Monograph on Radioactivity of the Environment. C. Rangarajan, Sarada Gopalarishnan and S. Sadasivan. Indian Nuclear Society, Project Square, Anushaktinagar, Mumbai 400 094. 2002. 49 pp. Price not stated.

Environmental background radiation has been one of the most widely studied topics by the health and safety community. Not infrequently have such studies produced controversial findings. For instance, a recent publication in the *New Scientist* claims that most cases of the commonest types of childhood thyroid cancer could be caused by low-levels of natural radiation from rocks and cosmic rays. On the other hand, there have also been several publications in the past that have reported that low levels of radiation are indeed beneficial to health, as they stimulate the DNA repair mechanisms and enhance the body's immune response. This phenomenon is referred to as radiation hormesis. The Indian Nuclear Society (INS) should be commended for its laudable efforts to bring out a monograph on such an important topic. The authors, in view of their long and rich experience in the measurements of atmospheric radioactivity, are eminently suited to handle the topic.

The monograph gives an excellent outline about the sources and types of radioactivity in the environment as well as their magnitude and distributions. Both natural and man-made sources are well discussed and their differences are highlighted. The reader will get a good idea of how the radioactive material is transported in the environment, through air, earth and water. Atmospheric diffusion properties have been described in great detail. Dispersions through water and soil are not covered to the same degree of detail. The fact that the exposure received by a member of the public from man-made sources like nuclear reactors is small compared to the natural background radiation, is highlighted. It is worth noting that the internal exposure accounts for 60% of the total exposure. The monograph also points out the fact that the diagnostic medical examinations account for much of man-made sources of radiation. The authors have thoughtfully included sections on basic concepts of nuclear physics and definitions of radiation.

There are a few minor avoidable errors. For example, it is stated that 'the limit for radiation worker is 20 mSv, effective dose'. The ICRP recommendation, in fact, is that the effective dose should not exceed 100 mSv over five years, with the annual limit being 50 mSv. The annual limit prescribed by Atomic Energy Regulatory Board of India for occupational workers is 30 mSv. In figure 5.2 showing the pathways of entry of radioactive elements into man, the important route from animal to man indicating the ingestion of meat and its products has been omitted.

After the collapse of the iron curtain, the world has come to know how the former Soviet Union had dumped indiscriminately, high-level radioactive wastes from its weapons programme into the Karchai Lake in the Chelyabinsk area, resulting in extensive contamination of Techa river and its environs. The exposures received by a large number of members of the public are high compared to even the population exposure in the Chernobyl accident. Extensive studies on the Chelyabinsk population, being carried out by a large number of international groups of scientists, are providing important inputs for the reassessment of radiation risks due to low levels of chronic exposures. It is surprising that the monograph has not made any reference to the Chelyabinsk site, which is arguably the most contaminated region on the earth today.

On the whole, the book is an excellent introduction to the subject under discussion. The level of presentation is such that the reader will not be put off by too many technical details which are typical of books dealing with such topics. INS should bring out more such monographs targeting the students and general public, to bring about an awareness among them regarding the myriad benefits to mankind from the applications of nuclear energy, and also to place the radiation risk in proper perspective.

A. R. SUNDARARAJAN

Flat 301, Raja Lakshmi Apartments, 24th Main, J.P. Nagar 6th Phase, Bangalore 560 078, India
e-mail: arsaerb@vsnl.net.

Sustainability and Management of Aquaculture and Fisheries. H. D. Kumar. Daya Publishing House, 1123/74, Deva Ram Park, Trinagar, Delhi 110 035. 2003. 429 pp. Price: Rs 995.

With reference to animal production, fisheries have some advantages: First, fishes are the cheapest source of animal protein and a health food. Unlike poultry, egg and meat, which are sold at a uniform price in the markets, fisheries constitute a unique sector, offering animal protein to the broad economic cross-section of the society, from a price as low as Rs 10/kg to as high as Rs 700/kg. Yet the low-priced fishes like the sardines are not low in nutritional quality, as their protein and energy contents are equally high, comparable to that of lobsters. Secondly, high fecundity (up to 1 million eggs) and fast growth rate (growth coefficient often > 1.0) of fishes have no parallel in other animal protein sources like the livestock, including poultry. The problem of feeding the world's 7–8 billion through agriculture in an environmentally sustainable manner, has prompted scientists to look towards water as a major source of food production. Not surprisingly, Kumar, who has authored books on algae, biodiversity and aquatic environment, has attempted in this book to discuss the present status and future prospects of fisheries and aquaculture, and their sustainability in the face of increasing demand for more and more fishes.

The book is organized in 10 chapters followed by glossary, bibliography and index. The first chapter introduces the subject with a focus on sustainability. This is followed by a detailed chapter on fish farming. Understandably, the achievements, especially the Indian capture fisheries and Chinese aquaculture are described in the fifth chapter. The seventh chapter pays special attention to ecological and biological importance of the declining wetlands and mangroves, and to environment. The last two chapters are devoted to futuristic management models of fisheries and aquaculture. In the remaining chapters, almost all aspects of fisheries and aquaculture are described, but not in the expected format, resulting in some kind of mixing. For instance, coastal aquaculture finds a place in marine fisheries, although there is a separate chapter on coastal aquacul-

ture. Yet, the author must be complimented for the clear and lucid presentation.

