

**FUNDAMENTAL PRINCIPLES
OF
AYURVEDA**

PART I

**INTRODUCTORY AND OUTLINES OF NYAYA-
VIASESHIKA SYSTEM OF NATURAL PHILOSOPHY**

BY

DR. C. DWARAKANATH, L.I.M. (MADRAS)

& Z.T. (HAMBURG 'VARSITY)

PRINCIPAL

GOVT. AYURVEDIC & UNANI COLLEGE

MYSORE



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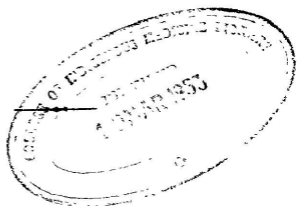
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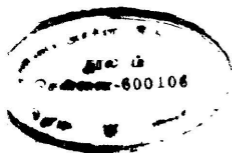


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Dedicated to
THE GREAT ĀPTAS
of the past and the present



FOREWORD

I am painfully aware that my competence to write a foreword to a book on the Fundamental Principles of Ayurveda does not keep pace with my enthusiasm for the subject. My plea is that I am imbued with a genuinely reverent approach to the Vaiseshika system of Natural Philosophy, which forms part of the subject matter of this book. Whether the conclusions of the Indian philosophical systems are final in themselves or whether they mark a certain stage of development in the evolution of scientific thought are points on which opinion seems to differ. Attempts have, however, been made from time to time to examine the 'Paramanuvada' of the Vaiseshika system from the standpoint of modern science. While the view points of modern science are changing from day to day as new discoveries come to light, it would be futile to correlate with the changing present the conclusions of the ancient seers, if the same are to be considered as true for all times. On the other hand, if Indian science had been in a stage of evolution up to a time and later, ceasing to grow, came to be looked upon as of divine origin, any attempt at correlation is likely to result in "much of text-torturing and forced interpretations.....to prove that every modern discovery had either already existed in the old doctrines or were anticipated by them." In spite of this dilemma, the author is intuitively correct in assuming Sri Rajagopalachari's dictum that "Truth and science are one. There can be no competition between truth and truth, but only between truth and error. Truth runs in a single course, and prejudice and ignorance should vanish to a minimum point." In this firm belief, Sri C. Dwarakanath has put his shoulders to the gigantic task of making "a critical, dispassionate and

scientific study of the doctrines basic to Ayurveda, so that they may be understood in a proper perspective with a view to apply the same intelligently and with advantage in practice." Such earnest efforts are bound to reveal in due course the true significance of our ancient heritage, regarding which Prof. J. B. S. Haldane has recently expressed his unbounded admiration.

The ancient Indian concepts of space, time and matter look complete and self-consistent in themselves but generally elude all attempts at identification with their modern counterparts. A perusal of the *Arambhavada* and the *Parinamavada* will not fail to remind one of some of the basic modern concepts regarding the evolution of the Universe. The concepts of time and space as expressed in Vyasa Bhashya may, in some places, recall to us some fundamental ideas underlying the theory of relativity. Even the very idea of invoking a "Sakshi" to perceive the concepts—

"Atha Sarvepadarthascha Sakshigocharam"

seems to correspond to the postulate of an "observer" in modern scientific thought. With all these resemblances between the ancient and the modern concepts, I must confess that the ancient picture eludes exact quantitative formulation on modern lines. Imbued with the zeal of a researcher, Sri Dwarakanath makes a bold attempt to elucidate the age old ideas and to consider them in the light of modern developments.

MYSORE,
1st November 1952

L. SIBAIYA, D.Sc., F.A.S.
Professor of Physics. &
Principal, First Grade College,
Mysore University.

AUTHOR'S NOTE

I have ventured to publish the Fundamental Principles of Ayurveda in three parts *viz.*, (i) Outlines of Nyaya-Vaisheshika system of natural Philosophy; (ii) Outlines of Sankhya Yoga system of natural Philosophy and (iii) Dosha Dhatu Mala Vignana, with a view to (a) provide modern students of Ayurveda studying in different Colleges and Schools of Indian Medicine in the country with a suitable text book on this important subject, and (b) place before the Modern Scientific world some of the valuable and salient features of two of the important systems of Natural Philosophies of Ancient India which form the basis of the doctrines of Ayurveda, in a language intelligible to modern workers. An intimate acquaintance with the doctrines of the Darshanas relating to matter, mind and life is a pre-requisite for a proper understanding and appreciation of the much mis-understood Pancha-bhootha theory of matter and the Tridosha theory of Physiology, Pathology and Therapeutics of Ayurveda.

The contents of this as well as the remaining parts yet to be published, are based on the notes of my lectures on Padartha-Vignana and Dosha-Dhatu-Mala-Vignana included in the first and second year curricula of the courses of studies prescribed two years back for the Government Ayurvedic and Unani College, Mysore. In my lectures on this as in other subjects, I have endeavoured as far as possible and to the extent feasible to implement the following directives contained in the approved prospectus of the College issued in 1950-51. "The teaching of the Indian and Western subjects will be supplementary and complimentary to one another, care being taken to see that *the necessary or valuable portions of the Western Medicine being so taught as to make these teachings fit in as naturally as possible into the scheme of studies appropriate to Indian Medicine itself.*

and not forced down as though they were things quite apart from and alien to the basic principles of Indian Medicine. Efforts will be made at every stage to stimulate and draw the scientific imagination and intuition of the students of Indian Medicine along lines of Indian Medicine itself so as to give it a distinctly Indian colouring and not make it a dead or second rate imitation of Western Medicine."

I have studiously avoided the temptation to read modern developments in Science through Ayurveda and avoided correlating modern concepts with the ancient. Wherever ancient and modern concepts appeared to be identical, there I have presented the two views together so that workers in the field, more competent than myself may draw their own conclusions on them. I may, however, add that some of the recent trends in Physics, Biology, Psychology and Medicine bear a striking resemblance to those of ancient Sciences.

Apart from my own studies of some of the Darshanas and Ayurveda, I have largely relied on the valuable contributions of Sir Brajendranath Seal and Vaidyaratna Capt. G. Srinivasa Murthi, B.A., B.L., M.B.C.M., and the discussions I had on the subject with my versatile brother Sri C. Kousalyanandan, Dr. L. Sibaiya, D.Sc., F.A.S., Professor of Physics and Principal, First Grade College, Mysore and Prof. M. Yamunacharya, M.A., Assistant Professor of Philosophy in Mysore University. I am greatly obliged to Prof. M. Yamunacharya, for having read through the proofs of this book. I have also to acknowledge with thanks the donation of the required paper made by Sri K. S. S. Iyengar, Proprietor of Messrs. Lindner & Co., Chickpet, Bangalore for the publication of this book.

Govt. Ayurvedic and Unani College.

MYSORE,

1st November 1952

C. DWARAKANATH

Principal

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10 MAR 1953

Fundamental Principles of Ayurveda

Padartha-vignana

Introductory

The Dosha, Dhatu and Mala Vignana—the subject matter of the 11th and 12th chapters of Vagbhata's Ashtanga Hridaya viz., Doshadi-Vignana and Doshabhediya, constitute the basis of the Physiological and Pathological doctrines of Ayurveda.

The term Physiology is used here to signify the normal functions of the living body in all its different aspects, in the same manner as this term is understood to-day viz.,

1. Cells, tissues, organs and systems, their structural and functional integration and direction as a single composite unit or whole;
2. The study as to how the living organism works in its surroundings or environment.

This includes the reactions of the living organism and the main body of knowledge which deals with the simpler parts of animals including man, leading to the recognition of the fact that the health of the body as a whole depends on the harmonious working of its parts.

This conception includes even the narrow, albeit the latest description of the physiological man, as a field of physico-chemical reactions or a complicated machinery which takes in potential energy in the form of food, changes it into work performed and waste products discharged. Irrespective of the philosophical point of view, it seeks to explain the physiological phenomena in terms of quanta or

units of energy, so as to reach fundamental and ultimate concepts.

The view is held in some quarters that the physiological and pathological doctrines of Ayurveda *viz.*, Dosha, Dhathu, and Mala Vignana, merely reflect the Indian version of the notions of Galen, Hippocrates and the rest of ancient Greece – the now exploded humoural doctrine of blood, bile, water and phlegm. But the ancient Indian doctrine under discussion presents a picture, in some respects very much modern in its conception. No less an authority than the well-known scientist of India, the late lamented Sri P. C. Ray observed that “too much has been made of the resemblance between the Greek and the Hindu theory and practice of medicine. The analogy is more superficial than real and does not seem to bear a close examination. The Hindu system is based upon three humours – wind, bile and phlegm – whilst that of the Greeks is founded upon four humours, *viz.*, the blood, bile, the water and the phlegm, a cardinal point of difference.” Quoting the high authority of Dr. Hoernle, who disposed off the view that the Hindus borrowed their notions of humoural doctrine from Greeks as “an elaborate joke,” Sir P. C. Ray observed that such views are advanced by critics who represent “a school which cannot and will not see anything in India which can claim originality or authority.”

However, careful and critical study and research undertaken in the doctrine during the last 4 or 5 decades by workers of the eminence of Sir Brajendranath Seal, Maharajasaheb of Gondal, Captain G. Srinivasa Murti and his colleagues, to mention but a few of the outstanding workers, have shown how right was Sri Pardey Lukis, the then Director General of Indian Medical Service when he observed during the course of a debate in the Imperial Legislative

Council in 1916 that, "he did not recognise any fixed line of demarcation between Eastern and Western Medicine.... Many of the so-called discoveries of recent years are merely re-discoveries of facts known centuries ago."

What has been stated above does not overlook the fact that the available literature on the subject contain not only valuable scientific doctrines but also interpolations and interpretations - often of faulty and erroneous ideas founded to a large extent on fanciful anatomy, physiology and pathology. This is apparently due to the fact that after the compilation by Charaka and Susrutha of all available knowledge discovered before their time, further developments virtually came to a stop; those who came after the authors of the two Samhitas, themselves not being discoverers, became the commentators of the one or the other school of medical thought. It may be stated that since then, the Science and Art of Medicine became archaic and they have continued to be so during the millinea that followed. Historical vicissitudes contributed their own quota to the process of decline and deterioration. The literature became mutilated and gave room for interpolations and fanciful interpretations to fill up the gaps by scholars, who were, may we say, genuinely anxious to keep the ancient knowledge alive. A critical appraisal of the doctrines in the light of observed facts became taboo due to the feeling that the knowledge contained in the ancient books were of divine origin and as such perfect, and cannot, therefore, be questioned or improved upon. Later commentaries on the subject became a matter of interpretation based more or less on Vyakarana and Nyaya Sastras and less on observed facts and experimental findings. This was, of course, contrary to the spirit of scientific enquiry, which the Acharyas of old commended to their followers to adopt.

The conservative method of interpretation of the valuable doctrines of Ayurveda in modern times has, if any thing, made the position more obscure and confused. The innumerable Churcha Parishads which took place during the last 4 or 5 decades, have not helped to clear the position. Varying and often conflicting versions of these doctrines have been put forth. Much of text-torturing and forced interpretations have been resorted to, to prove that every modern discovery had either already existed in the old doctrines or were anticipated by them. It will, therefore, be our purpose to make a critical, dispassionate and scientific study of the doctrines basic to Ayurveda, so that they may be understood in a proper perspective, with a view to apply the same intelligently and with advantage in practice. We shall do this in the belief that, "Truth and Science are one. There can be no competition between truth and truth but only between truth and error. Truth runs in a single course and prejudice and ignorance should vanish to a minimum point." *

Philosophy, Phenomenon and Noumenon

The basic doctrine on which the Ayurvedic conception of physiology, pathology, pharmacology, medicine and therapeutics are founded is known as the Doctrine of Panchabhutas. This doctrine has been expounded, among others, by the Shad-Darsanas or the six philosophical systems of India. Of these, Ayurveda has largely relied on the Nyaya-Vaisesika and Sankhya-Yoga Systems.

