

STUDIES IN INDIAN CONCEPTS IN PHYSICAL SCIENCES

A THESIS

SUBMITTED TO

THE UNIVERSITY OF MYSORE

FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

B. V. SUBBARAYAPPA, M.Sc.,  
Junior Scientific Officer,  
Central Food Technological Research Institute,  
Mysore.

OCTOBER

1960

C E R T I F I C A T E

I hereby certify that the research work  
entitled "Studies in Indian Concepts of Physical Sciences"  
which forms the thesis of Shri B.V.Subbarayappa, M.Sc.,  
Junior Scientific Officer, Central Food Technological Research  
Institute, Mysore, for the Degree of Doctor of Philosophy of  
the University of Mysore, has been carried out at the  
University Library and the Oriental Research Institute,  
Mysore, under my guidance during the period February 1957  
to September 1960.

Mysore,  
Vijaya Dasami,  
Sārvari Samvatsara,  
30-9-1960.

*L. Sibaiya*

(Dr.) L. Sibaiya

## DECLARATION

I do hereby declare that the entire work embodied in this Thesis has been done by me at the University Library and the Oriental Research Institute, Mysore, under the guidance of Dr. L. Sibaiya, D.Sc. The extent of information derived from several sources has been indicated in the body of the thesis at appropriate places. This work has not been submitted, in part or in full, for any Diploma or Degree in this or any other University.

Mysore,  
Vijaya Dasani,  
Sārvari Samvatsara,  
30-9-1960.

*B.V. Subbarayappa*  
(B.V. Subbarayappa)  
Signature of the Candidate

### A C K N O W L E D G E M E N T

I express my sense of gratitude to Dr.L.Sibaiya for his valuable guidance.

I acknowledge with thanks the help I have received from Prof.G.N.Chakravarty, M.A., Head of the Department of Sanskrit, St. Philomena's College, Mysore, Drs. M. Srikanta Murthy and M. Mahadeva Sastry of the Government College of Indian Medicine and Asthana Vidya Jyoti Siddhanta Kesari Sri Venkatasubba Sastry of Kollegal.

## SYNOPSIS

The object of the present studies is to understand the Indian concepts in respect of matter, medicine, chemistry and astronomy in a historical perspective. The studies are confined to the concepts and conceptual schemes only. The present studies have their limitations because of the vastness of the subject matter touched upon. Nevertheless, an attempt is made here to trace the thread of thought (discernible as well as inferential) which runs through several conceptual schemes of Indian thinkers within a broad chronological frame.

The thesis is presented under the following heads:

- (1) Introduction
- (2) Indian Attitude to Nature
- (3) The Problem of Matter
- (4) Indian Medicine and Chemistry
- (5) Indian Astronomy
- (6) Indian Thought and the History of Scientific Thought

In the introduction, some observations are made on the Indian thought in general. The historical background has been explained. The extent as well as the importance of the Vedic literature and the date of the Vedas have been discussed. The object and the limitations of the present studies also form a part of the introduction.

In the Chapter on Indian Attitude to Nature, the concept of nature has been discussed. The Vedic Indians' approach to life and world of things, synthetic vision of the Vedic seers, their ceaseless endeavour to find the ONE amidst the MANY and the Vedic gods as symbols

of cosmic light (visvājyoti) have been critically examined. Cosmic law or Ṛta as a transcendental principle is also discussed, particularly with reference to Cosmic Light and Sacrifice (yajña). Cosmogony of the Vedas, the theory of creation, cosmology of the Brāhmaṇas and the Upaniṣads have also been discussed. The evolution of the doctrine of the five elements or the pañca-bhūtas has been traced. Nature in relation to the Sāṅkhya, the Buddhist and the Jaina thoughts has been discussed.

In the Chapter, The Problem of Matter, limitations of modern science in understanding reality have been pointed out. The importance now being attached to scientific epistemology by some philosophers of science has been indicated. The epistemological approach of some of the Indian thinkers has been emphasised.

The problem of matter according to the Nyāya-Vaiśeṣika has been discussed at length. The probable date of the Vaiśeṣika Sūtras, the Nyāya-Vaiśeṣika concept of the external world, the nature of the physical substances, the Indian atomism and its characteristic features in contradistinction with the Greek atomism, properties of matter, heating an earthy body, motion, concepts of space and time, ideas about sound etc., have been critically examined according to the Vaiśeṣika as well as the Nyāya sūtras and their commentaries. It should be observed that the Indian epistemological approach to the problem of matter represents a logical frame of mind even in the early period of Indian thought. The Indian atomism, formation of gross bodies from atoms and the concept of Ākāśa prove beyond doubt a rare ingenuity

exhibited by some of our Indian thinkers. In this Chapter, matter according to the Sāṅkhya thought as well as the Jaina thought has been briefly touched upon as also the Buddhist view on matter.

In the next Chapter, medicine and chemistry of the Indians have been discussed under Āyurveda and Alchemy.

It may be mentioned that Āyurveda, though considered divine in origin, has a distinct thought pattern of its own based as it is on the expositions of the Sāṅkhya as well as the Nyāya-Vaiśeṣika. Under Āyurveda, the doctrine of pañca-bhūtas as applied to human body, the foodstuffs, the drugs as well as the poisons or toxins has been elucidated. Surgery in the Suśrūta-saṁhitā, various surgical instruments and the practical training which a surgeon was expected to undergo have been dealt with in sufficient detail.

