

BOOK REVIEWS

Images and Contexts. The Historiography of Science and Modernity in India. Dhruv Raina. Oxford University Press, YMCA Library Building, Jai Singh Road, New Delhi 110 001. 2003. 234 pp. Price not mentioned.

The title of the book under review reminds me of what two scientists, one of them a Nobel Laureate, recently said about context: 'Context has become one of the latest catchwords. Understandably, it is a rallying point where historians of science meet sociologists of science. The downside is that context may become a smoke screen for relativism.' (Hoffman, R. and Laszlo, P., *Angew. Chem., Int. Ed. Engl.*, 2001, **40**, 4599–4604.) Happily, no such tendency is apparent in the eight essays collected in this book which, to quote from the author, is about 'how Indian scientists and historians of science engaged with the sciences of India'. The commonality of the essays (written between 1990 and 2000) arises from two shared perspectives.

The first is the three clearly discernible milestones – Orientalism, Scientism and Relativism – that characterize the study of history and sociology of science in general. A point that Raina examines in most of the essays is how one or all of these 'isms' make their appearance to a greater or lesser degree in the study of history of science, specifically in the Indian context.

The second common theme is that the social, political and cultural contexts of pre- and post-independent India are used to show the inadequacy of conventional models as explanatory frameworks for the complex and rich history of science and technology in the country.

As many scientists may not be familiar with some of the concepts routinely used by historians and sociologists of science, a few words of explanation may be appropriate. The second part of the title of Edward Said's celebrated book *Orientalism: Western Conceptions of the Orient*, is probably the shortest and best definition of Orientalism. Said pointed out that '[Orientalism is] a dynamic exchange between individual authors and large political concerns shaped by the . . . empires in whose intellectual and imaginative territory the writing was produced.' This is a point frequently encountered and established in many of the essays in Raina's book. Scientism and Relativism

are harder to define and at a first approximation, they correspond to the two extremes of a spectrum of views about science. While Scientism looks at science as a given entity, ascribing it a transcendental and value neutral status, independent of social and historical contexts, Relativism denies scientific knowledge and truth any special status and equates them with that of any other system of belief.

Raina's Introduction sets the stage for '[situating] the historiography of science in India within a social theory of science'. While a practising scientist may find this and what follows somewhat obscure, a persevering reader could learn a lot, the terminology and dare I say, jargon notwithstanding, especially about the powerful influence society wields on the way images of science and scientists are represented in historical writings.

The second chapter, 'Scientism and romanticism', discusses how these two more or less mutually exclusive ways of interpreting the history of science and culture have manifested themselves in the Indian context over the last hundred years or so. Raina briefly outlines in four distinct phases, the main features of the way in which history of Indian science was looked at. These phases correspond to Orientalism, pre-independence nationalism, post-colonial reconstruction and post-positivism. Raina's balanced approach brings out the distinct character, or, should one say, the dominant belief and agenda of each phase that is sometimes closer to myth than reality.

As Raina points out, what 'prevented the realization of scientific revolution in India' remains a central question even today. Within a rational framework, Prafulla Chandra Ray (P. C. Ray) and others correctly identified the separation brought about by social forces between theoretical and practical knowledge (in today's context 'science' and 'technology') as the main reason for the decline of Indian science. Indeed a plausible and convincing hypothesis is that pointed out by Debiprasad Chattopadhyaya, viz. identification of the caste system as the main driver for this separation. It is less easy to see the rationale behind the rhetoric of anti-science academics who depict science as an exploitative instrument for the propagation of Western hegemony. It is to Raina's credit that he is able to bring out the core thesis that characterizes each phase in a short space, without making any value-loaded pronouncements.