It has to be observed that the term philosophy used here should not be confused with religion, as is generally the case. Ordinarily, this term has often been confused with the supernatural and the superstitious. On the other hand, it has

* H.E.C. Rajagopalachari's farewell address to Bangia Ayurveda Mahasabha, Calcutta; 17. June 1948.

been understood and used in the past as in the present, to signify, "the science which aims at the explanation of all phenomena of the universe by ultimate causes," and "as the science which aims at an explanation of all phenomena as explained by and resolved into causes and effects." The term phenomenon used here means, "the form through which, it (the thing) becomes known to the senses or understanding. It is the opposite of the term 'noumenon,' which means, "the unknown and unknowable substance or thing as it is in itself." In other words, the former term is used whenever materialisation and manifestation perceivable by our senses has taken place (i.e.) Vyakta.

व्यक्तमैन्द्रियकम् चैव गृह्यते तद्यदिन्द्रियैः ।

and the latter term is used whenever things exist in an unmanifested or Avyakta state :

अतोऽन्यत् पुनरव्यक्तम् लिङ्गप्राह्यमतीन्द्रियम् ॥

"Whatever is perceptible, being apprehensible by the senses is the manifest or Vyakta, but what is imperceptible and is beyond the senses and can be known only by inference is the unmanifest."

Charaka. Sarira 1; 62.

Philosophy can be classified under the following three broad-based headings viz.,

- i. The Natural Philosophy - Physics, Chemistry, etc.,
- ii. Mental Philosophy - Meta-physics, etc.,
- iii. Moral Philosophy - Ethics, etc.,

In the context of Ayurveda or the Science of Life or Knowledge of Life, the term philosophy comprehends all these three categories which, between them, seek to elucidate and explain the phenomenon of life and life process and lay down the laws and principles that govern them. The Shad-Darsanas claim to have sought for and ascertained the ultimate causes relating to life and life process in terms of

causes and effects and enunciate the laws and principles that govern them.

The term Darsana which is derived from the root 'Dris,' means "to see" "seeing," "looking" or "sight." It also means, the 'eye' 'mirror' and 'knowledge.' The Aptas like Kapila, Kanada, Goutama, Brihaspati and the rest who were the authors of the respective Darsanas viz., Sankhya, Vaiseshika, Nyaya and Charvaka Darsanas are, according to Nyaya Sutras, those who taught what they saw. Aptas, say the Sutras, "may be Rishis, Aryas or Melechas". * Darsanas, therefore, represent a body of truth—temporal and spiritual—discovered by Aptas, which have their value in actual application.

In order that we may not mix up these philosophical systems with religion, supernatural and the superstitious, it may be noted here, that these systems include the materialistic or atheistic philosophy of the Charvakas—the Charvaka Darsanas. The Charvakas, while denying the existence of God or a Creator, held that every aspect of the phenomena of the universe including life, was the result of the combination of atomic particles. For that matter, the Sankhya system is of two kinds viz., the Seswara Sankhya and Niriswara Sankhya. Whatever the difference between one system and another, all of them are generally agreed that the Pancha Mahabhutas are the material basis of the phenomenal universe and every thing included in it.

The Modern Concepts of Matter or Padartha

The modern concepts of the physical basis of the universe or matter may be summed up as follows :

* आप्तः खलु साक्षात्कृत धर्मं यथा दृष्टस्य अर्थस्य चिरव्यापयिष्या प्रयुक्त उपदेष्टा । साक्षात्करणं अर्थस्य आप्तिः । तथाप्रवर्तते इत्याप्तः । ऋष्यार्यम्लेच्छानां समानं लक्षणं, तथा च सर्वेषां व्यवहाराः प्रवर्तन्ते इति ।

Beginning with the views propounded by early Greeks - Aristotle, Leucippus, Democritus, Lucretius and the rest, the mechanical principles representing the body of thought enriched later by the contributions of Kepler, Galileo Newton and others, centred on the concepts of mass, motion and force, became precise in the atomic theory by the end of the 19th century. According to this theory, every material object could be analysed back and back till we reached the atoms - some 92 elementary substances - which are incapable of further division, or cannot be broken down into something simpler. These elemental particles were conceived as contributing to the constitution of matter. This theory was soon improved upon and it was shown that the atoms, far from being simple, elementary or uncuttable, are of complex structure - a structure comparable to the structure of our solar system in miniature, and a permanent concentration of matter at a point - a miniature sphere, possessing mass and incapable of undergoing any intrinsic change and following motions which could be determined exactly. These atoms were considered to be the brick-blocks of elementary particles with which all things in the universe are built up. The atomic brick-blocks of matter or chemical atoms were shown to be composed of still smaller particles of matter representing packets of electrical energy (quanta), some charged with negative electrical charge, some with positive charge and still a third variety having no charge or neutral, their arrangement and movements in fixed orbits within the atomic space resembling the pattern of our solar-system *viz.*, the Sun surrounded at varying distances by its satellites - the Earth, Venus, Moon, Jupiter, Mercury, Neptune, Saturn, etc. These particles are stated to be the bricks which make up the brick-blocks of atoms. So far, about 10 such particles have been described. The more important of these are :

- (i) **The Proton**—A heavy particle bearing a positive charge—heavier than electron; possesses one mass unit; forms part of the nucleus of the atom together with another particle—the Neutron—which has no electrical charge. These two together represent the Sun in the atomic Solar system.
- (ii) **The Electron**—A small light particle with a diameter of about 10^{-13} centimetre and a mass of about $1/2000$ mass units; has a negative electric charge which forms the natural unit of electricity.
- (iii) **The Neutron**—A particle possessing a mass unit but no electrical charge and forms the nucleus of the atom together with Protons.
- (iv) **Positron**—A particle bearing one positive charge, yet possessing a mass much smaller than that of the Proton, known as the positive electron.
- (v) **Photon**—Unit of radiation.
- (vi) **Meson**—A charged particle having a mass intermediate between the proton and electron.

(Note:—The diameter of atoms are of the order of 10^{-8} centimetres (i. e. 100 millionth part of a centimetre). The mass of an atom (absolute) is also very minute and it is simply called atomic mass unit. A mass unit is defined as $1/16$ of the mass of an atom of oxygen. The diameter of an electron is about 10^{-13} of a centimetre and its mass about $1/2000$ mass units)

As in the case of the solar system, so also in the atom, the Nucleus (containing the protons and the neutrons) take the place of the Sun and the electrons represent the planets. They move around the nucleus at different distances from it.

Chemical reactions between atoms involve only the outermost electrons. When two atoms combine, an electron may be transferred from one atom to another or they may share two or more electrons. The way in which an atom reacts chemically, therefore, depends on the structure of its electron system. This is determined essentially by the electrical charge on the nucleus. The electrons are always in motion around the nucleus in orbits. The centrifugal force created in consequence prevents them from being drawn in by the electric attraction and the atom is thus rendered neutral.

This apparently simple picture has become complicated with the discovery of other particles and the possibility of many more being discovered, as well as the existence of a large number of them has not been ruled out. The possibility also of these particles not being elementary in a fundamental sense looms large. In the ultimate analysis, all these atomic particles, whether in the lightest hydrogen atom or the heaviest uranium atom, whatever their nature, disposition and behaviour, may be classified under three main heads *viz.*,

- i. The positively charged,
- ii. The negatively charged, and
- iii. The neutrals.

A further development has modified the concepts referred to above. It bases its conclusions on the behaviour of the atomic particles and presents a picture in which, the particles express themselves in different forms at different times *viz.*, as material particles possessing mass and occupying a measurable space. They undergo transformation and thereby, they change their pattern and show themselves as waves, or particles of different mass occupying different positions in the atomic space. Some of these intra-atomic particles are not really particles at all in the true sense of

the term, as they do not appear to be permanent and unchangeable. They are seen to undergo changes. Some of them appear to be far from being simple. The latest trend is to regard them as the 'components of pattern.'

In the view of those competent to express an opinion on this subject, "the difficulties felt in pursuing the matter further is because of the analytical method, which is the search into the smaller and smaller structures and it has touched the bottom The accuracy of space-time measurement cannot be carried any further; it may well be, therefore, that we have reached the limit, to the fine structure of the universe or at least to the limit attainable by present methods. The bottom has perhaps been reached, as it were, with wrong kind of anchor. We cannot grasp the pattern of the ultimate structure of things because, we are using the wrong intellectual instruments, and instead of getting a firm hold or a clear vision of the bottom, we stir up with our dragging anchor a multiplicity of more or less spurious particles."*

In this view, physics is now a finite realm of study—a closed subject—and it will become very important to understand what its laws are. If, as Professor Whyte has stated, it is true that the bottom has been reached, then "the true form and laws of that basic structure must bear some relation to everything that happens in the world, not only to the entire world of physics but also to life and mind."

The modern trend in this regard can be stated as follows:—

(i) Contemporaneous with the disintegration of the mechanical particle picture, the new conception of spatial

* Prof. Whyte, 'Science and Human Understanding,' presented in the third programme of the B.B.C.; Extracted by the Round Table, published by the University of Chicago, p. 16.

patterns and their transformation has steadily grown more definite.

(ii) The theory of mechanical particles is not the complete explanation of the actual phenomena as was till recently believed, and the facts accumulated during the last 30 years have to be reinterpreted as part of some comprehensive approach.

(iii) We must not think of patterns as if they were built out of particles but what has been spoken of till now as particles may better be explained as 'components of patterns.' The facts accumulated during the last two and a half decades have shown that there is no doubt about patterns—the exact structural patterns of individual atoms, of chemical molecules, of crystals, fibres and so on. According to this view, this knowledge will not be true knowledge, until all the available knowledge on the subject has been co-ordinated under simple laws. The general laws of development and transformation of patterns are still unknown.

(iv) This new emphasis on 'pattern and transformation' has been extended to other sciences as well. In biology, the development of pattern is unmistakable in the growing embryo. The same applies to psychology also. In visual perception and in the process of thought, the determining factor is normally some regular pattern or configuration, some characteristic arrangement which makes the whole, rather than the isolated elements bearing no relation to one another.

(v) The need to restore balance, not by paying less attention to the causal analysis of detailed facts, but paying more attention to certain aspects of phenomena till now neglected, like pattern, tendency and transformation has become emphasised. The crucial problem is to discover

the relation of measurement, number and quality on the one hand to some unknown law that governs the development and transformation of pattern on the other.

(vi) The difficulty inherent in the problem is not overlooked and it is recognised that all measurements rest on the conception of some unchanging permanence, either of a scale or a clock, while transformation involves process or change. Hence it is recognised that the task of physics is to discover a new principle which can unite permanence to change—a new kind of causality to provide a broader and more reliable foundation.

