

BOOK REVIEWS

velopment, the topics that these chapters deal with were the least familiar to me.

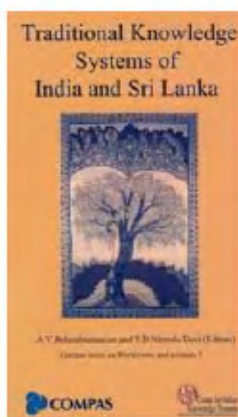
The last chapter discusses the evolution of multicellular development. It contains the idea that I have mentioned earlier: the developmental mechanisms of today have been achieved by gene-based fine-tuning. This insight highlights a feature of natural selection that is sometimes forgotten, namely that it both moulds traits and moulds them *reliably*. Besides tending to achieve the appropriate mean value for a trait, in general natural selection tends to reduce the variance in the trait. Genetic fine-tuning can act on ancestral, poorly defined outcomes that are achievable via physics and chemistry acting in concert with a skeletal genetic ensemble that is needed for metabolism and reproduction. Physics and chemistry lead to approximate outcomes; further evolution makes them more and more precise. The way it does so is by making opportunistic use of a number of undirected processes, among them gene duplication, mutation and gene shuffling (recombination). The variants that result are tested and those that lead to an increase in reliability are preserved. The randomness inherent in evolutionary change makes it inevitable that finally, what is seen includes a great deal of genetic clutter. The clutter obscures the underlying physics. It can become difficult to perceive that there is any interesting physics at all.

The strengths of this book are the use of lucid prose, the gentle way in which the required physics is brought in, and the successful fusion of formal ideas with factual information concerning known genes, their activators and repressors. I should not omit to mention the illustrations, which are artistic. Students with a background in physics, chemistry or mathematics, and an interest in biological problems, will benefit greatly from this book, which can serve as an excellent text for a course in developmental biology. Forgacs and Newman have assimilated much from a vast and diverse literature. They manage to convey a great deal of information, interesting in itself, about embryonic development; my guess is that most developmental biologists will be familiar with only a tiny part of it. In contrast to what could have been a micro-manager's guide to development, *Biological Physics of the Developing Embryo* tries to look at the big picture.

But Forgacs and Newman go beyond that. They point the way to a plausible merger of the two levels of explanation in biology: the one obtained after applying deterministic physical laws to the developing embryo, and the other based on a consideration of the contingent historical process of evolution. Marx would have liked it.

VIDYANAND NANJUNDIAH

*Indian Institute of Science, and
Jawaharlal Nehru Centre for Advanced
Scientific Research,
Bangalore 560 012, India
e-mail: vidya@ces.iisc.ernet.in*



Traditional Knowledge Systems of India and Sri Lanka. A. V. Balasubramaniam and T. D. Nirmala Devi (eds). Centre for Indian Knowledge Systems, 30, Gandhi Mandapam Road, Kotturpuram, Chennai 600 085. 2006. 263 pp. Price: Rs 250.

The book under review is a collection of mainly field studies on the contemporary applications of traditional knowledge (TK) in the development context. The studies cover a wide range of fields like healthcare, agronomy, livestock and veterinary sciences, water management, architecture and weather forecasting. It also has a section on methodology of traditional sciences and technologies and a section on policy issues related to traditional knowledge. It will serve as a useful introduction to the living traditions of indigenous knowledge in India and Sri Lanka and may surprise readers by the vitality and extent of their application.

This book has materialized in the context of a 10 year effort in promoting 'endogenous development' via, a network of individuals, non-profit and community-

based agencies, researchers and universities spread across 12 countries across Asia, Africa, Latin America and Europe called Compas.

In the introductory chapter the editors bring to notice the disparity in the public resource allocation and policy attention to TK compared to modern science. They also highlight that there is a completely different epistemological foundation for TK and point to the lack of appreciation of this fact by the mainstream scientists. They point out that there is strong revival of interest in TK today, which is an outcome of the critique of the modern mainstream monoculture.

In the first chapter titled 'Knowledge and sciences in the global context: Contradictions, competitions, coexistence, complementarity and coevolution', the author makes a comparative overview of TK in various continents and points out their common features. He advises us to look at worldviews, sciences and values not as universal but as expressions of a pluralistic reality. He therefore advocates intercultural/inter-scientific dialogue for mutual learning and co-evolution of knowledge systems.

Five papers in the agricultural section deal with various aspects of TK such as vrikshayurveda, documentation and validation of traditional knowledge, tribal agriculture and low external input agriculture. In this section Y. L. Nene gives a large number of examples of scientifically validated traditional agriculture practices like Kunapajala, a fermented liquid manure, made of various materials such as flesh, fat, marrow of animals, sesame oil cakes, ghee, etc., which is very effective for improving plant health. Yet another interesting article in this section is on 'Nawakekulam', a traditional agricultural practice of Sri Lanka, which minimizes water usage in cultivation. It is claimed that by reviving 'Nawakekulama' the national rice production can increase by 70%, increasing yield per acre. This section also contains well-researched articles from Gandhigram Rural Institute and Centre for Indian Knowledge Systems. The article on tribal agriculture touches upon interesting subjects such as tribal almanacs, soil, seed testing methods, intercropping systems, songs and proverbs.