In this Chapter, an effort is made to understand and evaluate the doctrine of tridoṣas (which forms the kernel of Indian medicinal thought) in terms of their attributes and functions. Vipāka or the biochemical processing of food, the sapta dhātus, jātharāgni and dhātvaṅni have been critically examined. It may be added that this thought-structure discloses a thorough understanding of the bodily functions by the Indian men of medicine. Blood as well as other fluids in the body and their circulation, role of the heart and the manifestation of the diseased state are among the other ideas which have been discussed under Āyurveda.

Under Alchemy, the characteristic feature of Indian alchemy as opposed to the alchemy of the West has been indicated. Mercury and its purification with reference to 18 treatments, the concepts of māraṇam or 'killing' as applied to metals, the eight mahārasas, the eight

uparajas, sulphur and arsenic substances and eight dhatus or metallic substances have been examined in detail.

Besides, the laboratory and the apparatus used by the Indian rasavadins have been discussed. The Indian methods for transmuting the base metals into gold, the Indian knowledge of alkalies, salt and acids have also been indicated.

In addition, some observations on the metal-working in India are given, focussing attention on the Iron Pillar at Meharauli near Delhi, the copper statue of Buddha at Sultanganj and the Iron Pillar at Dhar.

In the next Chapter on Indian Astronomy, first the limitations of Indian Astronomy have been broadly indicated. Astronomical ideas in the Vedic period and particularly in the Vedānga-Jyotisa, have been brought into light. In the Siddhāntic literature, the date of the Sūryasiddhānta has been discussed and indicated as being pre-Buddhist. The Indian astronomical ideas on the earth, sun, moon and other planets and the planetary motions, have been examined. The concept of Mahāyuga, astronomical time and its division with reference to a day and the year have been dealt with in considerable detail. The siddhāntic literature as well as the paurānic literature on the one hand and the presumed borrowing of astronomical ideas from Greek sources on the other, have also been studied. Among the other aspects covered in this Chapter are the Indian thought on the precession of equinoxes, astronomical instruments and Indian astronomy and the supposed Greek influence.

The sixth Chapter entitled Indian Thought and the History of Scientific Thought is the result of an attempt at evaluating some of the Indian ideas in relation to the development of the scientific thought in the West. This chapter has been sub-divided as follows:-

- (1) The period of synthetic vision  
(2500 B.C. to about 600 B.C.)
- (2) The period of free inquiry  
(600 B.C. to about 200 A.D.)
- (3) The age of speculation  
(300 A.D. to about 700 A.D.)
- (4) Indian thought and the Arabian men of Science  
(700 A.D. to about 1300 A.D.)

In the period of synthetic vision, the extraordinary "mental coherence" exhibited by the Vedic Indians has been emphasised. The Indian doctrine of the bhūtas or elements has been shown to be earlier than the corresponding one of the Greeks. In the field of medicine, it has also been stressed that the Indian concept of tridosas was far earlier than the 4 humoral Greek concept which might have owed its inspiration to the former. The characteristic differences between the Indian thought and the Greek thought have also been examined. It has been stressed that unlike the latter, the Indian scientific thought was always well within the frame-work of the philosophical speculations.

In the period of free enquiry, the Buddhist views on matter and the world have been indicated and shown how they constituted a sort of a stumbling block for the development of scientific thought in our country. The Alexandrian school as a possible source for the

influx into India of ideas on astrology and astronomy has been indicated.

In the period of speculation which corresponds more or less to the Golden Age of India, that is the Gupta Age, the high intellectual attainments in the field of medicine, astronomy, mathematics, metal-working and the like have been explained. A brief account of the Nalanda University as a great centre of learning has been given.

Lastly, the influence of Indian arithmetic, astronomy and medicine on some Arabic men of science has been indicated.

Select Bibliography - general as well as for the six chapters - has been given.

Select passages from relevant original sanskrit texts in respect of the four chapters - II to V - have been appended at appropriate places.

ABBREVIATIONS

Ait. Br.	..	Aitareya Brāhmana
Car. Sam.	..	Cara <sup>ko</sup> Simhita
E R E	..	Encyclopaedia of Religion and Ethics
I.P.	..	Indian Philosophy by S.Radhakrishnan, 2 Vols.
I.H.Q.	..	Indian Historical Quarterly
J.A.O.S.	..	Journal of the American Oriental Society
J.R.A.S.	..	Journal of the Royal Asiatic Society
N.S.	..	Nyāya-Sūtra of Gautama (Vizianagaram Sans. Series)
N.K.	..	Nyāya Kandali of Śrīdhara
N.V.T.T.	..	Nyāya-Vārtika tātparya tika
P.P.H.	..	Vaiśeṣika-Sūtrabhāṣya by Prasastapāda (Vizianagaram Sans. Series)
P.S.	..	Pañca Siddhāntika by Varāhamihira
R jn	..	Rasajalanidhi - 3 Vols.
Rnv	..	Rasārṇava
R.P.S.	..	Rasaprakāśa Sudhākara
R.R.S.	..	Rasaratna Samuccaya
S.B.E.	..	Sacred Books of the East
S.S.	..	Sūrya Siddhānta
Suś. Sam.	..	Susruta Samhitā
Tit. Sam	..	Tittiriya Samhitā
V.S.	..	Vaiśeṣika Sūtra of Kaṇāda