(vii) These trends have led to the development of a "New-outlook" in the physicists, who till recently believed that they could formulate the laws of physics without any reference to the investigator, the scientists and others who are interested in these laws and make the observations. As observed by Mott, "the scientist to-day does not feel any more that he is investigating some absolute truth, remote from mankind and this too is probably why he feels that the subject matter of his science physics, is the relation between mankind and the rest of the world." *

The pursuit of the knowledge of matter, or 'Padartha-Vignana' has, we have seen, taken the scientists from the realms of the seen or sense perception, to the realms of the unseen and intellectual abstractions. This has raised an interesting but to us a familiar discussion on the "Seer and the Seen" or the "Subject and the Object." Einstein, Bohr and Born and a host of the front rank scientists of the world to-day belong to a school which taught that, "There exists an objective world which unfolds itself according to immutable laws independent of us; we are

* Prof. N. F. Mott, F. R. S., Broadcast in B. B. C. (April 1948); published in the 'Round Table,' by the University of Chicago.

watching the process as the audience watches a play in a theatre." Of these scientists, some subscribe to the view similar to the Advaitic that, "there is no objectively existing external world, no sharp distinction between the subject and object," and following on Henri Poincare, some among them hold that, "all human concepts are free inventions of the mind and conventions of various minds; they are justifiable only by their usefulness in ordinary experiences."

The Ancient Indian Concepts—the Arambha Vada and Parinama Vada

It was stated elsewhere that Ayurveda has mostly relied on the Nyaya – Vaiseshika and Sankhya – Yoga systems of natural philosophy. These systems represent conclusions and generalisations - axiomatic truths - that occur in the form of sutras which are terse and aphoristic in style. It is seen from a close examination of these conclusions that their approach to the phenomenon of the universe is generally 'synoptic' or 'wholistic' in nature and they look at the 'part' in terms of the 'whole,' or, in the context of the whole. In other words, the idea that the whole permeates its parts becomes emphasised.

It is perhaps necessary for us in this connection to familiarise ourselves with the ancient views on the manifestation of the universe viz., the Arambha Vada and Parinama Vada. The former concept posits that the order of creation was primarily in the nature of creation first of the paramanus or atoms of Vayu, Thejas, Ap and Prithvi, and the things in the universe arise by the putting together of two or more atoms of these elemental substances. This school of thought is represented by the Vaiseshikas who believed in a manifold of ultimate 'Reals' whose atoms combine variously to form the things of the universe.

The latter, the Parinama Vada, postulates that all things including what are spoken of as 'Reals' arise out of an evolutionary transformation within the primary ground^{*} substance. This view provides for a quantitative permanence and transformation; in fact it relates the latter to the former and is represented by the Sankhya system.

These two schools, it will be seen, seek to explain the same phenomenon in two ways. The former reduces all physical phenomena to an irreducible final state designated as the 'Tatwas' or 'Reals,' which by combining and recombining form the phenomenal universe and every thing included in it. The position taken by them will become intelligible to all who are acquainted with the stand taken by physicists some 50 years ago, with this difference that the 92 chemical atoms represented to them the ultimate 'Reals' or 'Tatwas,' which by combining variously, were stated to have resulted in all the things that make the universe.

The latter school of thought, on the other hand, has taken a position similar to that of the more advanced physicists of to-day, that, in the ultimate analysis, the matter that constitutes the physical universe is, (i) component of patterns,* (ii) it interprets pattern, tendency and transformation, (iii) it has stated the laws governing the development and transformation of patterns, and (iv) also the law or principle which unites permanence to change. Stated in brief, the Parinama Vada, representing the Sankhya school of natural philosophy have, while noting the existence of what the Vaiseshikas designate as the 'Reals' or 'Tatwas', held that the so-called 'Reals' are nothing, if not, stages in the evolutionary transformation of the one permanent substance. They laid down the law

* Parinamakrama Niyama

that governs the development and transformation of patterns and enunciated the principle which unites change to permanence. The first substance out of which the multiplicity of heterogeneous substances in their infinite diversity have evolved by evolutionary transformation, was designated by the term 'Mula Prakriti' or the Root or Primordial matter.

This system which occupies a pre-eminent position in the history of philosophical thought in India has given an explanation of our experience; has presented a comprehensive picture of the process of cosmic evolution, viewed not merely as a pure metaphysical speculation but as a positive principle based on the conservation, transformation and dissipation of energy.

The Subject and the Object

The science of Ayurveda is primarily concerned with life, life process and living states. Its approach to all phenomena is with reference to and from the point of view of living beings. In his approach to his environment, the subject employs the instrumentality of his mind, and senses which are five in number. The former is known as the Anthahkarana or the inner instrument, and the latter as Indriyas, the external instruments through which the former, under ordinary circumstances, views the universe. It is the samyoga or correlation of the mind with the objects of its interest through the senses that completes the process of perception. This view, which is an ancient one has endured the test of time and is being restated to-day by modern science. Says P. Ouspensky, the leading mathematician philosopher of Russia, "Cognition of space and time (it may be noted here that Kala and Dik or time and space, are considered as Dravyas or substances by the Vaiseshikas), arise in our intellect, during its touch with

external world by means of the organs of sense and do not exist in the external world apart from our contact with it.”

This would bring us to the consideration of Charaka's conception of; (a) Phenomenon and Noumenon; (b) Universe and the Man; (c) Life or Ayus; (d) the Tripod that constitutes Man; (e) the Subject or Purusha; (f) Mind or Manas—its structure and function; (g) Objects of the senses; (h) the correlation of the Subject with the Object, and (i) the limitations of sense-perception.

(a) **Phenomenon or Vyakta:** “Whatever is perceptible being apprehensible by the senses is the manifest or Vyakta.” *

व्यक्तमैन्द्रियकम् चैव गृह्यते तद्यदिन्द्रियैः ।

Noumenon or Avyakta: “What is perceptible and yet is beyond the senses and can be known only by inference—the unmanifest—is Avyakta.” †

अतोऽन्यत् पुनरव्यक्तम् लिङ्गप्राह्यमतीन्द्रियम् ॥

Charaka; Sarira, 1; 62.

(b) **The Universe and the Man:** “Man is the epitome of the universe. There is in him as much diversity as in the universe outside him and there is in the universe as much diversity as in man.”

‘पुरुषोऽयं लोकसंमितः इत्युवाच भगवान् पुनर्वसुरात्रेयः । यावन्तो हि लोके (मूर्तिमन्तो) भावविशेषास्तावन्तः पुरुषेयावन्तः पुरुषेतावन्तो लोके ।’

Ibid 5; 3.

(c) **Life or Ayus:** “The life is spoken of by such synonyms as the union of body, the senses, the mind and

*The form through which it (the things) become known to the senses is phenomenon i.e. Vyakta.

† The unknown and unknowable substance or thing as it is in itself i.e. Avyakata.

spirit; the support, animation, the flux, and the link (between the past and the future).”

शरीरेन्द्रियसत्त्वात्मसंयोगो धारिजीवितम् ।

नित्यगश्चानुबन्धश्च पर्यायैरायुरुच्यते ॥

Charaka, Sutra 1 ; 42.

(d) **The Tripod that constitutes Man:** “The Mind, the Atma and the Body together as it were, are the Tripod; the universe endures by reason of cohesion and all things are established therein.”

सत्त्वमात्मा शरीरं च त्रयमेतत् त्रिदण्डवत् ।

लोकस्तिष्ठति संयोगात्तत्र सर्वम् प्रतिष्ठितम् ॥

Ibid, 46.

(e) “The Subject or Man is stated to be the sum of six elements *viz.*, the Akasa and the four elemental substances, the sixth being the element of consciousness. Some hold that the element of consciousness alone constitutes Man.”

* Again as a consequence of the elemental modifications man is said to be composed of twenty-four elements *viz.*, the mind, the ten organs (the five Jnana or cognitive and five conative).”

खादयश्चेतनाषष्ठा धातवः पुरुषः स्मृतः ।

चेतना धातुरप्येकः स्मृतः पुरुषसंज्ञकः ॥

पुनश्च धातु भेदेन चतुर्विंशतिकः स्मृतः ।

मनोदशेन्द्रियाण्यर्थाः प्रकृतिश्चाष्टधातुर्का ॥

Charaka Sari ; 1 ; 16-17.

(f) **Manas or Mind :** “The presence of cognition as well as the absence of cognition constitutes the indication of mind. Thus, if Atma (Spirit), the senses and the sense-objects are opposite and the mind is elsewhere, there is no cognition. But with the mind present, there is cognition,

The mind is stated to have two properties - atomic dimension and an indivisible unity."

लक्षणमनसो ज्ञानस्याभावो भाव एव च ।
सतिह्यात्मेन्द्रियार्थानां सन्निकर्षे न वर्तते ॥
वैवृत्यान्मनसो ज्ञानम् साञ्जिध्यात्तच्च वर्तते ।
अणुत्वमथ चैकत्वं द्वौ गुणौ मनसः स्मृतौ ॥

Charaka Sari 1: 18-19.

The functions of the Mind: "The functions of the Mind are the direction of the senses, control of itself, reasoning and deliberation. Beyond this is the field of the intellect."

इन्द्रियाभिग्रहः कर्म मनसः स्वस्य निग्रहः ।
ऊहो विचारश्च ततः परं बुद्धिः प्रवर्तते ॥

Ibid 21.

(g) **The Artha or objects of the senses:** "Whatever admits of being thought about, considered, speculated, meditated upon, imagined, in fact whatever can be known by the mind, all goes by the name objects."

चिन्त्यं विचार्यमूह्यं च ध्येयं संकल्प्यमेवच ।
यत्किञ्चिन्मनसो ज्ञेयं तत् सर्वं ह्यार्यसंज्ञकम् ॥

Ibid 22-23.

(h) **Methods of correlation of the Subject with the Object:** "The sense object is cognised by the sense which is in contact with the mind. Thereafter, the object is interpreted or understood by the mind with reference to its merits and demerits. Guided by whatever conclusive judgment thus formed regarding the matter in hand, one endeavours to speak or act, fully aware of the nature of one's action."

इन्द्रियेणन्द्रियार्थो हि समनस्केन गृह्यते ।
कल्प्यते मनसातूर्ध्वं गुणतो दोषतोऽथवा ॥
जायते विषये तत्र या बुद्धिः निश्चयात्मिका ।
व्यवस्यति तया वत्कृतुं कर्तुं वा बुद्धिपूर्वकम् ॥

Ibid 22-23.

The visible & the invisible: (i) "The visible is limited, while there exists a vast unlimited world of which we are made aware by the evidence of authoritative Agamas, inference and reason. In fact, even the very senses by whose agency direct observations are obtained are themselves outside the range of observation."

प्रत्यक्षं ह्यल्पं; अनल्पमप्रत्यक्षमस्ति, यदागमानुमानयुक्तिभिरुपलभ्यते; यैरेव तावदिन्द्रियैः प्रत्यक्षमुपलभ्यते, तान्येव सन्ति चाप्रत्यक्षाणि ॥

Charaka Sutra, 11; 7.

The limitation of perception: "Further, even a perceivable object escapes observation under the following conditions:—

When it is either too close or too distant from the observer; when it is obstructed by other objects; when there is some defect in the perceiving sense-organ, when the observer's attention is focussed elsewhere; when the object is merged in the mass; when it is overshadowed by some thing else or lastly when it is microscopic."

सतां च रूपाणामतिसन्निकर्षादतिविप्रकर्षादावरेणात् करणदौर्बल्यान्मनोनवस्थानात्, समान अभिहारादभिभावादतिसौक्ष्म्याच्च प्रत्यक्षानुपलब्धिः ।

Ibid 11; 8-1.