Six papers in the veterinary section cover aspects like documentation and assessment of local veterinary practices both in India and Sri Lanka, mass pro-

motion of local veterinary practices through home herbal gardens, local herbal veterinary enterprises, conservation of local breeds and pastoral rights. An interesting article titled 'Punyakoti test' describes an Egyptian method of diagnosing pregnancy in cattle through urine analysis. All these papers although present preliminary results, they offer new and promising leads for innovations in veterinary science.

In the traditional healthcare section there are articles on topics like documentation of traditional food practices, assessment of traditional bone setting practices, revitalization of Dai (traditional midwives) and poison healers' tradition. An interesting article in this section by sociologist Harish Naraindas challenges the notion of 'innovation' in the field of traditional medicine and highlights contemporary challenges for trans-disciplinary work.

Though lone, the article on weather forecast provides significant information about weather forecasting traditions in Gujarat. Yet another solo article on water management delivers the key message that traditional methods of tanks and anicuts and their diversity has had a significant impact on food security. One article on vastu (traditional architecture) examines concepts and principles used in traditional houses and their modern adaptations in Sri Lanka.

There are seven papers on methodology of knowing and research, which provide a preliminary perspective for intercultural or trans-disciplinary research. However methodologically it is clear that there is still a long way to go in order to develop a comprehensive operational framework for trans-disciplinary research. Balasubramanian's article 'Is there an Indian way of doing science?' suggests that although there is a revival of interest in TK today, the comprehension of the epistemology of TK continues to be an area marked by ignorance. Ananda Wood's article 'New physics and old sciences' makes a deep distinction between modern and traditional sciences and points out that the methods of enquiry in modern sciences are restricted to investigating the objective sensory world in a way that excludes several dimensions of our mental faculties and their expressions of underlying consciousness. On the contrary, older sciences conceive nature in a way to include both the sensory world and an inner mental world by using deeper fac-

ulties of the mind giving rise to impersonal knowledge based on a subjective scheme of standardization.

There is a section on policy directions. Though loosely structured, this section puts forth many points for future action. Pushpa Bhargava's paper titled 'How to make India a knowledge based society?' discusses the government's strategy for traditional knowledge and its employment and income generating potential.

This book reminds us that we do have two parallel knowledge systems that inform social affairs in our subcontinent. The knowledge systems based on the western cultural and intellectual tradition are mainstream and they are adequately reflected in the formal education system at the school and university level. The TK systems exist without any institutional support except in the field of medicine. They are transmitted through an oral tradition kept alive by the commitments of individual knowledge holders.

DARSHAN SHANKAR

Foundation for Revitalisation of Local Health Traditions,
74/2, Jarakbande Kaval,
Yelahanka, Attur P.O.,
Bangalore 560 064, India
e-mail: darshan.shankar@frlht.org.in

The Vedic People: Their History and Geography. Rajesh Kochhar. Orient Longman, 2000. xiv + 259. pp. Price: Rs 300.

Every Indian or Indophile or perhaps even Indologist is exposed traditionally in one form or another to *Vedas, Upanishads, Puranas, Ramayana, Mahabharata, Panchatantra*, and so on. MeghaNad Saha and N. C. Lahiri in 1955 gave India its official solar calendar after examining the history of the calendar in different countries through the ages, although this calendar is little known to the average Indian, let alone used by any sufficiently large group of people. There have been few studies since then on similar topics by people or agencies other than vested interests with their own axes to grind. The study reported in the book under review is a rare example of such an unbiased, objective work. (Another example

is Amartya Sen's *The Argumentative Indian* – see especially the essay 'India through its Calendars'.) The book grew out of the author's Kosambi Memorial Lecture delivered in Delhi on 16 October 1992, and, as it happens, refutes (p. 77) Damodar Dharmanand Kosambi's 1956 argument that the invading Aryans shattered the Harappan dam system, ruining the agriculture and hence the cities. Astrophysicist-turned-Indologist Rajesh Kochhar 'seeks to interpret the historical and geographical content of the *Vedas, Puranas, Ramayana, Mahabharata* and [*Zend Avesta* (the Zoroastrian book)] 'in a global context' using data from 'archaeology, natural history, metallurgy, astronomy, geology and even genetics', plus linguistics, history of technology, hydrology and other disciplines. He does this, eschewing any vested interest, and examines the available evidence in each discipline independently, and only then correlates very fruitfully across disciplines. Similar studies of other ancient texts of the world should benefit hermeneutics, the contextual study of their contents in a holistic, comparative manner.

In a nutshell, the book argues that a major part of *Rigveda* was composed in south Afghanistan from 1700 to 900 BC, before its nomadic composers entered the Punjab plain and well before they moved east of Ganga. During their migrations, these Indo-Aryans not only carried with them their rituals and hymns but also place and river names which they selectively reused. In particular, the Rigvedic description of Sarasvati and Sarayu fits the Afghan rivers Helmand and Hari-rud better than any river in India. Hydrological studies (including meander) of the various river systems over the millennia are needed to fully interpret these pieces of literary evidence. Two other constraints imposed by natural history are: the proto-Indo-Europeans domesticated the horse; and the Rigvedic and Avestan Aryans, but not other Indo-Europeans, built a cult around the Soma/Haoma plant, identified with Ephedra, as the author clearly shows, removing the confusion created by modern European studies, which indiscriminately multiplied the possibilities for Soma/Haoma, rather than eliminating those that did not fit the available evidence.

Apart from the preface, list of figures (totalling 6), maps (13) and tables (15) at the beginning, and notes, references and index at the end, the book is divided into