Image Modeling of the Human Eye. U. Rajendra Acharya, Y. K. Eddie Ng and Jasjit S. Suri (eds). Artech House, Inc., 685 Canton Street, Norwood, MA 02062, USA. 2008. 359 pp. Price: US$ 149.

Gone are the days when patients visited specialists and were treated in super specialty hospitals. Do not be surprised if your doctor refers you to a sophisticated computer centre which treats eye disorders or a robotic manipulator which fixes your arm. We have already started seeing the benefits of computer-aided diagnostic and prognostic tools in various disciplines of medicine and surgery. Even more interesting is the fact that most disciplines have 'converged' and there is no single line of demarcation as it was earlier. Innovative technologists have been using their engineering skills to reduce human pain and suffering in the field of medicine and this book is just one of those resource books which takes image modelling of the human eye to a higher level.

Three pioneers in the field of bioinformatics and biomedical imaging have come together to create an image modeling of the human eye and explain how it could help identify the different stages of retinopathy, maculopathy, glaucoma, etc. All of them are surprisingly engineers with a background in electrical or mechanical engineering from Cambridge, Singapore and Washington. The book has been divided into 17 chapters and is the first of its kind to explore a new generation of computational methods that combine image processing, simulation and statistical discrimination tools to improve early detection of cataract, diabetic retinopathy, glaucoma, iridocyclitis, corneal haze, maculopathy and many other visual impairments and conditions.

Since the book is a perfect example of interdisciplinary subjects, the first chapter is focused on the human eye, i.e. its different parts and pathology. Once the reader is clear about the intricacies of the human eye, the authors move on to imaging optics and imaging systems. The principles, applications, advantages and limitations of the imaging systems are covered in detail with pictures, diagrams and sketches for five different imaging systems, viz. tomography, confocal laser scanning microscopy, MRI, optical coherence tomography and ultrasound imaging. The real content of the book comes alive in the fourth chapter (after about a 100 pages), where the authors combine complex algorithms and artificial neural network-based classifier to demonstrate anterior segment eye abnormalities automatically.

This comprehensive resource book presents the latest advances in computer-based detection and identification of various eye conditions, including issues involving automatic retinal image registration, computer-based optic disc localization and contour detection using eclipse fitting and wavelet transform. Different ocular pathologies have been discussed in different chapters and each chapter is well organized into introduction, methods, results, discussion and conclusions. Nearly 250 illustrations have been included in this resource book but all of them are mainly in black and white. Colour images/photographs would have added more lustre to the overall quality of this well-written volume.

This book explains various infrared and bioheat analysis methods, including 2D and 3D ocular surface temperature profiles produced by FEM/BEM (finite element method/boundry element method) simulation of the eye structure. Corneal surface temperatures with contact lens wear, boundary element modelling of heat transfer in the eye and the role of aqueous humor hydrodynamics in human eye heat transfer have all been well explained by the authors.

The last two chapters present the results of a clinical study that utilized dynamic ocular thermography and a statistical study on changes in the ocular surface temperature with age using IR thermography.

The editors of the book have chosen accomplished contributors and collaborated with technologists, surgeons, doctors, clinicians and computer scientists to produce this unique volume. It is also heartening to note that a lot of work mentioned in the book was carried out in India and several Indians have created benchmarks in the field of image modelling. This book has created a unique niche for itself and will be referred time and time again by computer scientists, technologists, students, clinicians and anyone who chooses to gain knowledge about image modelling and use the same for the betterment of mankind.

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Social History of Science in Colonial India (Themes in Indian History; Oxford in India Readings). S. Irfan Habib and Dhruv Raina (eds). Oxford University Press, New Delhi 110 001. 2007. 385 pp. Price: Rs 695.

Even after six decades of independence, effects of colonialism remain in India today. English language dominates as the medium of communication, with *c*. 100 million using it with facility[1]. Societal plurality, multiple languages and an allegiance to traditions characterized XVIII–XIX century India, contributing to a hard-to-imagine social structure. These characteristics interacted with each other in complex ways, eventually widening the gap between indigenous and introduced knowledge systems, including the sciences. Moreover, nationalism was emerging strongly which, looking back, has added another dimension to India's social complexity. Nationalistic science gained in significance invigorated by the thoughts and actions of nationalist–scientists such as Prafulla Chandra Ray. Mahātma Gandhi, who influenced Ray's thinking on nationalistic science, was critical of the materialistic philosophy of Western science. However, philosophers of Indian history reiterate that Indian science of the colonial time grew entwined with the complex social context[2,3] – a configuration that contests George Basalla's view[4] of the influence of Western science on the growth of colonial science.

This volume chronicles and validates the rise of Indian science in the social context of XVIII–XIX century India. It includes 12 chapters (all of them being previously published articles as either book chapters or journal papers between 1979 and 2000) on diverse, but interrelated dimensions of the social history of science in colonial India, written by eminent historians of colonial science with most of them from India (S. I. Habib, D. Kumar, K. N. Panikkar, D. Raina, S. N. Sen and S. Visvanathan) and others from Australia (R. MacLeod), Canada (Z. Baber), France (K. Raj), UK (I. Inkster) and USA (S. Dasgupta, M. H. Edney, G. Prakash and R. Dionne). The preface clarifies the context of the volume; the remark that this volume will refrain from referring to any aspect of social history of either medicine or environmental science in colonial India dampened my enthusiasm, because my personal interest in the history of Indian science remains in precisely those disciplines.

