations such as craniotomy were first systematically described in the Sushruta Samhita long before fillets and forceps were dreamt of in Europe.

I am reminded of a verse in Dhanvantari's Shabda Kalpadruma referring to vaccination. It says: "Take the serum from the pustules on the teats of cows or from the "arms"of men at the end of a knife, and introduce on the arm (of ,. the child) caused by sacrification with a knife. The serum when mixed with blood causes fever of small-pox."

I do not wish to multiply instances of the advancement made by ancient Hindus in the field of medical sciences.
Psychosomatics seem to many of us to be a modern discovery, but the ancient Hindus were not only quite competent with the intimate relationship between body and mind but between physical and mental health and morals and ethics in life. In fact, Yoga is a preventive medicine because it enumerates steps for a proper training of cultivation of the body as well as our mental factors.

(To be continued)