The third essay on renowned chemists P. C. Ray and Marcellin Berthelot, is the one that I liked best. Both made significant contributions to the history of science in the late nineteenth and early twentieth century. Raina's thesis that Ray's choice of research problem and his interest in the history of chemistry in India were strongly correlated, is especially attractive. As he says, 'the aim is [to discuss] the relationship between his scientific research program and his deliberations on the history of Indian alchemy during the 1885–1907 period'. Raina's argument to back this thesis is a fine example of 'historiography' (the history of historical interpretation) at its best. The influence of the historical milieu of Bengal at the turn of the last century on Ray's intellectual growth and worldview is lucidly described. Ray's involvement with the *swadeshi* movement, his keen interest in setting up an industrialization programme based on chemical technology, and his attraction for Gandhian politics and asceticism are discussed to show how 'pre-independence nationalism' is the correct context in which Ray's work needs to be viewed.

In a letter to Berthelot in 1896, Ray had questioned Berthelot's thesis that it was the Syrian Reistrains who carried Greek alchemy in general, and the medicinal use of mercury in particular, to India and China. Berthelot responded with grace and objectivity. Ray subsequently wrote *A History of Hindu Chemistry* in two volumes, the second of which was dedicated to Berthelot. Based on Ray's work, it was generally accepted by the historians of science that Indians, and not the Greeks, had priority in the use of mercurial and metallic drugs. As an aside one wonders how much hype the same observation would have created in today's IPR-dominated world of science.

Raina provides elegant analyses of Ray's research publications to show that the chemistry of mercury and more specifically, the position of the element in the Periodic Table were questions that dominated Ray's research endeavours between 1894 and 1907. He makes a compelling case for a strong correlation between Ray's scientific research programme and his historical project – the conjuncture of science and history, as he puts it. Apart from the significant connection that Raina shows to have existed between Ray's mercury-based research and his interest in ancient Indian chemis-

try, there are nuggets of historical facts backed by appropriate references that tell us a lot about Ray. Raina establishes quite clearly that '[Ray's] politics was at one level predisposed to the emancipation of the "oppressed" and . . . opposed to European rule over the Asian people'.

The fourth chapter is based on the interactions between the Belgian historian of science, George Sarton and Ananda K. Coomaraswamy who was a Sri Lankan-born art historian. Sarton, 'probably the most effective evangelist of the history of science during the first three decades of the twentieth century', recognized Coomaraswamy's scholarship and originality as a thinker. The editor of a journal called *Isis*, Sarton published Coomaraswamy's sympathetic review of the work of the French 'Orientalist' René Guénon. Sarton also described Coomaraswamy as someone 'deeply versed in Eastern as well as Western lore . . . the leading mystical philosopher . . . [and] most able to study Guénon's views from the inside'.

The source materials used for contextualizing Coomaraswamy's world-view are many. They include his metaphysical treatise 'Time and Eternity'. The main point that emerges out of this essay is that although both these men wrote on different aspects of history – one on the history of art and culture and the other on the history of science – they both had a deep faith in humanism. In the strife-torn world of their time, this faith and commitment to humanism found its expression in different ways in their writings and made their exchange that much more noteworthy. Sarton did not believe that the value of scientific truths had anything to do with the power that the society of his time bestowed upon it. To him 'History of science is the only history which can illustrate the progress of mankind'. History of science is also a critical component of effective humanism because it 'will teach men to be . . . brothers and help one another'.

In contrast, Coomaraswamy, a student of geology and botany, discoverer of the mineral thorianite, and an ardent supporter of the freedom struggle in India, found any description of knowledge, culture, etc. incomplete unless its common origin in folk art, language, etc. was taken into account. To Coomaraswamy, the real importance of history lies in the fact that it shows the 'universality of fundamental ideas'. Raina does an excellent

job of showing how the world-views of both these intellectuals were influenced by the historical time in which they lived. This reviewer agrees with Raina's description of his own essay as an interpretation that is 'probably more charitable towards Coomaraswamy than Sarton'. In fact, it is here where context is stretched to the limit to produce the most charitable interpretation of Coomaraswamy's world-view.