The introductory chapter (by the editors?) dilates on the theme of the volume offering an explanation of the links among science, politics and the social context; challenges Basalla's view[4] on colonial science; explains 'colonial science' as a term invented to describe a particular stage in the institutionalization of science in the colonies, and concludes with a comment on the contemporary Western philosophies that drive scientific thinking. It also refers to Macaulay's agenda of social engineering through education. The following observation:

> 'The multicultural history of science appears to suggest that universality is not given a priori but is constantly refurbished and thus evolving in time. This evolution occurs within the context of encounter of local scientific knowledge. The current preoccupation with scientific and cultural practices, the renunciation of the tropes of 'original texts' and 'original homes' of science, and a critical awareness of the categories and theoretical constructs we employ may yet lead us onto a more cognitively adequate and interesting version of the transmission of scientific and technological knowledge'. (Introduction, p. xxxv),

is powerful and should stimulate historians and philosophers of Indian science to explore its intent. Outlining the cultural trends in pre-colonial India, Panikker questions some of the assumptions on the XVIII century Indian society. At the same time, he reinforces that Indian intellect and creativity have remained vibrant in spite of the stressful politics and strained economics of that time.

In the chapter 'Introduction of Western science in India' (adapted from Sen's article in the *Indian Journal of History of Science*, 1988), Sen refers to studies by European naturalists and especially to that of Hendrik Adriaan van Rheede tot Draakenstein (Dutch Governor of Cochin) and his monumental *Hortus Malabaricus*, an English edition of which is currently available[5]. A reference to the work of James Anderson exists in this chapter, which has missed to capture (inadvertently?) the following: Anderson (referred as 'James Anderson M. D.', because another James Anderson (with an LL.D.) practised law in Madras at the same time)[6] established a nopalry in Saidapet (a suburb of modern Madras) in 1789 for rearing cochineal insects (species of *Dactylopius*, Hemiptera: Coccoidea; Nopal is the Spanish name of the Mexican prickly pear *Nopalea cochenillifera* (= *Opuntia cochenillifera*), Cactaceae; nopalry is a garden of *N. cochenillifera* to raise the carmine-dye yielding cochineal insects.)[7]. The Saidapet nopalry was closed and the cacti were moved to Lal Bagh, Bangalore in 1800. Anderson, while serving as Surgeon-General, developed a botanical garden in Madras (in Haddow's Road area, where a suburb by the name 'Anderson Gardens' still exists, although the garden does not). Here he experimented with silkworm rearing, cotton cultivation, and raising exotic plants till his death in 1809. Sen also refers to the work of William Roxburgh (1751–1815), a Scottish surgeon of the Indian Medical Service first in Madras, then in Samalkot ('Samalkottah', Northern Circars of the then Madras Presidency, now in Andhra Pradesh), and finally in Calcutta, who is remembered for his contributions to Indian botany. Few know that Roxburgh catalogued climate patterns in Samalkot and documented the El Niño phenomenon[8,9] by collecting datasets pertaining to atmospheric temperature and pressure in 1778, and predicted the droughts that occurred in 1789. Roxburgh obtained extensive meteorological data, when serving in Madras, by obtaining three measurements each day, using a Ramsden barometer and a Nairne thermometer – instruments of repute then[9]. In the chapter by Sen, while reading about the Calcutta Medical College (p. 77), I was looking for remarks on the Madras Medical College (MMC), which was also founded in 1835 and included surgeons of eminence like Charles Donovan (discoverer of the leishmaniasis–causing protozoan)[10] and William Niblock (author of the widely cited paper 'Cancer in India', *Indian Med. Gaz*., 1902, **37**, 477–482; performer of the first successful gastrojejunostomy in India in 1905)[11] on its faculty, although the General Hospital of Madras to which MMC remains attached was founded much earlier, in 1664 in Fort St George[12,13].

In a passionately written chapter, and befittingly the concluding chapter of the volume, Kumar refers to the powerful debates on determining a convincing nationalistic context for the science of that time and perceptions of science being a thoroughly divergent element from technology that occurred among Indian scientists of the early XX century. Considering the concluding comment,

> 'In today's India, one sorely misses the quality and intensity of the early to mid-twentieth century development debates',

in the context of its discourse, I agree with Kumar. Or, could it be so that today we do not have scientists who can speak boldly and from their hearts as those of the early XX century India?

Chronicles of the dynamics of science history within complex social contexts of a specific time-frame cannot afford to overlook any societal prejudices that would have prevailed then. Colonial India was no exception because discomforting human prejudices have indeed marred the growth of Indian science[14]. But what cannot be ignored is that science in colonial India did grow also because of people of non-Indian origin. As an example, I refer to a paper published in 1934 by Eleanor Mason, a North American, who was on the academic staff of Women's Christian College (WCC), Madras[15]. This paper impresses as a brilliant study offering meaningful inferences, done with adequate samples and reliable measurements in the 1930s. Whether Mason left a legacy of quality in scientific research in WCC, and in turn, in Madras, I could not verify. But I am convinced that the science of XVIII–XIX century India has grown more by synergism and not by the overpowering of indigenous science by Western science[16,17].

