

Science and Technology in Ancient India. Edited by the Editorial Board of *Vijnan Bharati*, Mumbai. Vijnan Bharati, A-10 Tulsi Bhavan, Sion, Mumbai 400 022. 2002. 113 pp. Price: Rs 495.

This book is said to be ‘... a humble effort to put before all of us a glimpse of the scientific and technological achievements of our forefathers. By and large, we have restricted our coverage to the tenth and twelfth century AD’. The book is a compilation of material that was assembled for an exhibition that was on display at Bhayandar (near Mumbai) in December 2000. The editorial board, functioning under the overall editorship of P. R. K. Rao, seems to have consisted largely of scientists drawn from modern science and technology institutions in and around the western part of India. The book carries a foreword by B. V. Subbarayappa, President, International Union of History and Philosophy of Science. In explaining the intention of the book, the editorial board says in its preface that ‘There is a general impression among scholars abroad and even among educated Indians, that our heritage... is primarily religio-philosophical. There is hardly anything worthwhile to mention about our scientific and technological past. The reasons for such an impression are well known. References on science and technology are scattered in several works, whose main themes are not related to science and technology. These works are in Sanskrit and Pali, that are currently not in use. Added to this is the fact that the ancient knowledge is often in a highly condensed form which can be understood only by experts in those languages.’

The book is presented in the form of ten chapters covering the areas of agriculture, architecture, astronomy, chemistry, mathematics, medicine (Ayurveda), metallurgy, physics, shipping and navigation, textiles and numismatics. There is also a brief biodata of the contributors, a foreword and an epilogue. The chapters are heterogeneous and uneven in terms of size, thematic spread and the kind of presentation (a fact that has been acknowledged in the preface), perhaps reflecting the composition of the editorial board.

The chapter on agriculture provides a good list of some ancient Indian literature pertaining to agriculture starting from the Vedic period onwards. The tendency to divide the knowledge of

agriculture into various periods leads to some puzzling results. For example, it is not clear why ‘Neem sticks used for brushing the teeth’ is mentioned as an achievement/discovery covered under the ‘Jain period’. The references at the end of the chapter are an annoying spectacle offering five references, where one or more of the following are missing in *each* one of the references – the year of publication, name of the editor, author, the place of publication, pages, etc. Some interesting observations that have been presented in the text are liable to be dismissed in the absence of proper back-up with a reference. For example, the chapter makes a reference to an analysis of rainfall predictions made by the panchangas in Varanasi, which concluded that their predictive capacity is better than that of the India Meteorological Department. However, it has not been backed up with precise references which would have added a lot of conviction to the claim. It is indeed a pity, since this reviewer is independently aware of this interesting study.

The section on architecture is relatively smaller and gives an overview of a few selected items. No references are given to back-up the text, even though it is among the contents of the chapter that appears in the beginning. The section on astronomy carries some interesting quotations from ancient Indian literature on astronomy, and also a table listing prominent ancient Indian astronomers. There is a constant reference to the achievements of Indian astronomy that predated the corresponding achievements in the West (Aryabhata’s work on movement of planets, and the heliocentric model of the planetary system, movement of the earth, etc.). The chapter on chemistry gives a detailed listing of various chemical substances and their classification. The section is uneven in many respects. While there is an elaborate description of ‘Rasayana Shastra’ and understanding regarding metals, the entire presentation is based on Ayurveda, and we find no mention of the Siddha tradition of the south which is in fact the most advanced in this area. There is a good set of references given at the end of the chapter.

The section on mathematics is organized in a pleasing manner with illustrations that cover a lot of ground, including recreational mathematics. The section on medicine (Ayurveda) gives a bird’s-eye view regarding Ayurvedic understanding

of biological functions, anatomy and disease diagnosis. Here again the references are listed in a totally inadequate manner – there is no year of publication for any of the references, and the list is a mixture of classical Ayurveda texts and indological works that are less than five years old. The section on metallurgy gives an overview regarding iron, bronze and zinc technology. There is a small chapter on shipping and navigation. There is a final chapter clubbing together textiles and numismatics. The representation of textiles is totally inadequate considering the vast scope and importance of this area, right from the ancient times down to this day.

The book suffers from certain limitations of perspective. The underlying attempt of the editors and authors seems to constantly point out that ‘we got there before the Europeans did’, about which I have cited a few cases earlier and much more can be stated. It is certainly a fact that current projections and presentations of Indian achievements in science and technology are totally inadequate, and there is much that needs to be done to restore the balance. Nevertheless, in devoting oneself largely to this pursuit, we seem to miss out on few other important elements. For example, we find that traditional Indian disciplines (science, technology) are not presented in their entirety, which would give us an idea about the utility of these disciplines as seen by Indians and the role that they played in the Indian society. Rather, the tendency has been to pick up and list only those aspects which would today qualify as scientific knowledge. For example, the discussion on astronomy is totally silent about the fact that traditionally, in India, astronomy was only a part of Jyotishsha.