The fifth chapter titled 'Science, scientists and the history of science in India', covers the period 1966–94. The title is ambiguous, in the sense that it does not have much to do with either science or the scientists of this particular period, but is an incisive, data-based analysis of the way history of Indian science is written about in India. A bibliometric analysis of the articles published in the *Indian Journal of History of Science* during the above-mentioned period shows that a large majority of the authors are obsessed with the history of Indian astronomy and mathematics in the ancient, medieval and early medieval period. This is strikingly in contrast to the near-zero interest in the history of Indian technology of any of these or other periods. Raina argues persuasively that 'The object of investigation called science appears to be frozen in time and eternity.'

The later sections of this chapter deal with what Raina calls 'philosophical approaches' aimed at finding parallels between today's science and Indian knowledge and practises of earlier times. Works by Subbarayappa and S. N. Sen on the Vaishika philosophical school, a school of thought aptly described as Indian atomism, are presented from this perspective. The perceived slow introduction of science is discussed to show how historical and political contexts define the broad contours of basic concepts such as 'science', 'knowledge', etc. The argument here is somewhat dense and difficult to follow, especially to a non-specialist like the present reviewer.

The same holds true for the last three chapters that show other less obvious manifestations of the context dependence of studies in the history of science in general, and the history of science in India in particular. 'The missing picture' examines why there is no work in India that may parallel Needham's celebrated work *Science and Civilization in China*. This is done to highlight how the images of science and civilization themselves have

undergone substantial changes from Needham's time. To practising scientists, Raina's rhetorical question immediately rings a bell. The question as to why Indian science has been unable to repeat the pre-independence glories of Raman, Sen and Saha after independence has been asked far too often, not just in science magazines but also in newspapers. Those who ask this question and those who try to answer it, will hopefully see part of the context-dependent fallacy that is inherent in questions of this type.

The chapters titled 'Reconfiguring the center' and 'From West to non-West' elaborate on the basic inadequacy of a Eurocentric model of history of science that proposes that the spread of science was unidirectional, i.e. from Europe to the colonies. Such a model ignores the significant two-way interaction that took place between the knowledge systems of the colonizer and the colonized. The celebrated and productive exchanges between Ramanujan and Hardy, and the lesser known but equally significant ones between Ramachandra and De Morgan, are two cases in point. More importantly, since the Eurocentric model views science as a monolith, the political motive that accompanied the spread of only certain branches of sciences in the colonial context is overlooked. Raina points out, as other science historians have done, that 'The sciences that served the colonial need to survey and map the continent, and to ensure . . . expropriation of resources . . . were rapidly instituted.'

The last essay, 'Future trajectories', is extremely broad in scope but brief. It points out the emerging areas of science and technology that are expected to have a major impact on the practise of science and its image and representation in sociological studies. Most of the issues discussed will probably be of more interest to sociologists and historians of science than to practising scientists. The point that needs to be noted by scientists as citizens is that the downside of a globalized free market, in all likelihood, will give rise to economic and social tensions in the Third World. In such a situation mythical reconstruction of the past and jingoism, both of which go against the essence of science, may hold sway in historical studies.

In summary, this book may help practising scientists and technologists to understand a little better the ever-changing perception of their crafts by the rest of

society. Its objectivity, the fine quality of the arguments and analyses, and overall readability would also have definite value to academic sociologists and historians with an active interest in the study of science. However, the terminology and concepts used in the book have the in-built constraint that they must be accepted by academics of that particular subset. A majority of practising scientists would not be familiar or care to understand words such as 'realistic constructivism and constructive realism', 'triumphalist vision of modern science', etc. In other words, the untrained mind, especially one unfamiliar with academic social sciences, could find it heavy-going.

SUMIT BHADURI

*Reliance Industries Ltd.,
Swastik Mills,
V. N. Purav Marg, Chembur,
Mumbai 400 071, India
e-mail: sumit_bhaduri@ril.com*

Quality Standards of Indian Medicinal Plants. A. K. Gupta (co-ordinator) Vol. 1, Indian Council of Medical Research, P.O. Box 4911, Ansari Nagar, New Delhi 110 029. 2003. 262 pp. Price: Rs 600; US \$ 40.