Information and the depth of analysis in a couple of chapters (e.g. Raj on 'New knowledge and national identities' and Dionne and MacLeod on 'Science and policy') were beyond my understanding. However, all the chapters impressed as repositories of vital information that would be useful to students of history and philosophy of Indian science. They are well edited, in spite of being from different sources and of different publication times. Chapters are consistent in their styles of presentation and are generally easy to read. Each chapter, written by experts, is a mine of information with appropriate comments provoking the reader for further exploration. The volume is attractively finished and the price is reasonable for the quantity of information and quality of details. The bibliography (pp. 378–392) that includes references up to 2005 is valuable. Absence of an index was frustrating. Abstracts at the start of the chapters would have been of help. In summary, the Habib-Raina volume is a

quality contribution to the social history of science in colonial India. It will be a vital resource not only for those teaching the philosophy and evolution of Indian science, but also to students of higher-degree programmes of any scientific discipline in India. Students, in particular, would find this volume useful in strengthening their understanding of the social dynamics that orchestrated the rise of science and scientific temperament in the recent past in India, and how it is in contemporary India.

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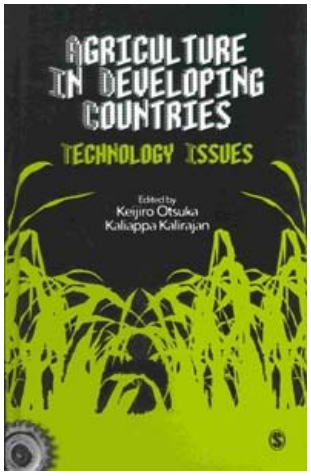

Agriculture in Developing Countries: Technology Issues. Keijiro Otsuka and Kaliappa Kalirajan (eds). SAGE Publications India Pvt Ltd, B-1/I-1, Mohan Co-operative Industrial Area, Mathura Road, Post Bag 7, New Delhi 110 044. 2008. 163 pp. Price: Rs. 450.

There is no doubt that agriculture in the developing countries is in turmoil. Millions of resource-poor rural farming families are expected to produce enough to ensure food security at the national level, and also manage their own livelihoods and household level food security, in an ever-increasing grim scenario of environmental degradation, acute freshwater shortage and a free but not fair trade in the globalized market. The human population in the developing countries is now growing at an annual rate just above the food production. In addition, unsustainable lifestyle is rapidly exhausting the natural resources. The 'ecological footprint' has exceeded earth's capacity to provide basic human needs and absorb the waste. Also, in many of these countries, the arable land is diverted for non-agricultural purposes. Consequently, several national and international organizations are looking for suitable models to achieve productivity in perpetuity without ecological harm to meet the growing demand for food on the one hand, and increasing the income of the farming families on the other.

Lessons learnt from the green revolution of the 1960s and 1970s are that unless the ecological foundations of agriculture (i.e. water, soil health, biodiversity, atmosphere) are kept intact, high levels of productivity would not be sustainable. The importance of the 'traditional knowledge' of the farming families and the essential need of a 'bottom-up' approach in developing technologies for farm operations are now well recognized. Further, the rural technologies must be pro-nature, pro-poor and pro-women orientated.

On the premise of the above-mentioned principles, several articles, reviews and books have already been published. The book under review falls in this category.

The book consists of eight chapters written by authors with considerable field experience. In the first chapter, the editors address the technology issues in agriculture in the developing countries. They rightly emphasize the need for a shift from the predominantly 'top-down' approach to integrating the traditional knowledge and experience of the farmers with frontier science and technology in the development and dissemination of ecotechnologies to the rural areas. It is rightly emphasized, 'unlike technological changes in manufacturing industries, realization of potential outputs from agricultural technologies depends largely on farmers' adjustment efforts in production, compounded by the complexity and uncertainty associated with the climate changes'.

The traditional practice based on conventional wisdom of the rice farmers in Bangladesh is effectively brought out by Azad and Hossain. Double transplantation of rice system is an effective strategy to achieve economic efficiency and profitability by greatly minimizing loss due to submergence in the flood-prone rice ecosystem in Bangladesh. Of course, modern plant breeding to evolve submergence-tolerant rice varieties is the relevant technology.

In chapter 3, Ananth *et al*. have shown that agricultural research investment leading to the development of improved varieties of rice and sugarcane and continuous upgradation of technologies has resulted in higher rate of return to agricultural research estimated by using the 'total factor productivity'. The returns were negative in respect of red gram, groundnut and sunflower, which had no investment in research. These are the crops which require less irrigation and are greatly suited for dryland agriculture. More public-funded research in these crops will facilitate yield improvements in the fields of resource-poor small farmers in the largely rain-fed regions.

Chapter 4 by Macleod *et al.* brings out the value of the traditional systems which integrate farm animals and crops in a mutually reinforcing manner. The farm