In the ensuing statements, the author's concern for fishing and biodiversity is reflected: 'Fishing is not just about catching fish and making money; rather it is bound up with the culture of coastal societies' (p. 81). 'Fishing has always been and continues to be a highly dangerous occupation' (p. 302). 'Fishing reduces both species richness and ecosystem stability (p. 88). Hence, the author had to strike the right balance between these opposing poles and the job is more difficult, with the provision of the Exclusive Economic Zones by the United Nation's Convention of the Law of the Seas, as these zones include about 90% of the world's fishing geographical area, and as many states have taken advantage of this new opportunity. The author has struck the right and justifiable balance by suggesting that any development plan must be economically sound, technically feasible, socially acceptable and environmentally sustainable. Hence, the management and conservation of the resource base must ensure the continued satisfaction of human needs for both present and future generations.

The reviewer is also constrained to point out incorrect statements and avoidable errors. For instance, it is stated that 'Fisheries began using such military technologies as radar, sonar and loran to peaceful attempts of food gathering. The technologies opened up the previously inaccessible possibilities of catching fish in dense fog, deep beneath the ocean's opaque blanket.... It is so overcapitalized with excess killing power that over $120 billion is spent each year to catch $70 billion worth fish' (p. 30). It is stated elsewhere (p. 88) that 'The total value of fish trade between nations exceeds $50 billion each year and the trade within nations is much more'. An estimate of marine fishes and products traded and consumed within India alone is in the range of $44 billion. Hence world production of marine fishes traded within and among nations must be more than $70 billion. Secondly, several tables and figures are densely accommodated in any chapter. For instance, there are 30 figures and 4 tables within 44 pages of chapter 3. Consequently, many remain to be fully explained and in many others, errors have crept in. In table 3.1, the quantity of global marine discarded bycatch is listed, and is expressed as ratio of the targeted species (?). For example, to land 10,000 t of eel, about 3360 t of bycatch is discarded. Not only is the corresponding ratio wrongly expressed as percentage, but is totally not understandable. The values are also not compatible with the corresponding ones in table 3.2. Thirdly, it is difficult to understand certain phrases; e.g. 'regression tree' (p. 105), 'chemicals entering receiving waters' (p. 160), 'ready breeding' (p. 230), 'easy breeding' (p. 232), and so on. Examples of avoidable errors are 'Eatern' (p. 79), and for reference cited in text but wanted in bibliography is Kumar 1995 (cited in p. 230). Yet these do not demerit the book.

The book represents a contribution to fisheries science.

T. J. PANDIAN

School of Biological Sciences,
Madurai Kamraj University,
Madurai 625 021, India
e-mail: tjpandian@eth.net

Geodynamics of the Lithosphere. Kurt Stüwe. Springer, New York. 2002. p. 449. US$ 69.95.

The author of the book Kurt Stüwe, deserves to be called the Renaissance man – a term usually reserved for a rare breed of scientists who have a wide range of interests. The blurb of this book describes him as a field geologist, a mountain-climbing guide, a Ph D in metamorphic petrology who has also contributed to varied branches within earth sciences, including geodynamics, geomorphology, geophysics and structural geology. The book is a reflection of the author's amazing grasp of various facets of geodynamic processes, technically a difficult subject to communicate – discussed in most lucid terms. This book differs from its predecessor *Geodynamics* by Turcotte and Schubert, a classic textbook in its own right, in that the target audience purportedly is the field geologists. The new book also differs in its emphasis on orogenesis, metamorphism, heat transport, crustal thickening and geomorphology, probably an indication of the author's own predilections as a geologist. The high point of the book is its treatment of mathematics and the way in which it is made accessible to field-oriented geologists.

The book opens with a discussion on the imperatives of developing mathematical models. The author justifiably points out that many geologists do not trust models (one is reminded of the 1992 inaugural address by Charles Drake, President of the IGC in which he made a tongue-in-cheek statement that 'model building, not truth, was what earth sciences is all about...'). In fact, modelling studies do provide us a powerful way of approximating the evolution of earth in space and time, as most of the earth processes are not amenable to direct observation even with most advanced instrumentation. Of course, a good quantitative model must be testable by observations, and it should be able to describe a 'large set of observations with a small set of parameters'. This book essentially tells you how we go about modelling various earth processes with mathematical tools. After this introductory chapter, the author deals with basic aspects of the theory of plate tectonics, and the discussion eventually veers round to the kinematics of processes that occur on spherical earth. A major part of the book is devoted to the thermal structure of the lithosphere – a starting point of any book on geodynamics. This chapter introduces the role of heat and temperature in the lithospheric processes, most importantly for regional metamorphism. The section starts with Fourier's law of heat conduction, goes onto the principles of heat production, advection, thermal structures of continental and oceanic lithospheres, temperature distribution around intrusives and thermal advection associated with fold and faults. The book deals in detail with other important topics like uplift, exhumation, isostasy, stress and strain, and rheology of the lithosphere. The last part of the book covers processes including mechanics of continental extension, collision and also some currently hot topics like evolution of mantle plumes. Finally, the author discusses the metamorphic evolution of rocks and its relation to changing pressure and temperature and deformation paths with respect to space and time.

What fascinated me most was the author's knack of blending field observations with theoretical studies from the point of view of causes and consequences. What we find on the surface is the ultimate effect of various processes that are taking place within the earth and the author is in a vantage position to focus on the interrelationships because of his