In the context of the more recent trends in physical, biological and psychological sciences, the views of Charaka extracted above assume considerable importance. In certain aspects, the former appears to generally confirm the latter, particularly where it seeks to relate the object to the subject to complete the process of perception and the role of the mind in the fruition of this process. The fact that the physical world is the world of the senses, the sense data are the foundations of physics: and so the physical world is the world reported to the human mind by the senses and inferred from the data contacted by the senses,

and, the fact that beyond these lie an invisible and imperceptible state of things which cannot be contacted by the mind through the senses has been affirmed. The following points have also likewise been affirmed:

(1) The five senses are so constructed as to enable them to function within fixed and well defined ranges. This would apply to our perception of light which is the object of the eyes, as to sound which is the object of the ear and the same applies to smell, taste and touch also.

(2) Ranges above and below to what are normal to these sense-organs are beyond the purview of sense-perception or cognition. Even the employment of external-aids to extend the range of the senses—both ways—does not take us very far.

(3) Senses, either by themselves or supplemented with external aids can, at best, connect the Object to the Subject and they are not the interpreters of the objective phenomena.

(4) It is the mind, in the final analysis, which has to work on the data presented to it by the senses, and from out of them reconstruct the phenomenon.

(5) The phenomenon thus reconstructed cannot but be incomplete and defective.

(6) The nervous system in its different aspects through which the mind operates is designated as the "near-mind."

(7) The mind itself, according to modern psychology, is of an imponderable structure. In the view of one school of psychologists, it is compared to an ice-berg with 6/7 of it submerged in the unconscious, and the remaining 1/7 functioning as the conscious part. The 1/7 part of the mind corresponds to the conscious. It functions actively in wakeful states, when it operates through the senses and contacts the environment. Its relations to such contacts

are governed by the laws of Time and Space. As such, the knowledge gained by the mind under such conditions cannot but be limited.

(8) It has been noted by modern workers that the mind frees itself from its association with the senses in certain special states, when it is stated to be above considerations of time and space. According to the psycho-analyst Dr. Godwin Baynes, "The unconscious is merely a term which comprises every thing which exists, that has existed or that could exist beyond the range of this individual consciousness."* Another modern authority, William James, referring to an examination he had made of nitrous-oxide intoxication says, "one conclusion was forced upon my mind (at that time) and my impression of its truth has ever since remained unshaken. It is that our normal waking consciousness, rational consciousness as we call it, is but one special type of consciousness, whilst all about it, parted by it by flimsiest of screens, there lie potential forms of consciousness entirely different. We may go through life without suspecting their existence; but, apply the requisite stimulus, and at a touch, they are there, in all their completeness, definite types of mentality which probably somewhere have their field of application. No account of the universe in its totality can be final which leaves the other forms of consciousness quite disregarded; yet, I repeat once more, the existence of mystical states absolutely overthrows the pretension of non-mystical states to be the sole and ultimate dictators of what we may believe." †

Yoga

Further progress made in psychology and in particular, experimental psychology, abnormal psychology and para -

* Quoted by G.N.M. Tyrell in his work "The Personality of Man" p. 29, from the Journal of the Society of Psychical Research., Vol. XXX, p 68.

† Ibid.

psychology during recent years due to the labours of Freud, Jung, Adler, McDougall, Tyrell and latterly Rhine and others, have yielded a harvest of new and more facts, so far not known, or if known, not recognised in the West. The sum-total of their contributions is the growing recognition of the fact that, "There is a faculty in man, which when sternly disciplined and assiduously trained is capable of apprehending knowledge directly and not through the special senses and the working of the intellect. The West has no name for this instrument of direct cognition and to make matters worse, many recent writers have applied to a faculty which functions only in a state of heightened consciousness, the utterly misleading term "the sub-conscious." So observes Dr. Kenneth Walker in his famous book 'Meaning and Purpose.' He further notes that "In Sanskrit there are many words with which to describe both the instrument and the psychic experience associated with its functioning. Amongst those terms which describe this instrument of direct cognition is the term "bodh" from the root "bodhi" meaning "awakening," thus rightly implying that it functions only in states of heightened awareness. It is therefore, very different from that submerged area in our being which becomes active in our sleep, and is the creator of our dreams, the Sub-conscious." Furze Morrish in his well known work "Outlines of Metaphysics" discussing the state of heightened consciousness observes that, "The technique of applying these laws of mind is called Yoga and the famous Yoga school of Samkhya order is that of Patanjali. The Yogasutras (rules) of Patanjali are well known. They are an exposition of an exact science of Mind and do not comprise religious or any other sort of canons which demand veneration or obedience from formal necessity. The goal of Yoga is to reach a state of intense concentration and detachment from material surroundings

in which Purusha alone is experienced. This produces a state of bliss in glimpsing that which is eternal.”

In Charaka's words the phenomenon of Yoga is described as follows:—

“The apparatus of sensation is the mind and the body together with the sense-organs, with the exception of hair of the head and the body, the tips of the nails, the indigested food, faeces, excretory fluids and sense-objects.”

वेदानामधिष्ठानं मनो देहश्च सेन्द्रियः ।

केशलोमनखाप्रन्तमलद्रवगुणैर्विना ॥

Charaka Sarira; 136.

“Both in Yoga and final liberation, there is no existence of sensation; in final liberation there is absolute cessation, while Yoga leads to that liberation.”

योगे मोक्षे च सर्वासां वेदानामवर्तनम् ।

मोक्षे निवृत्तिर्निःशेषा योगोमोक्षप्रवर्तकः ॥

Ibid 137.

“From the contact of the self, the senses, the mind and the sense objects arise pleasure and pain; these two cease to be, as the result of inaction of the mind which is firmly fixed in the Self. Then while embodied, it acquires the psychic powers; and such a state, the Rishis who are conversant with Yoga know to be Yoga.”

“The entry into other bodies, telepathy, the doing things according to one's will, clairvoyance, clairaudience omniscience, effulgence, vanishing from sight at will – these eight are said to be the sovereign powers of the Yogis. All these accrue from the concentration of the pure mind.”*

* The well known thinker and writer, Aldous Huxley in his work “Ends and Means” describes the phenomenon of Yoga as follows

“The Indian ascetics train their body systematically until they are able to exercise conscious control over physiological processes that are normally carried

आत्मेन्द्रियमनोर्थानाम् सन्निकर्षात्प्रवर्तते ।
 सुखदुःखं मनारम्भादात्मस्थे मनसि स्थिरे ॥
 निवर्तते तदुभयम् वशित्वम् चोपजायते ।
 सशरीरस्य योगज्ञास्तं योगमृषयोविदुः ॥
 आवेशश्चेतसोज्ञानमर्थानाम् छन्दतः क्रिया ।
 दृष्टिः श्रोत्रं स्मृतिः कान्तिरिष्टतचाप्यदर्शनम् ॥
 इत्यष्टविधमाख्यातं योगिनां बलमैश्वरम् ।
 शुद्धं सत्वसमाधानात्, तत्सर्वमुपजायते ॥

Ibid 13 ; 139.

Summing up what has been stated above, it will be seen that apart from the fact that the mind possesses dual properties viz., (i) it functions through the five senses under normal circumstances of life and the scope of such operations being limited by Time and Space factors; and (ii) when freed from the senses in special states cultivated by stern discipline and assiduous practice, it transcends all limitations and is able to perceive the true nature of things which are stated to be 'revelations.' It may incidentally be noted here that the basic concepts of Ayurveda, the Doctrine of Panchabhutas, are claimed to be the outcome of such revelations.

The Concrete and the Abstract

The universe and all it contains—comprising of the living and the non-living – which can be cognised with the

out unconsciously. In many cases, they go on to produce unusual mental states by the systematic and profound modifications of certain bodily functions such as respiration. There are good evidences to show that such practices may produce very valuable results. It is possible for a man who employs the methods of Yoga to achieve a high degree of non-attachment to things of this world and at the same time to heighten his consciousness, that he can attach himself more completely than the normal man to that which is greater than himself, the integrating principle of all beings."

aid of our senses is the concrete.* It is the opposite of abstract, which means "to draw away;" "to separate" "a notion," "considered or thought of;" and "treated apart from any particular object". Colour for example, is an abstract notion. In other words, the phenomenal world perceivable by the senses and conceivable by the mind which impresses us as possessing form, mass, occupying a measurable space, undergoing changes as could be judged in terms of time, is the concrete. For that matter, Time and Space are considered to be abstractions of the mind even though, as far as our experience goes, they are felt as 'Reals.' On the other hand, a tree, an elephant, a hill, the cloud, gold, diamond, man etc., are concrete. A flower, for example, is a mass formed by parts, growing and changing. Growth is a change in Space and Time. Its colour, smell, and taste experienced by the subject or the person who sees-hears, touches, smells and tastes it, are the abstracts, (i. e.) notions in the mind of the person who experiences them. If this person is asked to describe the particular colour, smell and taste of the flower, he will often find it extremely difficult to state what they are in exact terms. We may, however, assume for our purpose, that the concrete and the abstract are both 'Reals,' the former demonstrable and the latter experienced and understood. They do not possess mass and the rest. According to the ancient Indian doctrines, both the abstract and the concrete of the universe are Padarthas. The term Padartha means an object which can be thought of or 'Artha,' and named, or 'Pada.' In other words, the term Padartha comprehends all things which exist, can be cognised and named. In short, all objects of experience and not merely the things of the

* The dictionary meaning of this term is "grow together" "increase formed by the union of separate particles." "An object that exists in nature;" "formed into a mass denoting a particular thing," "a mass formed by parts growing or sticking together."

physical world (i. e., the world of matter) are Padarthas. This term world, therefore, apply to the concrete as to the abstract.

We have already noted that the modern Western physical and biological sciences have been mainly concerned with the investigation of the concrete with their tools. Their methods of investigation are essentially analytical. Thus, the phenomenal universe has been classified into two groups *viz.*, the inorganic representing the non-living systems and the organic representing the living systems or things which arise out of them. The former includes solids, liquids and gases and the latter comprises of substances which are associated with the play of life, or arise in consequence of the association of matter with life. All forms of matter, whether the living or non-living, have been shown to be composed of basic or fundamental units of matter known as atoms, and each atom in its turn has been shown to be composed of still smaller units of matter known as elementary particles charged variously with electricity. The living matter or protoplasm is itself composed of about 14 such non-living atoms. It is from the combination and recombination of the atoms of chemical elements that concrete substances or Padarthas arise. The atoms and the elementary particles are *adrisya*, in view of their extreme subtlety. They are beyond the purview of the senses. They apparently possess mass and motion and are susceptible to change or transformation. The state of matter beyond the elementary particles is a subject of speculation or in other words, abstractions of the mind. These conclusions are reached by a process comparable to the climbing of a ladder, rung by rung, the first rung below representing the concrete and the top-rung representing the abstract. The ancient Indian way of approach represents the descent from the top-most rung *i. e.* the abstract, to the lower rungs representing the concrete. The modern Western way is an ascent from

the lower to the top-rung (i. e.) from the concrete to the abstract. In this process, the two approaches to the problem have, for all intents and purposes, met at the level of the elementary atomic particles.

