CHAPTER VIII

Conclusion

'The generally accepted corollary was that the history of science since antiquity had essentially been a European drama...'. (Gegory Blue, 2001) A paradigm shift in this assumption began to emerge among the historians with the import of the theory of a 'new humanism' of George Sarton. Sarton in his 'Introduction to the History of Science' (1927-1947), argued explicitly against Euro-centrism and made discussion on the scientific developments in various other non-European civilizations mostly of Asia and North Africa. Sarton's younger contemporary, Needham was strongly influenced by the Marxist approach to the history and philosophy of science. One of his major conceptual contributions was the idea of *Oikoumen* in which people from all nations and cultural background could be involved. The conventional notion of the western writers that the non-western people had no indigenous scientific tradition was countered by Needham. Needham made a systematic study of Chinese materials relevant to the history of science and successfully highlighted the indigenous scientific tradition of pre-modern China. 'The ultimate aim of Needham's monumental project *Science and Civilization in China* was to promote mutual understanding among different cultures' (Goldsmith, Joseph, Needham, p. 146 quoted in *Situating the History of Science*. p. 94). But the study of the history of science in India is not marked by such Needhamian touch. The documentation of Indian traditional knowledge passed its different phases in the hands of the Orientalists, the Nationalists and the Positivists as well, since the days of its inception.

One major concern of the history of sciences in India at this stage was to establish the existence of sciences rather proto-sciences or elements of science (based on empirical procedures) in antiquity. Bernal rightly observes: 'Science does not appear in the first place in a recognizable form .... it is necessary to search for its hidden sources in

the histories of human arts and institutions' (*Science in History,* 1969, p. 61). The tool using and fire using animal, in his view, is well on the way to scientific humanity. Gordon Childe's observation is 'Even the simplest tool made out of a broken bough or a chipped stone is the fruit of long experience — of trials and errors, impressions noticed, remembered, and compared. The skill to make it has been acquired by observation, by recollection and by experiment. It may seem as exaggeration, but it is yet true to say that any tool is an embodiment of science'. (*What Happened in History,* 1961, p. 9).

In this sense India has her indigenous scientific tradition. Her 'cumulative tradition of knowledge' is stored in different texts and treatises. It is true for the historical period. But prior to that, archaeological evidences give clear clue to the scientific or technological development both in qualitative and quantitative terms which induced Childe to refer to the transition of early societies to agriculture as the Neolithic Revolution.

In the course of historical process, change is visible from experience to experiment. In the developmental process people from each group leave their marks. But an evolutionary pattern may be discerned while investigating different areas of studies.

There is no mention of rice in the *Ṛgveda.* As food grains,only *Yava* (ka) is mentioned in the Ṛgveda (Table 1). But rice is mentioned in the *Atharvaveda.* Further the use of various types of rice (*Vrīhi*) such as *plāśuka, āśu* and *hāyana* etc. is evinced by the *Śatapatha Brāhmaṇa* (Table 2). The relevant tables make it evident that continuous observation and cultural practices gradually extended the horizon of knowledge of the Vedic people. *Saṃhitās, Brāhmaṇas, Āraṇyakas* and *Upaniṣads* bear ample testimony to the progressive extension of knowledge in material culture. For this period, material prosperity was in no way distanced from the prospects of agriculture, and agricultural pursuits definitely made further progress in the later phase of the Vedic period.

The growing acquaintance with plant life is reflected in the appreciation of the medicinal properties of plants. In the *Atharvaveda* different herbs and plants are highly praised for their medicinal values. The selection of edible or the medicinal herbs was the outcome of long experience. Naturally in that intellectual climate we come across a concept of the contemporary people with an exceedingly discernible science-potential. Again, if the concept of *ṛta* of the early Vedic people is viewed as the 'order of the universe', the peoples' instinctive awareness of a primordial complex of natural order as well as of social order is also to be recognized though this is also to be agreed that the hymns are wrought with mythological imaginations of the Vedic poets.