Herbal medicine (based on plants), also referred to as alternate medicine/traditional medicine/complementary medicine, has been in use in India since time immemorial. Nearly 70% of the human population is reported to be dependent on plant-based medicines. The current value of the Indian system of medicine (Ayurveda, Sidha and Unani) and homeopathy is estimated to be around Rs 4000 crores. Over 8000 plant species are reported to be used to prepare some 25,000 formulations to treat various ailments. Even in Western countries, there has been a renewed interest in herbal drugs and the demand for plant-based drugs has increased dramatically in recent years. The current global market of medicinal plants-related trade is estimated to be around US \$ 62

billion. However, the global market for Indian herbal drug industry is yet to be exploited fully. One of the most important reasons for this under-exploitation has been inadequacy or non-availability of quality standards for herbal medicine. For developing drug standardization, the quality of base material used for formulating the herbal products is a prerequisite.

Since the materials used in herbal drugs are traded mostly as roots, bark, twigs, flowers, leaves, and fruits and seeds, visible authentication of the material used is difficult and has led to a high level of adulteration. To identify and authenticate the materials, the availability of detailed morphological, histological and pharmacognostic information is essential. Identification of active principle(s), wherever it is known, or a biologically active marker compound requires their standardization using appropriate chemical procedures such as TLC, HPTLC, HPLC and GLC.

This volume is an earnest attempt toward fulfilling these major lacunae. It is the result of the initiative taken by the Indian Council of Medical Research (ICMR) for development of standards for about 200 medicinal plants commonly used in India for their therapeutic value. A Task Force involving scientists from four institutions has prepared this first volume containing data on pharmacognostic and phytochemical information along with other relevant data on 32 medicinal plants. Work on the remaining plants is reported to be in progress, with more volumes likely to appear in the coming years. These attempts for developing standards for medicinal plants are only the beginning; it is going to be more difficult to develop standards for herbal drugs. The enormity of the problem has been highlighted in a recent publication in *Current Science* (Sangwan, R. S. *et al.* 2004, **86**, 461–465) describing the results on phytochemical composition of ten products of Ashwagandha (*Withania somnifera*) available in the market. The content of withaferin A (the main active constituent of Ashwagandha) has been shown to be variable by more than 70-fold in different products.

For each species included in the volume, the botanical name along with the authority, family, synonym, plant part(s) used in drug preparation, habit and habitat, English, Hindi and other names available

in regional languages are given. Colour photographs of the plant and parts used in drug preparation are given and this helps to some extent in the identification of the plant/ its parts, even to the layman. A comprehensive account of both macroscopic and microscopic (histological and anatomical) description of the part used along with colour photographs and line diagrams follows. Major and other chemical constituents together with their structures are included. Details of identity test (TLC/GLC) and analytical method(s) (GLC, HPTLC, HPLC) together with the description of the procedure and chromatograms are given. Other aspects included for each species are: quantitative standards, adulterants/substitutes, pharmacology and therapeutic category as mentioned in Ayurvedic texts, safety aspects and dosage. At the end, full references of the cited publications are given. The quality of colour photographs and particularly the line diagrams is generally good.

There are several appendices at the end: methods for evaluation of crude drugs, phytochemical evaluation of raw material, methods for isolation of some markers, drying and storage of raw materials, and pesticides, residues and microbial contamination. These are useful. Indices give botanical names, chemical constituents and other names of the plants.

The volume is certainly the right step toward improving the quality of herbal drugs in the country. It will be useful to the industry (to procure authentic materials that contain essential components as required under pharmacopoeia standards, and thus maintaining the quality of the drugs), drug analytical laboratories, drug control authorities and researchers on medicinal plants. The present volume and the forthcoming publications would help in giving the required boost to the industry. ICMR and members of the task force are to be congratulated for bringing out this quality publication. I hope that the coming volumes in the series are also going to be of the same quality and utility.

K. R. SHIVANNA

*Ashoka Trust for Research in
Ecology and the Environment,
659, 5th 'A' Main, Hebbal,
Bangalore 560 024, India
e-mail: shivanna@atree.org*