The Vaiseshika System

The term 'Vaiseshika' is derived from the root 'Visish,' meaning 'distinct,' 'particular,' and 'pre-eminent.' The term 'Visesha' means 'the difference between,' 'characteristic difference,' 'special property.' The Nyaya Vaiseshika school of natural philosophy owes its origin to the great atomist of India, Kanada, and Gowthama, who stated that the root cause of the universe is the atoms. To them as to modern physical science, the paramanus are the ultimate basic entities of matter and these combine variously. In this process, they acquire new qualities. Myriads of new things emerge out of their combinations. Life results, in this view, when these paramanus or atoms and the atom of mind combine or unite.

Vaiseshikas adopt two methods of proof or Pramanas in the determination of truth viz., (i) Prathyaksha or observation, and (ii) Anumana or inference. According to them, Padarthas or things are of six kinds.

1. Dravya or thing or substance,
2. Guna or predicament,
3. Karma or action,
4. Samanya or community or genus,
5. Visesha or special property or particularity,
6. Samavaya or co-inherence or intimate connection of constituent parts.

The above are designated as Bhava Padarthas. Later Vaiseshikas have included Abhava or non-existence as the seventh Padartha.

Dravya †

This category comprises of nine Padarthas viz.,

- (a) Prithvi
- (b) Ap.
- (c) Thejas.
- (d) Vayu.
- (e) Akasa.
- (f) Kala.
- (g) Dik.
- (h) Atma.
- (i) Manas.

Of these, Prithvi, Ap, Thejas, Vayu and Manas are atomics and Akasa, Dik^{kaala} and Atma are vibhu or all-pervasive and omnipresent.

The Vaiseshikas describe Anu or atom as spherical or parimandalya (परिमाण्डल्य), a mere point without dimensions or extremely subtle (i.e.) minute and invisible, incapable of division and eternal in themselves (but not so in aggregate forms).^{*} They are stated to possess specific and characteristic individuality of their own, each differing from others of the category in many respects. For example, Vaiseshikas

† Charaka describes Dravya as follows :

“ The five primary substances viz., Akasa and others, together with Atma mind, time and space constitute the totality of substance. Possessed of the senses, a substance is animate; devoid of the senses, it is inanimate. ”

खादीनात्मा मनः कालो दिशश्चद्रव्य संग्रहः ।

सेन्द्रियं चेतनं द्रव्यं निरीन्द्रियमचेतनम् ॥

Ch. Sutra, 1: 48.

* “The elementary character of the particles” says prof. Carl D. Anderson “is rather uncertain, for, according to modern physical theories, particles may exist in ‘ Virtual ’ states in which they may have observable effects while not existing actually as independent observable particles.” He quotes Dr. Oppenheimer as saying in this connection that “ An elementary particle is one that is so simple that one has no understanding of it whatsoever.” (Current Science, No. 11, November 1951, P. 289).

describe the phenomenon of light as the aggregation of radiant or luminous atoms or atoms which travel at an inconceivable speed.† In the same manner, the aggregates of other paramanus yield substances possessing different other qualities and properties.

† The Andhra Poet Srinathakavi Sarvabhowma, a contemporary of Vijayanagar period has furnished a formula of the speed of light which works out to 185,300 miles per second, as against 186,300 miles of modern physics. The Sarvabhowma says:

योजनानां सहस्रेद्वेदशते द्वेचयोजने ।
एकेन निमिषार्धेन क्रममाणनमोस्तुते ॥

The following is the reckoning of the above in terms of a second, as calculated by Dr. L. Sibaiya, D.Sc., Professor of Physics, University of Mysore :

$$1 \text{ Yojana} = 9 \text{ miles and } 160 \text{ yards} = 9 \frac{160}{1760} = 9 \frac{1}{11} = \frac{100}{11} \text{ miles}$$

$$\therefore 2202 \text{ Yojanas} = 2202 \times \frac{100}{11} \text{ miles.}$$

$$\text{Paramanu Kala} = \frac{1}{75000} \text{ second}$$

$$2 \text{ Paramanus} = 1 \text{ Ana} = \frac{1}{37500} \text{ second}$$

$$3 \text{ Anus} = 1 \text{ Trasarenu} = \frac{1}{12500} \text{ second}$$

$$100 \text{ Trutis} = 1 \text{ Vedha} = \frac{3}{125} \text{ second}$$

$$3 \text{ Vedhas} = 1 \text{ Lava} = \frac{9}{125} \text{ second}$$

$$3 \text{ Lavas} = 1 \text{ Nimesha} = \frac{27}{125} \text{ second}$$

$$\frac{1}{2} \text{ Nimesha} = 1/2 \times \frac{27}{125} = \frac{27}{250} \text{ second}$$

∴ Light travels in $\frac{27}{250}$ second a distance of 220,200 miles. Hence the

$$\text{distance traversed in } 1 \text{ second} = \frac{220200 \times 250}{11 \times 27} = 185,300 \text{ miles.}$$

An interesting feature of the Vaiseshika doctrine is their view that the paramanus or atoms unite in twos - forming molecules known as 'Dwyanukas; in threes forming molecules of 'Thryanukas;' and in fours, forming molecules of 'Chaturanukas' and so forth. These combine and recombine until the state known as 'trasarenu' is reached. A 'trasarenu' stands for "the minimum visible or just discernible glancing particle in the slanting beams of the sun falling into a dark room through a chink or hole." The volume of a spherical 'trasarenu,' calculated from the standpoint of view of Varahamihira's table of measurement* works out to $\frac{4}{3} \times \pi \times 3^3 \times 2^{-63}$ of a cubic inch † corresponding to 2×10^{-16} c.c. The volume of a paramanu then works out to 0.33×10^{-17} c.c. The diameter of a spherical paramanu (according to the Sankhya Yoga System) is less than 3.2^{-20} of an inch. = 7.3×10^{-6} c. m. Its weight is estimated at approximately 1.1×10^{-6} gram.

* Varahamihira's table

8 Paramanus	..	1 Rajas (Or Ratharena)
8 Rajas	..	1 Valagra
8 Valagras	..	1 Liksha
8 Likshas	..	1 Yuka
8 Yukas	..	1 Yava
8 Yavas	..	1 Anoult
24 Angulis	..	1 Hasta (18")

परमाणु रजो बालाग्रलिङ्गा यूक यवोद्गुलं चैति ।

अष्ट गुणानि यथोत्तरं अद्गुलमेकं भवति संख्या ॥

(Varahamihira, Brihat Sambhita Ch. 57 ; 2)

† B. N. Seal, 'Mechanical, Physical and Chemical Theories of the Ancient Hindus (History of Hindu Chemistry by P. C. Ray) Vol. II, P. 166.

In the above calculations $\pi = \frac{22}{7}$ or 3.14159265; one inch = 2.549 cms

& 1 cubic inch = 16.39 C. Cm., & one micron = 10^{-4} cubic Cm.

According to Charaka 1/30th of a trasarenu is a paramanu

त्रसरेणुस्तु विज्ञेय त्रिंशता परमाणुभिः ।

The diameter of atom as computed by modern physics is of the order of 10^{-8} c m. The mass unit of a proton is estimated at 1.6×10^{-24} grammes. It will therefore become obvious that the Vaiseshikas had, with the methods then available to them, described matter upto a few micrograms, which for purposes of following and interpreting chemical reactions, was found to be sufficient enough, as is now evidenced in the micro-chemical reactions. It is significant to note that the density of the paramanu (3×10^{-11} grams per c.c.) is of the same order of magnitude as that of an electron or positron.

Another interesting feature of the Vaiseshika School of Natural Philosophy is their description of paramanus viz. by dividing and sub-dividing things, the stage is reached when further division is no longer possible. The 'matter' in this state is the paramanu. This has a striking resemblance to Boyle's definition of an atom viz., a substance which itself was not capable of further separation but which could be obtained from a compound. *

The Kanada school further posits that there is no other root cause of the universe than paramanus. In this view, which is known as the Arambhavada or the theory of commencement, the union or the combination of the elementary particles of paramanus results in the production of diverse forms of things. This conception does not, however, clarify the question, as to how and under what circumstances and conditions, the paramanus or atoms were set into motion and action in the beginning, and also how the successive stages or gradations of the evolution of life - plants, animal

* This definition has since been modified as follows :

" A substance which cannot be broken down into something simpler by the ordinary chemical methods." (Physical Chemistry A. S. Mee, p. 14.)

and man-came into existence, or how and under what circumstances living systems emerged out of the non-living

Guna

The nearest equivalents of Guna in English are 'quality' 'property,' 'attribute,' 'a mode,' 'predicament,' 'natural divisions of modes of things' etc.,. By the term 'thing' is meant Padartha. We have already tried to grasp the significance of the concept of Padartha as a thing that can be thought of or conceived and named. To be able to understand the implications of the term Guna, it is necessary to expand the idea of Padartha a little more.

An idea can be a thing. Ideas stand for things such as objects, beings etc. An idea is the intellectual representation of a thing. The same is also true of judgments. Judgments represent facts about things. Ideas and judgments express reality. When we say, the air is transparent, it is meant to convey the fact behind the idea that transparency is a physical quality, which in reality belongs to the physical substance air as it exists in nature independent of the ideas and judgments of our mind. It will thus be seen that ideas and judgments express things and facts about things or Padarthas. *

* The place of the hypothetical undulatory ether in modern physics to explain the wave mechanics will illustrate the conception of Padartha. In the words of Sir James Jeans :

" Modern physics is pushing the whole universe into one or more ethers. It will be well then, to scrutinise the physical properties of these ethers, with some care since in them the true nature of the universe must be hidden.

It may be well to state our conclusion in advance. It is in brief, that the ethers and their undulations, the waves which form the universe, are in all probability fictitious. This is not to say that they have no existence at all; *they exist in our minds, or we should not be discussing them; and something must exist outside our minds to put this or any other concept into our minds. To this something we may temporarily assign the name "reality" and it is this reality which it is the object of science to study.* But we shall find that this reality is something

Reverting to the consideration of Gunas, we saw in the example of air cited above that transparency represents one of the physical properties of the substance air. In this sense, it can be described in one of the following ways :

Transparency is the quality of air ;

Do the property of air ;

Do a mode of air ;

Do a predicament of air.

Among the above, numbers three and four recommend themselves as the nearest approach to the term Guna. The atomic concept of matter posited by the Vaiseshikas, has in a fundamental sense much in common with certain aspects of modern physical science. Both the Vaiseshikas and modern physicists consider that the universe of bodies consists ultimately of atoms - paramanus, In the view of the former, positively charged, negatively charged and neutral particles, as well as photons in the view of the latter, are indivisible, and the diversity of things in the universe originate by a mere arrangement and configuration of these ultimate particles. Substantial change is an illusion and a mere abstraction. Whatever happens is the result of mechanical motion giving rise to nothing more than a shift of local relationships of quantitative character - among masses, trasarenu, etc., according to the Vaiseshikas, and molecules, atoms, electrons, protons neutrons, etc., according to modern physicists. The ultimate particles are homogeneous in nature, that is to say, they are alike in each group in essence, so that

very different from what the scientists of fifty years ago meant by ether, undulations and waves, so much so that judged by his standards and speaking his language for the moment, the ethers and their movement are not realities at all. And yet they are the most real things of which we have any knowledge or experiance and so are as real as anything possible can be for us." (Sir James Jeans, *The Mysterious Universe*, pp. 70-71).

they differ only in size, shape and charges. Hence, everything in the universe can be explained by means of quantitative structure and spatial motion. Knowledge in this regard will be complete only when these can be expressed in mathematical formulae of quantitative measurement.* Therefore, there is no place for 'quality' in such a materialistic and mechanistic conception of the universe or things contained in it; matter in motion is the sum-total of all objects and events. Thus, what the common people term as quality is reducible to 'quantity.' As such, the term quality and property, have to be replaced by other terms, which at any rate, are free from such defects or terminological inexactitudes.