With the emergence of state power in the form of kingship, the scattered but viable knowledge obtained through observations and experience came to be codified. Scattered information led to the development of systematic branch of studies.

Experiment hardly contradicted experience. Experiment was linked to theoretical knowledge which in turn depended on precedence. Organized knowledge system required writing of texts. Royal courts extended support for documentation of knowledge. Under the royal patronage different sciences flourished. The rulers patronized the veterinary sciences pertaining to the health of elephants and horses as these animals were the indispensable part of the army, the defender of state. The comprehensive treatise of *Kauṭilya* may be cited as an example of the initial-most attempt in this direction. Inspite of some confusion regarding *Kauṭilya,* his royal linkage is not denied by history.

Thus *Kṛṣiśāstra, Vṛkṣāyurveda, Hastyāyurveda, Aśvāyurveda* and others had their steady development and this is evident by the composition of a series of texts not only in Sanskrit but also in other regional languages in different parts of India through the centuries. As for example we may draw the instance of *Lokopakāra* in old Kannaḍa and *Kṛṣigītā* in old Mālayālam languages, *Hastividyārṇava* in *Tai-Āhom* language and *Ghorā Nidān* in old Assamese script or the *Gajaśāstraprabandha* in Marathi language.

It is a well-known that agriculture has been playing a vital role in the history of India ever since the days of Harappan culture. The *Kṛṣiparāśara* is generally recognized as the first ever specific text on agriculture in ancient India. *Kṛṣi* was initially a part of a wider discipline called *Vārttā* and constituted the main source of income and as such the subject of agriculture was methodologically and scientifically studied by scholars like *Parāśara, Garga* and *Kāśyapa. Parāśara* is a common name and tradition knows of several *Parāśaras.* The tradition associates the name with politics, *smṛti,* astrology, astronomy, meteorology agriculture, plant science and also with medicine. So it can best be inferred that the different *Parāśaras* perhaps were associated with a school of study of that particular name.

The name of *Parāśara* has come down to us from the hoary antiquity. *Parāśara* has been referred to in the *Ṛgveda* (VII.18.21), the *Taittirīya Āraṇyaka* (1.1.3.37), the *Bṛhadāraṇyakponiṣad* (11.6.2; IV.6.3), *Mahābhārata (Sabhāparva*), *Yājñavalkya saṃhitā* (15) *Carakasaṃhitā* (*Sūtrasthāna,* Chap.I), *Bṛhatsaṃhitā* (Chapt 29) and in the commentary of *Bhaṭṭapāla* on the *Bṛhatsaṃhitā.* So, ascertainment of the date of two *Parāśaras,* one associated with agricultural science and another with plant-science is a difficult job.

It is tempting to find out relation between the two *Parāśaras* associated with two branches of science viz. *Kṛṣitantra* and *Vṛkṣāyurveda* which are also thematically linked to a great extent. Both the *Parāśaras* are central figures in this discourse. On the basis of examination of the internal evidences of the *Vṛkṣāyurveda* of *Parāśara* it his held that the basic text of the *Vṛkṣāyurveda* may be placed in the 3rd - 4th century A.D. (*Vṛkṣāyureveda* of *Parāśara,* 1996, p. viii).

With regard to the date of *Kṛṣi-Parāśara* it is held that the author of the text was perhaps earlier than the 6th century A.D. but certainly not later than the 11th century A.D. (*Kṛṣi-Parāśara,* 2001, p. xix). Thus, the whole question of identification of the two authors is still vacillating between centuries.

It is always accepted in theory that *Paśyāyurveda* or *Vṛkṣāyurveda* are applications and extensions of *Āyurveda* to forms of life other than human. The basic theories and concepts, the diseases and their symptoms, the medicines and the methods of treatment are mostly the same in these sciences as in the case of the humans. The treatment of disorders in plants or animals in based on the *tridoṣa* theory which is the central theme of *Āyurvedic* science. According to the *tridoṣa* theory, disease is caused by the imbalance of the three humours, *vāyu, pitta* and *kapha*. In fact *Vṛkṣāyurveda, Hastyāyurveda, Aśvāyurveda* and others are all branches of one major science i.e. *Āyurveda*. Thus the fundamental concept is that the entire creation including humans, animals and plants are ecologically linked and that is why their diseases and treatments are essentially the same in many respects.