The get-up and production leave much to be desired. The book is printed on art paper, but for some unknown reason the entire main text has been printed only on one side – leaving the backside of each page blank! Each page is printed onto a background of a light brown shade over which are superimposed running characters in white Devanagari script (presumably to constantly remind the reader of the Sanskrit source), and the text is printed on this surface. The overall effect is pages that are unclear, distracting and have a ‘smudged’ look. The reproduction of illustrations is poor – several of them look like ‘shaky’ photographs – it is

astounding considering that they are printed on art paper. Typographical errors abound the text; there are references to 'implements like seed grills' (instead of drills), 'granurries' (instead of granaries) and the Devil's tree has been described as *Alstonia seholaris* (instead of *scholaris*), to cite a few examples. Page 17 has been reprinted and it occurs twice.

A serious shortcoming of this book is that it is not connected up to the present-day India in any way, even though there is plenty to suggest that the tradition of sciences and technologies referred to have a large presence in India even today. The chapter on medicine makes no reference to the fact that even today most Indian babies are delivered by traditional birth attendants, and a majority of the broken bones are definitely set by traditional bone-setters. The All India Coordinated Research Project on Ethnobiology has recorded in 1994 that the tribals of India (who constitute only 6% of our population) have a knowledge of about 9000 species of plants among which 7500 species were being used for medicinal purposes – a truly staggering figure that is perhaps unmatched by any other civilization. The chapter on metallurgy talks of the rust-proof iron pillar of Delhi made 1600 years ago. However it does not tell us that even in 1960s Orissa tribals were making iron that was highly resistant to corrosion, or that even now iron is being made using the traditional process in tribal areas of Madhya Pradesh and Uttar Pradesh. The chapter on navigation and shipbuilding discusses about the ancient achievements from Mohenjodaro to the nineteenth century. However, it does NOT show an awareness of All India Coordinated Research Project on Navigation and Shipbuilding. This project has documented the great depth and knowledge in this area that has survived with our fishing community and boat builders even in the 1980s. As a result, the chapters in the book read more like indological essays ('The Wonder that *was* India!') rather than the description of a living tradition that has possibilities for today and tomorrow.

Today, in the study of sciences of various cultures, there is a growing understanding of how the science and technology of various civilizations are rooted in specific geographical or social contexts. Following this, there are also signs of a growing appreciation of the distinct difference in world views of

civilizations that gave rise to varying traditions of science and technology. One would expect that a publication of this kind would address some aspects of science and technology in India that make it distinct from Western science and technology, and the how and why of it. However, rather strangely, the book really reinforces the old dominant view that sees science and technology of various civilizations in a 'linear hierarchical' order! The only point the authors are keen to score are '... we got there earlier!'. In their overwhelming desire to hike up the score on all that Indians did – particularly before the West, this compilation has also slipped in material that is highly speculative or suspect (to put it mildly!). Descriptions regarding Sage Bhardwaj's spectrometer and electrolysis of water (Agasthya Samhitha – *Shilpasashtra*) do not pass the test of critical examination and editing. Better editorial guidance and greater attention to production would have vastly enhanced the value of this compilation on a fascinating subject.

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Migraine: A Neuroinflammatory Disease. E. L. H. Spierings and M. Sanchez del Rio (eds). Birkhauser Verlag AG, P.O. Box 133, CH-4010, Basel, Switzerland. 169 pp. Price not mentioned.

Migraine is a recurrent clinical syndrome characterized by a combination of neurological, gastrointestinal and autonomic manifestations. It causes substantial suffering and disability, and gives rise to great economic and personal burden by affecting a large number of people across their lifespan. It is a heterogeneous condition and the symptoms vary both among individuals and within individuals from attack to attack. The exact pathophysio-

logical disturbances that occur with migraine have yet to be completely elucidated; however, it is currently regarded as a neurovascular disorder of trigeminal sensory processing system. Despite the recent advances in the understanding of the pathophysiology of migraine and new treatment options, it remains an under-diagnosed and poorly treated health condition.

The three mechanisms thought to be involved in the pathogenesis of migraines are arterial vasodilation, decreased inhibition of central pain transmission and inflammation. The classical drugs used for treatment of migraines are vasoconstrictors, including ergotamine and dihydroergotamine that were introduced for the treatment of migraines in 1926 and 1945 respectively, and are in use even today. More recently, the triptans (selective serotonin agonists) are becoming the first-line alternatives in the acute pharmacological treatment of migraine along with non-steroidal, anti-inflammatory agents. Often, preventative medication is also indicated for patients experiencing frequent and/or refractory attacks.

The book under review focuses on the involvement of neurogenic inflammation in the pathogenesis of migraine and explores the possibility of developing anti-migraine medications that act by inhibiting inflammation. The current and potential future therapeutic approaches for preventive and acute treatment have been reviewed in a series of articles by clinicians and research scientists and the need for drugs that would be multi-pronged in their mode of action has been emphasized by several authors throughout the book.

In the first article in the book, Spierings reviews the three major pathogenic mechanisms involved in migraines, namely extracranial vasodilation, inhibition of central pain transmission and inflammation, and presents evidence that the lowering of pain thresholds is secondary to inflammation. Drugs like ergots and triptans have two modes of action, vasoconstriction and reduction of neurogenic inflammation. This article also introduces the reader to the calcitonin gene-related peptide as a mediator of neurogenic inflammation. The important role of calcitonin gene-related peptide in neurogenic vasodilation and in the pathogenesis of migraine is discussed in great detail in subsequent chapters. The animal models currently used to study the pathogenesis of migraines have been des-