The Guna and Predicament

Predicament is the supreme and ultimate genera or class of predicates (it does not in the technical sense mean anything like a perplexing or an embarrassing situation). The significance and implications of this term can be illustrated by the example of "Man is a rational animal." In this instance, "rational animal" is the predicate of the subject man, and it represents an idea or judgment of the examining mind, relating to a fact associated inseparably with the 'thing' man, differentiating him from other animals. In the same manner, the term transparency in respect of air is the predicate which describes an unchanging fact connected with the subject air. The 'mode' again,

* "The intensity of Sound is a physical quantity which is measurable to a considerable degree of accuracy, and its physiological counterpart is loudness, which is capable only of relatively rough measurement. It must be noted however, that sound intensity corresponding to the threshold of hearing is very different from sounds of different frequency, being considerably greater, for very high and very low notes than notes of medium frequency, and therefore, a sound-energy meter, cannot in all cases, be used to measure loudness." (Clark, *Mathematical and Physical Tables*, p. 43).

represents the same ideas (i. e.) a mode of air is transparency. The term Guna represents an inseparable Predicament of a thing. So then, the nearest equivalent to Guna is predicament, which will be used in this context.

Of the Bhava Padarthas, the Paramanus of Prithvi and the following four have each one, the undermentioned Gunas as well as an organ of sense.

Akasa (Vibhu)	Sabda or Sound	Ear
Vayu (Anu)	Sparsa and Sabda	Skin
Thejas ..	Rupa, Sparsa and Sabda	Eyes
Apa ..	Rasa, Rupa, Sparsa and Sabda	Tongue
Prithvi ..	Gandha, Rasa, Rupa, Sparsa and Sabda	Nose

The following are the 24 Gunas described by the Vaiseshikas. *

1. Rupa .. Light, form, colour (Visual perception)
2. Rasa .. Savour, Gustation (Taste perception)
3. Gandha .. Odour or smell (olfaction.)
4. Sparsa .. Sensation of touch, (General sensibility).
5. Sankhya .. Number or enumeration
6. Parimana .. Dimension
7. Prithakthwa .. Severality, differentiation, bheda

* "The sense objects, the qualities such as Guru etc., Buddhi in the list ending with Prayatna and (the modes of understanding described as) Paradaya are spoken of as Gunas."

सार्था गुर्वादयो बुद्धिः ।

प्रयत्नान्ताः परादयः गुणाः प्रोक्ताः ॥

8. **Samyoga** .. Conjunction or combination (which can be seperated) or integration
9. **Vibhaga** .. Disjunction or seperation or disintegration
10. **Parāthwa** .. A relative creiterion of comparison with reference to time, and space, e. g., remoteness- or priority or anteriority
11. **Aparathwa** .. Do, but the opposite of parathwa, proximity or posteriority
12. **Guruthwa** .. Heaviness (gravitation)
13. **Dravathwa** .. Fluidity
14. **Sneha** .. Viscosity (oiliness)
15. **Sabda** .. Sound (audition)
16. **Buddhi** .. Gnana, understanding or knowledge
17. **Sukha** .. Pleasure
18. **Dukha** † .. Pain or misery
19. **Ichcha** .. Desire (attraction)
20. **Dweshā** .. Aversion, dislike or repulsion
21. **Prayatna** ‡ .. Action, effort, volition
22. **Dharma** .. Merit, virtue, support, duty and law
23. **Adharma** .. The opposite of No. 22

† **Dukha** or pain or misery, according to Sankhyasika arises out of the seperation of mind from what is liked and union with what is not liked.

मानसं प्रियवियोगाप्रियसंयोगादि-

‡ Behaviour such as effort etc., is said to be action. (Charaka)

प्रसन्नादि कर्म चेष्टित मुच्यते ।

24. Samskara .. Restitution including motion, elasticity, memory and self-reproduction; (retention; endurance; reiteration)

It may be noted here that according to Vaiseshikas, light and heat are different forms of the same substance. In this description may perhaps be included electricity and magnetism. Akasa, in this view, is an uncompounded substance, infinite and eternal in nature. It is posited only as the substrate of sound, the vibrations of which is stated to travel wave-like *Parispanda** in the manifesting medium – the *Vayu*. In fact, it is the substrate of not only *Sabda*, but also *sparsa*, *rupa*, *rasa* and *gandha*.

Manas

It was already seen that *Manas* or mind was described as atomic in its dimension and, therefore, capable of receiving

* It is interesting to note that the *Nyaya Vaiseshikas* recognised that all action of matter can be resolved into motion. Except *Akasa* which is non-atomic and incapable of any change or activity (*Nishkriya*), all *paramanus* from those of *Vayu* onwards are stated to be in incessant motion of an infinitude of continually whirling or vibratory particles.

अनवरत परिस्पन्दमाना परिमित पवनादि परमाणवः ।

परमाणवः हि गतिशीलत्वात् पतत्रव्यपदेशाः पतन्तीति ॥

Udayana Kusumajali, (*Stavaka V*) quoted by B. N. Seal in his *Mechanical, Physical and Chemical Theories of the Ancient Hindus*. The effect and by the same token the action of material events are held to be the resultant of the combined motions of the various causes involved. A ray of light connotes the rectilinear propagation of extremely minute particles in all directions with inconceivable velocity.

अचिन्त्यो हि वेगातिशयः तेजः ।

प्रसर्पत् व्याप्नोति पृथ्वग्रत्वात् ॥

(*Udyotakara*, *Vachaspati*, quoted by B. N. Seal). The sound waves in and through the vehicle of air waves are stated to travel by concentric circles in many planes (Vide., *The History of Hindu Chemistry* by P. C. Ray, Vol. II, pp. 218-20).

only one sensation at a time and transmit the same to the Atman. It is stated to be eternal and distinct from both the body and the Atman with which it is intimately associated.† This topic will be pursued again at a later stage.

Guruthva

Guruthva means the mode of being heavy. This term is interpreted by Colebrook as gravity which "is the peculiar cause of primary descent or falling." In the view of Udayanacharya, gravity is imperceptible and can be inferred from the act of falling. Vallabhacharya thinks that it is perceived in the position of a thing descending to a lower situation. This mode is specially inherent in Prithvi and Ap.

Laguthva

Laguthva or levity is the negation of Guruthva.

Kala

"Kala or Time, is the measure of change" says Charaka "कालः पुनः परिणामः".* It is the relative dating of events and the interval that arises between two events in a

† Charaka observes, "The mind which is super-sensual is designated as 'Satva' and some call it 'Chetah' (consciousness). Its function is dependent on the presence of the mental object and the Atma. It is the cause of the activity of the sense-organs."

अतीन्द्रियं पुनर्मनः सत्त्वसंज्ञकं
 'चेतः' इत्याहुरेके तदर्थात्म
 संपादयत्त चेष्टं चेष्टा प्रत्यय
 भूतमिन्द्रियाणाम् ।

Charaka, Sutra 8, 4.

"On account of the multiplicity of mental objects, sense objects and impulses, as also of the combinations of the qualities of Rajas, Tamas and Satwa the mind appears as multifaceted in one and the same person. There is no multiplicity of minds, because a single mind cannot have contact with many sense-objects simultaneously. Hence all sense objects do not function at one and the same time."

* Charaka, Vimana, 8, 76.

causal series. Ordinarily Kala or Time is reckoned with reference to the sun, and the time relationship that exists between the sun and the earth. It is described in terms of Bhuta (i.e.) the past or priority, and Bhavishyat (i.e.) subsequence. From a technical point of view, which is important, Kala or Time is the unit of measurement of physical and chemical reactions and changes, or better still, physico-chemical reactions that take place at micro, molecular and atomic levels. Stated in general terms, Vaiseshikas consider Kala or Time as Vibhu or non-atomic and a Dravya (i.e.) an entity by itself which possesses measurable qualities. However, as stated above, it has special reference to physical and chemical changes.

It is interesting to note in this connection that, extremely small fractions of time have been employed by both the ancient physicists and astronomers in their calculations. For example, the following Kalamana of the astronomers is significant:

30	Kshanas	..	1	Day
2	Ghatikas	..	1	Kshana
30	Kalās	..	1	Ghatika
30	Kāshtas	..	1	Kalā
18	Nimeshas	..	1	Kahshta, 30 Tatparas
1	Nimesha and 100 Trutis	-	1	Tatpara †

According to B. N. Seal, a truti of Time is equal to $\frac{1}{83750}$ of a second, which is nearly the measurement of the paramanu of Time.* The ancient physicists computed Time as per table mentioned below:

† Kalamanadhyaya, Bhaskara, Siddhanta-Siromani, quoted by B. N. Seal in his 'Mechanical, Physical and Chemical Theories of Ancient Hindus; 'History of Hindu Chemistry' Vol. P. 158.

* Ibid.

30	Muhurtas	..	1	Day (24 hours)
30	Kalās	..	1	Muhurta
30	Kāshtas	..	1	Kalā
18	Nimeshas	..	1	Kāshtha
2	Lavas	..	1	Nimesha
2	Kshanas	..	1	Lava †

“This makes 1 Kshana of Nyaya Vaiseshikas equal to 2/45 of a second. Nyaya considers that the unit of physical change or the time taken by a single antecedent step in a causal series (i. e.) prior to the oncoming step, is equal to a kshana (i. e.) 2/45 of a second.” *

The consideration of Kala or Time leads us on to a related topic *viz.*, the measurement of the duration of time involved in physical and chemical changes. It will be profitable to take note in this connection, of the Vaiseshika concept of atomic agglomeration or integration. It was seen earlier, that in the view of Vaiseshikas, the entire universe is constituted with paramanus or atoms. Basing on the view that “the properties that exist in the causative factor are present in the resultant factor, † – each Paramanu was stated to possess some special or specific properties – the things arising out of their combination, are held to develop the same properties (i. e.) specific to the respective paramanus. This view is supported by the analogy of waves in a lake. Waves occur in a big lake or tank due to the action of the wind. The water constituting the wave is not structurally different from the water at the

† Ibid “क्षणद्वयं लवः प्रोक्तौ निमेषस्तु लवद्वयम् ।

अष्टादश निमेषस्तु त्रिंशत्तु ताः कला ।

त्रिंशत्कला मुहूर्तः स्यात् त्रिंशद्वाल्याहणी च ते ” ॥

* Ibid P. 159.

‡ कारण गुण पूर्वक कार्य गुणो दृश्यते ।

bottom of the lake. In both cases (i.e.) the waves, and the water at the depths of the lake are alike composed of extremely small particles of water—the difference in the physical appearance between the former and the latter notwithstanding. It should be remembered in this connection that paramanus do not occur in nature in an uncombined state.