The texts specific on agriculture are *Kṛṣi-Parāśara, Kāśyapiya Kṛṣisūkti* and *Kṛṣi-gītā*. Since the days of the *Ṛgveda,* agriculture is invoked as a venerable vocation. This idea is distinct in the later texts also. *Kāsyapa* repeatedly stressed the need for support of the king in each and every step for success in agricultural operation. He takes it to be a noble profession.

Parāśara stresses the importance of supervision and hard labour for success in agriculture. It is said — an agriculturist who looks after the welfare of his cattle, visits his farms daily, has the knowledge of the seasons, is careful about the seeds and is free from lethargy, is rewarded with the harvests of all kinds and never perishes. Practically these traditional texts or scientific manuals did not ignore Indian agricultural ethos. As a consequence, such texts are not free from speculative observations and ritual ceremonials.

That the agricultural knowledge was diffused through oral communication is evident from *Khanār Bacan* in Bengali. *Khanā* and *Dak* are much popular among the agricultural people of Bengal and Assam.

The contents of *Lokopakāra* seem to be a very practical and of mundane utility to the common man and the rulers alike. This text is a

compendium of various sciences of the time in a concise form. Such texts in local languages must have helped the common people who had no knowledge in Sanskrit.

The titles of the texts like *Lokopakāra* or *Viśva-vallabha* provoke the imagination that these treatises were compiled in a changing background where more and more popular involvement was desired by the authors and the intellectuals of the society. Such type of names gives a clue to the exact nature and purpose of composition of the texts. *Lokopakāra* indicates that the text was composed for the benefit of the people. True to the title *Lokopakāra,* the scientific knowledge is written here in non-technical language for the benefit of the uneducated cattle owners who were the actual beneficiaries of the knowledge. As the title indicates, this work in spirit and presentation might appear as a compilation on folklore. Yet as is evident from the discussion in different chapters, the contents are firmly rooted in the *śāstras.* The medical treatments prescribed in the text for curing diseases of animals have a strong base in the Indian medical science, the *Āyurveda.*

Viśva-vallabha means 'Dear to the world' which also indicates that science, more specifically the plant science during the period, for all practical purposes bent on popular involvement. The period practically coincided with the period of agricultural extension which needed knowledge on agriculture and plant science.

Thus, this science steadily transcended the limits of the textural confinement and diffused into the day to day activities and cultural practices of the common people.

There is fundamental uniformity in the scientific texts or the manuals, produced in different regions of the subcontinent. In spite of differences of provenances, the texts cover wide area of studies and are more or less identical. Agricultural texts mostly are in tune in eulogizing agriculture as noble vocation. Invocation to gods occurs in the texts. Practical science is replete with speculations.

A comparative statement on the contents of the agricultural texts or the texts on plant science or animal science reveals similarity among the respective texts. This perspective hints at interaction and osmosis.

The widely accepted reasons which are defined by the historians for the decline in scientific activities and experiments in ancient period are obviously embedded in Indian social structure and in the nature of temperament of the people of this country. Repeatedly discussed factors for such decline were self complacency, intellectual lethargy, caste rigidity, foreign invasion and the like. 'Separation of the head from the hand' (B.M. Udgaonkar, 1996, p. 254) no doubt obstructed the growth of science where theoretical studies could be monopolized by the brahmins and the practical arts left to the other castes, but in case of agriculture and plant science or animal science, the common people could not be sent to limbo.

From the internal evidences of the texts, it is distinctly proved that total involvement of the mass was the essential condition for development of these studies. Thus these sciences for practical utility and for being of essential nature could not be treated as prerogative of higher caste people. The knowledge accrued through the centuries was transmitted both vertically and horizontally. This knowledge system, osmotic in nature could not be extinguished by any internal or external factor. It persisted as if in a catenated form in the history of science.