

## BOOK REVIEWS

the 'seat of free will'. The frontal lobe is not well-understood. It is affected in many syndromes, disorders and trauma situations, and is probably the seat of many known and as yet unknown biological processes.

The strength of Sternberg's book is the wealth of information about philosophers and their ideas, which he provides to the laypersons. He explains 'emergent properties', that the 'whole' is more than the sum of its parts, suggesting that free will could be an emergent property of the determined interactions between neurons. Often the author explains experiments and ideas without commenting on the results. Benjamin Libet's recordings of brain activity, Laplace's 'demon', and Descartes and his 'ghost in a machine' are such examples. Antonio Damasio's 'somatic marker hypothesis' suggests that our experiences leave 'bodily markers' upon our nervous system. Sternberg does not mention that today, these markers would be explained as new synapses.

Sternberg's writing technique is often self-indulgent. For example, he tells the story 'The Appointment in Samarra' to explain the difference between fate and determinism. He tells lengthy stories of Hercules and Hera, and Les Miserables. While charming, they do not add a great deal to his arguments. The book is entertaining and informative, but often groundless in its conclusions. Embarrassingly, Sternberg compares the rejection of free will by scientists to the historical rejection of the ideas of continental drift or quantum mechanics. He mentions Bohr and Heisenberg, but does not credit 'uncertainty' to explain the randomness in human behaviour. Sternberg appeals to scientists to study the 'conscious agency' scientifically, as the theoretical tools needed are already available! In his opinion, the boundlessness of our experience and reasoning cannot be explained by 'determinism' and hence free will must exist.

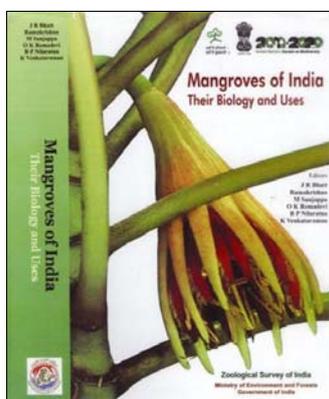
A wonderfully witty discussion on the meaning of free will is found in the essay 'Is God a Taoist'<sup>2</sup>. In this conversation between God and a mortal, God says, 'I could no more choose to give you free will than I could choose to make an equilateral triangle equiangular. I could choose to make or not to make an equilateral triangle in the first place, but having chosen to make one, I would then have no choice but to make it equiangular'. Another interesting idea comes from

Carter<sup>3</sup> that nature, of which our brain is a part, has created an illusion of free will giving us an apparent sense of responsibility necessary for smooth functioning of human society. Thinkers have also stated that if there is no free will, and no responsibility, it is necessary to rethink our laws and our punishments, and revise our societies<sup>4</sup>. The impression that we are making free, conscious decisions is in fact only a reflection of signals we receive from our surrounding, our genes, and the stochastic processes beyond our control.

1. Cashmore, A. R., *Proc. Natl. Acad. Sci. USA*, 2010; <http://www.mit.edu/people/dpolicar/writing/prose/text/godTaoist.html>
2. Smullyan, R. M., 1977, **107**, 4499–4504.
3. Carter, R., *Exploring Consciousness*, University of California Press, Berkeley, 2002.
4. De Duve, C., *Vital Dust*, Basic Books, New York, 1995.

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**Mangroves of India – Their Biology and Uses.** J. R. Bhatt *et al.* (eds). Zoological Survey of India, Prani Vigyan Bhawan, M-Block, New Alipore, Kolkata 700 053. 2013. XIV + 640 pp. Price: Rs 2950/US\$ 160.

Mangroves – considered a tropical beauty and surviving many odds for their existence in the transition zone between land and sea, have evolved many unique characters such as the ability to tolerate high salinity, extreme tidal conditions, higher

wind velocity, high temperature and muddy anaerobic conditions. With characteristics such as viviparous germination, strong network of respiratory roots, stilt and prop root system and salt excreting leaves, they are able to survive in a hostile environment. Mangroves are immensely helpful to the human society with their valuable ecosystem services, such as protection of coastline from storm surges, maintenance of water quality, sequestration of carbondioxide and provision of livelihood through fisheries, honey, tourism and innumerable products of commerce. In short, there is no other habitat which occurs under such an adverse condition and still serves the cause of human beings so well. The manner in which mangroves withstood the super cyclone which battered and devastated Odisha in 1999 and the Indian Ocean tsunami in 2004 which ravaged Tamil Nadu and Kerala, notwithstanding the Andaman and Nicobar islands, underscores their importance in protection of the coastline of India. Many publications have come out on the biology and biodiversity of mangroves, besides other topics. However, a comprehensive publication covering various vital aspects of mangroves was a long felt need. This book meets the above requirement admirably well.

The impressive foreword by the Honourable Minister of State for Environment and Forests (MoEF), Government of India (GoI), Jayanthi Natarajan, adds to the value and importance of the book. She is appreciative that this compilation of research on mangroves is being brought out during the UN Decade on Biodiversity (2011–2020) and India's Presidency following the hosting of the Eleventh Conference of Parties (COP-11) to the Convention on Biological Diversity in October 2012 at Hyderabad. What is significant is that this book has been released on the International Day for Biological Diversity, 22 May 2013, the theme of which (water and biodiversity) is quite relevant to the subject of this book.