Peelupaka or Chemical Change

Peelu means paramanu or atoms, and paka means the transformation or change brought about in their relationship under the influence of heat and light. It is in this context that the reference made above and elsewhere to the fact that (i) the paramanus (atoms and molecules) do not occur in nature in an uncombined state, and (ii) they combine in twos, threes, fours, and so on, to form molecules of Dwayanukas, Thrayanukas, Chaturanukas etc., become significant. The Vaiseshikas note that paramanus always combine, separate and recombine under the influence of heat and light or Tejas, which is of two kinds viz., endothermic and exothermic. The observed difference between one substance and another, or in fact, between all substances in regard to their colour, consistency, roughness, smoothness, etc., is held to be due to what is known as Pakabheda or difference in chemical reactions. "It is heat and heat alone that can cause transformation in respect of colour, taste, smell or physical characteristics of paramanus. These depend on (a) the nature of the constituent substances in contact; (b) the intensity or degree of heat described in terms of Khara, Mrudu and Madhyapakas and, (c) the species of the Tejas corpuscles that impinge on paramanus or atoms (and molecules) and the nature of the impact (विलक्षणतेजः संयोगः)."^{*}

*न ब्रूमोऽत्रिसंयोगात् एकस्मात् रूपादयइति अपितु पूर्वरूपादि विशेषापेक्षात् । यद्द्रव्यं पच्यते अत्रि संयोगेन तस्य ये पूर्वरूपादयस्तेषां यः स्वगतो विशेषस्तमपेक्षमाणः अत्रिसंयोगः उत्तरान् रूपादीन् विशिष्टानारभते ।

Stated in brief, the Vaiseshika School holds that "there is decomposition into homogeneous atoms (paramanus) transformation of atomic qualities (qualities of paramanus) and finally their recombination, all under the influence of heat and light." †

The views expressed above are illustrated with the following example :

In the process of the baking of a raw clay pot by a potter,* quick succession of changes are observed to take place in the material of the pot, in respect of its colour, density, consistency etc., similar to changes that take place during the process of the cooking of food. The Vaiseshikas interpret and explain the successive phases of transformation and change, as due to the decomposition of the constituent molecules of the material of the pot into their component atoms (paramanus) and their subsequent recombination under altered spatial relationship, different from their original disposition in the material of the raw clay pot before the same was subjected to the action of heat. The entire process of change in the molecular and atomic alignment is stated to take place in three consecutive steps viz.,

- i. the decomposition of the material of the pot into its molecules, in the first stage ;
- ii. the decomposition of the molecules into their constituent paramanus, in the second stage ;

अस्माकमभेदेऽपि उपादानस्य पिठरस्य औष्ण्यापराख्यस्य च बन्धिसंयोगस्य पूर्वरूपादि प्रभ्यंसानां कारणानां भेदात् भिन्न जातीया जायन्त गन्धरूपरसस्पर्शा इति सिद्धान्तः । Vachaspati I. i, Sutra 4 quoted by B. N. Seal, ' Mechanical, Physical and Chemical Theories of Ancient Hindus ' — History of Hindu Chemistry ' by Sir P. C. Ray, Vol. II P. 194.

† Ibid

* Under the condition of temperature prevalent in the potter's kiln.

- iii. the recombination of the paramanus in new relationships and altered spatial alignments into molecules of two paramanus - Dwayanukas; into molecules of three paramanus - Thrayanukas, and into molecules of four paramanus - Chaturnukas, and so forth.

Thus, in the finished baked pot, the spatial relationship that originally existed between one paramanu and another in the material of the original unbaked clay pot is altered, and altogether new relationships are established, resulting in the exhibition of new properties in respect of colour, density, consistency etc. of the baked pot.

The process of transformations and changes referred to above, in terms of Kāla or Time, are stated to take place as follows:

It takes nine moments or Kshanas for the completion of the consummation of the change from the unbaked to baked state in the clay pot. In the first moment (Kshana), the Dvayanuka is destroyed. In the second moment (Kshana) the original black colour of the unbaked clay is destroyed. In the third moment (Kshana) a different colour - red - is generated due to the influence of heat and light. In the fourth moment (Kshana) the paramanus combine to form the new substance. In the fifth moment (Kshana), the paramanus separate themselves from their old status (*i.e.*) from their former place or the previous position. In the sixth moment (Kshana) they separate themselves again. In the seventh moment (Kshana) they combine with other paramanus. In the eighth moment (Kshana) they again align themselves as molecules of two paramanus (*i.e.*) Dwayanukas. In the ninth moment (Kshana), the specific or the characteristic properties of the paramanus, such as colour, etc., manifest in the constituent Dwayanukas of

the material of the now fully baked pot. Thus, in nine moments (Kshanas), the soft, dark, unbaked clay pot is transformed into the hard and red baked pot.

It will be seen from the foregoing that the Vaiseshikas held that, when a raw clay jar or pot is baked, the old jar or pot as the case may be is destroyed, involving *pari pasu* the decomposition of the several compounds of its *Dwayanukas*. The production of new red colour in the molecules themselves is stated to be brought about by thermal influence on the compounds formed by them eventually producing a new jar or pot, as the case may be. The rapidity with which the successive steps in the process of transformation has been envisaged to occur is stated to prevent the eye from detecting each consecutive individual step. The followers of purely the Nyaya School assert that, "the Tejas penetrates into the different compounds of two or more atoms (*paramanus*) and thereby changes, not the jar, but its colour etc. The jar is still the same jar; only it is red and not black."*

The conception of physical and chemical changes of Vaiseshikas *viz.*, the old theory of *Peelupaka* are suggestive of the following important facts of physical chemistry:

(1) The *Paramanus*, which as noted earlier correspond to matter described upto a few micrograms, and which for purposes of following and interpreting chemical reactions was found to be sufficient enough as now evidenced, are in a constant state of vibratory motion.

(2) The Vaiseshikas have resolved all physical action into motion – molar, molecular and subtle – of mass, molecules and atoms respectively. This motion is stated to be of the whirling or rotatory and circular, and also harmonic (e.g. vibration) in kind. This motion, as noted earlier, is

* Based on Nyaya Vaiseshika, Ayurveda Siksha - Philosophical Background, Chapter 2, section 1, Vol. II, pp. 16-17.

spoken of as 'parispanda.' All matter - atoms, molecules and aggregates of molecules - are always in a state of parispanda.

(3) The fact that paramanus do not in nature occur in an uncombined state having been posited, the problem of what is known to-day as pseudo-unimolecular reaction* does not arise and such a reaction is usually a rare phenomenon. The more common and frequent reaction as contemplated by the theory of Peelupaka, involving the association and dissociation of two, three and four molecules, should remind us of bimolecular † termolecular ‡ and still higher reactions of modern physical chemistry.

(4) Physico-chemical changes and transformations involve contact between and collision of atoms and molecules respectively, a fact which is implied in Peelupaka.

(5) Apart from the fact that associations and dissociations of paramanus or molecules in the consecutive steps of Peelupaka imply the utilisation and release of energy respectively, the fact that thermal influences take a leading part in accelerating or retarding the process of Paka or reactions will also emerge. The theory of Peelupaka implies the formation of Exothermic compounds and Endothermic compounds.

* Unimolecular reactions are those in which the reaction velocity is proportional to the first power of the concentration of the reacting substance. They are not so common and are rare and they do not represent homogenous reactions at all and they occur only in the gaseous phase.

† In bimolecular reactions, the concentration of two molecular species may vary or two molecules of the same species may disappear as a result of the reactions. This kind of reaction is most common.

‡ In Termolecular and reactions of higher order, the concentrations of three molecular species vary during the change or three molecules of the same species enter into the reaction. This kind of reaction is rare.

* Compounds which are formed with the evolution of heat are called the Exothermic compounds. These compounds are stable at ordinary tempera-

(6) Stated in terms of Kāla or Time, the successive steps of changes and transformations envisaged in Peelupaka instanced with the example of the baking of the clay pot, is stated to occupy one Kshana or $2/45$ of a second for each step.

Pitarapaka or Physical Change†

In contrast to the views held by the Vaiseshikas regarding chemical changes, the Nyaya School holds that the molecules and larger aggregates assume new characteristics under thermal influence without undergoing decomposition into homogenous atoms (paramanus) or the change of atomic characters. In other words, the Pitaras or molecules (the material of the clay pot which is stated to be composed of numerous Pitaras) undergo transformations and whatever change as may due to thermal influence in them results merely in a physical change of the molecules concerned. It does not in any case involve the atoms of the Pitaras. A Pitara is stated to consist of two or more atoms. The change in colour (i.e.) from black to red is stated to be really a change in the colour of the Pitaras.‡

tures. Endothermic compounds are those which are formed with the absorption of heat and contain more energy than the substances from which they are made. They require high temperature for their formation, since the absorption of heat tends to annul the constraint put on the system. These compounds are therefore, not stable at low temperature. (Mees-Physical Chemistry).

† Pitarapaka means "the union of causes and effects (i. e.) atoms by means of heat." Sanskrit - English Dictionary; Monier Williams p. 625.

‡ The view of the Vaiseshikas that the change in colour of the clay-pot from black to red when baked is due to the change in the colour of the Pitaras is an interesting suggestion. It is known to-day that there are a number of elements which have coloured ions. If an ion is coloured, it means that it absorbs light in the visible spectrum. Colour phenomenon, according to the Charaka school, is intimately connected with the formation of molecular qualities in chemical compounds - organic and in-organic due to chemical

It will be seen from the foregoing that the main factor concerned in Pakas or physical, chemical, physico-chemical and bio-physical reactions, is Kāla or Time, and this is perhaps the reason why the Vaiseshikas accorded this factor the status of a Dravya.

Dik or Space

“Space (or place)” says Charaka “is the region of action.” (देशस्त्वादिष्टानम् ।)* According to the Vaiseshikas Dik or Space is understood in relation to priority or subsequence, other than that of Kāla. It is stated to arise out of our notions of here and there; up and down; front and back, and right and left, etc. The notion of Dik or Space is based on the spin of the earth around the sun which creates the idea of direction such as, East, North West and South. The idea of East, for instance, arises out of the the phenomenon of sun-rise, and is in consequence, fixed towards it. West of course is the opposite of East (i.e.) the place of sun-set. North and South are fixed in relation to Dhruvas (i.e.) North and South Poles. To these directional dimensions are added two more viz., the upper and the lower. † Whatever may be the conventional division—Dik or Space, according to the ancient natural philosophers, is a *continuum* (i.e.) Vibhu or all-pervasive, eternal or Sanatana.

combinations. It is considered that both colours and tastes of molecules of chemical compounds arise out of the collocation “in unequal proportion and unstable equilibrium of the various forces latent in the paramanus themselves.” Says Charaka. एवमेतेषां रसानां षट्त्वमुपपन्नं न्यूनातिरेक विशेषात् महाभूतानां भूतानामिव स्थावरजङ्गमानां नानावर्णाकृति विशेषः ॥

* Charaka, Vimana 8, 75.

† In the masterly exposition of the Nyaya conception of Space in his ‘Mechanical, Physical and Chemical theories of the ancient Hindus,’ B. N. Seal notes as follows:

“Arrangements of atoms in Space :—The Nyaya conceives atomic magnitudes

In the context of the Nyaya Vaiseshika system, Dik or Space is considered in view of the position occupied in it by paramanus and their motion during the processes of Samyoga and Vibhaga (i.e.) atomic and molecular association and dissociations (decomposition or disintegration). For example, the proximity or otherwise of substances to one another will constitute a fundamental difference in the chemical reactions. (i.e.) Paka of different substances. In the same manner, the importance of the relative position occupied by paramanus in Space with reference to North or South (Uttara and Dakshina Dhruvas) and the temperature factor is emphasised by the Vaiseshikas. Thus, Tejas (Heat and Light), Kāla (Time) and Dik (Space), which are of profound importance in Physical and Chemical sciences, are classified as Dravyas by the Nyaya-Vaiseshikas, as they possess specific Gunas or predicaments.

as Parimandalya, a term which indicates a spherical shape.