This book is the outcome of a Workshop on 'Mangroves in India: Biodiversity, Protection and Environmental Services' sponsored by MoEF, GoI, during 2008 at Bengaluru to analyse the current status of knowledge on the mangroves in India with reference to their biology and uses. It is appreciable that a detailed exercise has been undertaken to

revise and update the contents of these papers prepared in 2008 with the latest data on the subject matter. The list of various species of organisms included in different articles will be immensely useful to those who try to make inventories on biodiversity from time to time. The list of endangered species will send a strong message to the readers about the need to protect them as well as the mangroves. Excellent photographs taken by experts add to the value of this compilation.

The book presents the history of mangroves, an atlas of mangrove species and organisms associated with mangroves, a gazetteer, an illustrated check-list, a textbook and a valuable guide, all kneaded into one which can whet the enthusiasm of nature lovers. Overall, the book is fairly comprehensive and can be considered as a good source of first-hand information about major findings on various topics of mangroves for researchers, teachers, students, administrators and planners. Very minimal inconsistencies enhance the value of the book. Editors of this book have to be congratulated for the mammoth effort they have undertaken.

The book has 56 articles written by experts. The contributions are organized under six themes, namely, (i) Status of conservation and management of mangroves in different states of India, (ii) Floral diversity and ecology, (iii) Faunal diversity and ecology, (iv) Mangrove utilization and environmental services, (v) Mangrove conservation initiation and people's participation, (vi) Policy and legal issues related to mangrove conservation. They cover the entire gamut of mangrove research. Of course, the length of each section varies based on the number of articles in that section. The senior editor of this treasure chest along with the co-authors, sets the stage admirably well with a detailed overview on the status of conservation and management of mangroves in different states of India. This article is followed by status reports on mangroves in Sundarbans, Tamil Nadu, Kerala, Karnataka and Maharashtra. It would have been nice if mangroves in Odisha, Andhra Pradesh and Gujarat also had been covered in this section. The section on floral diversity and ecology is an exhaustive one with as many as 16 articles covering the diversity of mangrove species, cyanobacteria, lactobacilli, fungi and yeast. Other aspects covered in this section include adaptation, phenology, reproduction, above-

ground biomass, standing carbon stocks and biochemical changes during rooting of air-layers.

The section on faunal diversity and ecology deals with interesting aspects such as diversity of insects, their relationship with special reference to herbivory in the mangroves, diversity of oribatid mites, mosquitoes, wood borers, burrowers and birds, besides predatory effects of crabs on mangroves. There are also innumerable invertebrates occurring in mangroves about which not much is known. Probably this book will prompt research on them. This section has also covered the emerald islands (Andaman and Nicobar), which have about 13% of the total mangroves in India, listing the gaps in our knowledge on the faunal diversity associated with the mangroves present there. The gaps pointed out in this section will also encourage researchers to undertake work on these aspects. Articles on the utilization of mangroves as wood, their anatomical characteristics, phytochemicals, their efficacy in preventing hair loss and enhancing the durability of wood besides the use of xylanase enzyme in improving paper quality highlight the innumerable uses of mangroves. An article on novel genes present in the mangroves sheds light on the prospects of developing greater stress-tolerant economically important crops. Conservation strategies followed in various areas with people's participation and initiatives on various endangered species raise hopes for developing mangroves in all the degraded places and in species revival. The section on policy and legal issues for conservation, stresses the importance of evolving a combination of legal and management instruments as the best approach. The role of remote sensing and GIS in mangrove conservation has also been pointed out. Most importantly, the policy options for coastal protection through conservation of mangroves have been emphasized strongly.

Simple style and language make the book a delight to read, especially for nature lovers. In view of the rich content, it will survive the passage of time.

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### **Deformation Microstructures in Rocks.**

Soumyajit Mukherjee. Springer Geochemistry/Mineralogy, Springer-Verlag, Berlin, Heidelberg. 2013. 111 pp. ISBN: 978-3-642-25607-3. Price: €99.99 (Hard-copy).

The book under review presents morphological variations of few selected microstructures in the form of an atlas. The book discusses seven topics, viz. ductile shear sense indicators, brittle shear sense indicators, nucleation of minerals, fold developments in shear zones, grain boundary mobility, geometry of mineral inclusions and faults in micro scale with colour photographs and brief captions. The step-by-step clarifications at many places are helpful in the detailed description of rocks. The advanced illustration of grain-scale observations with only optical microscopy would generate interest among undergraduate students as well as researchers. The book starts with an introduction on mineral fish and ductile shear sense indicators. The second chapter, explains trapezoids as unique geometric shapes of micas and as brittle shear sense indicators. Newly published microscopic features, e.g. flanking microstructures, have been included in some chapters. However, some topics such as grain boundary migration which have been highly researched but the details are not presented in the book. The chapter on intrafolial folds has accommodated recent information on shear zone microstructures. The book describes how small-scale features connote 'big stories'.

Throughout the book major findings of fundamental observations of rocks under optical microscope have been well presented. If one goes through this book, the link between microstructures and tectonics becomes clear. In particular, all the figures are eye-catching, self-explanatory and easy to follow. The seven topics included in the book may not be the complete list of deformation microstructures. This book is an asset for learners, useful for self-study of microstructures and serves as a user-friendly guide for a one-semester course. I recommend the book for libraries of geoscience institutes.

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