नित्यं परिमण्डलम्—परिमण्डलमेव परिमाण्डल्यम् (Sankaramisra).

To conceive position in space Vachaspati takes three axes, one proceeding from the point of sunrise in the horizon to that of sunset on any particular day, (roughly speaking, from the East to the West); a second bisecting this line at right angles on the horizontal plane, (roughly speaking from the North to the South), and the third proceeding from the point of their section up to the meridian position of the sun on that day, (roughly speaking up and down). The position of any point in Space relatively to another point, may now be given by measuring distances along these three directions, i.e. by arranging in a numerical series the intervening points of contact, less magnitude or distance being that which comes earlier in this series, and the greater that which comes later. The position of any single atom in Space with reference to another may be indicated in this way with reference to the three axes. But this gives only a geometrical analysis of the conception of three-dimensional Space, though it must be admitted in all fairness that by dint of clear thinking, it anticipates in a rudimentary manner not only the foundations of solid (co-ordinate) geometry, but also of the geometry of position, and especially the conception of Space as a manifold, which alone can serve as the basis of a generalisation comprehending all different possible kinds of geometry, Euclidean and non-Euclidean."

Karma

'Karma' means action. "Behaviour, such as effort, endeavour etc.," according to Charaka "constitutes action." He further elaborates the concept by stating that, "endeavour is action directed towards an end, and it is the action, the performance, the effort and beginning of a work."

प्रयत्नादि कर्म चेष्टित मुच्यते ॥

(Charaka, Sutra 1; 49)

प्रवृत्तिस्तु खलु चेष्टा कार्यार्था, सैव क्रिया,
कर्म, यत्नः, कार्यं समारम्भश्च ॥

(Charaka, Vimana 8; 77)

Karma or action has a direct reference to the property inherent in matter (atoms and molecules) to combine or integrate together to form various compounds and also the decomposition or disintegration of such compounds, implying physico-chemical reactions of various kinds. Says Charaka, "Action which is the cause of conjunction and disjunction resides in the substance. Action is the performance of what is to be done. It depends on nothing else."

संयोगे च विभागे च कारणं द्रव्य माश्रितम् ।

कर्तव्यस्य क्रियाकर्म कर्म नान्यदपेक्षते ॥

(Charaka, Sutra 1; 52)

एकत्वेऽपि दिशः आदित्योदयदेश प्रत्यासन्नदेशसंयुक्तो यः स इतरस्माद्विप्रकृष्ट-
प्रदेशसंयोगात् परमाणोः पूर्वः एवमादित्यास्तमयदेश प्रत्यासन्नदेशसंयुक्तो यः स
इतरस्माद्विप्रकृष्टप्रदेशसंयोगात् परमाणोः पश्चिमः तौ च पूर्वपश्चिमौ परमाणू अपेक्ष्य
यः सूर्योदयास्तमयदेश विप्रकृष्टदेशसंयोगः स मध्यवर्ती । एवमेतयोर्धौ तिर्यक्देश
सम्बन्धिनौ मध्यस्य आर्जवेन व्यवस्थितौ पार्श्ववर्तिनौ तौ दक्षिणोत्तरौ परमाणू । एवं
मध्यन्दिनवर्ति सूर्यसन्निकर्षविप्रकर्षौ अपेक्ष्य उपर्यर्धोभावो दृष्टव्यः । संयुक्त संयोगाल्पत्व-
भूयस्त्वे च सन्निकर्षविप्रकर्षौ पूर्वसंख्यावच्छिन्नत्वं च अल्पत्वं परसंख्यावच्छिन्नत्वं च
भूयस्त्वम् ॥ (Vachaspati, Tatparyyatika, Chap. IV. Ahnika 2 Sutra 25).

The original physical arrangement of atoms is also given. Each atom is in contact with six other atoms, which gives a cubical arrangement.

एवं दिशोऽपि एकस्या अपि संयोगाएव भागः सोऽयं परमाणोः षट्केनयुगपद-
योगो मूर्त्तत्वमात्रं प्रयुक्तः न सावयवत्वप्रयुक्तः ।

'Karma' is of five kinds viz.,

1. Utkshepanam — Upward movement;
2. Apakshepanam — Downward movement;
3. Ākunchanam — Contraction or narrowing;
4. Prasaranam — Spreading or dilatation;
5. Gamanāgamanam — All motions in general.

This classification of Karma, it will be seen, is spoken of in terms of motions of various kinds — both in time and space — and its special reference will, therefore, be to physics, chemistry, physical-chemistry, bio-physics and bio-chemistry.

Samanya

The term Samanya refers to the 'community' or the 'genera' to which the 'thing' belongs. It represents our notion of the 'genus' and is also known as 'Jati'. Samanya connotes the qualities and features shared in common by many 'objects' or 'things'. Charaka describes Samanya (general) as, "the cause of increase of all things and at all times, and the general combine, for, the element of agreement is the general."

सर्वदा सर्व भावानां सामान्यं वृद्धि कारणम् ।

(Charaka, Sutra 1; 44)

सामान्यमेकत्वकरम् ।

तुल्यार्थता हि सामान्यम् ॥

(Ibid 45)

The term 'Samanya' is, therefore, used to signify 'identity' or 'sameness' between 'concepts' and 'things'. True identity is the 'sameness' or 'oneness' of things as they are. Samanya is always responsible for increase of the concerned Bhavas.

Samanya is of two kinds viz.,

- (i) Para-samanya, and
- (ii) Aparasamanya.

Para-samanya, (the 'higher') in modern parlance, corresponds to 'Genus,' and the Apra samanya, (the 'lower') to 'Species'.

Visesha

As compared to Samanya, Visesha signifies 'single' or 'simple' objects. It constitutes the real distinction or the negation of 'identity' or 'sameness' between 'things' in their true nature. Even though 'things' may form part of the same totality, the entity of one is different from the entity of the other. This concept is illustrated with the examples of the tree and the house. Although the leaves, flowers, fruits, seeds, branches and roots of a tree form the real constituent parts of the tree proper, still, they are all in structure and function different from one another. As such, each one of them constitute an entity by itself. Hence, the leaves, flowers, fruits, seeds, branches and roots, constitute the Viseshas of the tree. Similar is the case with the example of the house. The foundation stones, bricks, mortar, plaster and boards that go to make the whole house, are the Viseshas of the house.

Vaiseshikas consider that the knowledge of the objective world comprises in the perception of 'things' in their three different aspects, viz., Dravya, Guna, Karma. Samanya comprehends all these three aspects, whereas, Visesha applies exclusively to the nine Dravyas (which are eternal). Ātma (Soul), Kāla (Time), Dik (Space), Akasa, Manas and the four Paramanus in their ultimate states are devoid of community and they do not belong to any genera. This special feature of the Vaiseshika system comprehends the concepts that;

- (a) all substances are composed of paramanus which are extremely subtle and invisible;

- (b) out of the combination of the paramanus arise all forms of 'things' – Physical and Mental – and on account of the operations of which all phenomena occur;
- (c) the combination of the paramanus are transient in nature and are subject to change, decomposition and alteration;
- (d) the individual paramanus can neither be changed nor altered or destroyed. It is in this respect that the three fundamental genera of elementary particles (atomic) viz., Protons, Electrons, Neutrons and Photons of modern Physics resemble the fourfold paramanus of the Vaisesika System viz., Prithvi, Vayu, Ap and Tejas.

Viseshas being elementary entities, each having an identity and individuality of its own, do not belong to any genus. As examples of the above may be cited the case of Ātma (Soul), Ākasa, Kala (Time) and Dik (Space), which are non-atomic and Vibhu – the atomic entities of Viseshas being, the Manas, and the four kinds of paramanus which are also indivisible and not made up of parts – they are the *ne plus ultra* (i. e.) nothing further.

We may now round up this discussion with Charaka's description of Samanya and Vissha viz.,

“The general (similar) is the cause of increase of all things at all times, and the particulars (dissimilar) are the cause of decrease. The general (similar) combines and the particular (dissimilar) differentiates; for, the element of agreement is the general, while the particular is the reverse.”

सर्वदा सर्व भावानां सामान्यं वृद्धि कारणम् ।
 हास हेतुर्विशेषश्च, प्रवृत्तिरुभयस्य तु ॥
 सामान्य मेकत्वकरं, विशेषस्तु पृथक्त्वकृत ।
 तुल्यार्थता हि सामान्यं, विशेषस्तु विपर्ययः ॥

(Charaka, Sutra, 1; 44 and 45)

Samavaya

The sixth category of Bhava Padarthas is Samavaya or co-inherence (*i. e.*) an inseperable union in which the parts of things are held together in their proper position, as quality - Guna and the qualified - Guni. Charaka describes Samavaya as follows:—

“Samavaya (co-existence) is difined as that inseperable relationship which exists between Prithvi etc., and their predicaments. This relationship is eternal; for, wherever substance exists, the co-existent predicament is never absent.”

“That which is the substratum of action and predicament and co-existent cause, is substance.,

“Predicament is co-existent and inactive (potential) cause.”

समवायोऽपृथग्भावो भूम्यादीनां गुणैर्मतः ।
 स नित्यो यत्र हि द्रव्यं न तत्रानियतो गुणः ॥
 यत्राश्रिताः कर्मगुणाः कारणं समवायि यत् ।
 तद्द्रव्यम्, समवायी तु निश्चष्टः कारणं गुणः ।

(Charaka, Sutra 1; 50, 51.)

The Deterministic Outlook of Nyaya Vaiseshika System

It will be seen from the foregoing that the Nyaya Vaiseshika System bears a striking resemblance to the

Mechanistic and Deterministic outlook of the Physics of the 18th and 19th centuries, in that,

The principles posited by this system centered generally on the concepts of mass, of motion and of forces.

It believed that the Paramanus represented a permanent concentration of matter at a point which cannot be further analysed (Anuthva or atomicity and Parimandalya).

These mechanical particles have been stated to possess mass and incapable of undergoing any intrinsic change and follow motions which could be determined (Parispanda).

Their theory of matter was based on the Deterministic doctrine of causality or form of the mechanical laws, such as the assumption that "like causes produce like effects" and the principles of contiguity and antecedence' according to which, things can act only on neighbouring things or through a chain of things in contact, and if cause and effect refer to situations at different times, the cause should be prior to the effect.

Whatever differences there may be between the mechanistic determinism of the 18th and 19th centuries and the ancient Nyaya Vaiseshika System, such differences relate only to details, such as the views of the latter, that the irreducible elements in nature, known as 'Dravyas,' are only nine instead of the 92 of the former; of these five are atomic viz., Vayu, Tejas, Ap, Prithvi and Manas, while Akasa, Kāla (Time), Dik (Space) and Ātam are non-atomic or Vibhu. The principle of 'indeterminism' was sought to be explained by positing the influence of a 'Soul possessing merit or Dharma.' Another difference which is again a matter of detail worthy of note here is the inclusion of Manas or

Mind as a material factor in the category of ultimate substances, to explain the phenomenon of consciousness and life, as well as the Soul for the same purpose—the former being atomic and the latter non-atomic. Over and above everything else, the Nyaya Vaiseshika System laid the general basis of Physical-chemistry and Bio-physics, and this is perhaps the reason why Charaka freely drew from this system, among others, to construct the Science of Life (Biological Science) or Ayurveda.



ERRATA

- Page 28 line 13 add Kāla after Dik
Page 33 line 15 delete fullstop after paramanus and
change capital I to i
" line 16 add and after former

