statement that 'except ozone, the other atmospheric gases do not absorb solar radiation', is misleading. Both carbon dioxide and water vapour absorb solar radiation, although the amount of radiation absorbed is small. In section 1.6, there is a brief discussion on the impact of volcanic activity, and changes in solar radiation and cosmic radiation on the earth's climate. The author does not state explicitly if these changes had any impact on the global warming in the 20th century. A discussion on the relative importance of natural and anthropogenic factors in the 20th century warming would have been useful.

In chapter 2 on 'climate monitoring', there is a detailed discussion on how global mean temperature is calculated. This is followed by a section on monitoring of greenhouse gases and sea level. The discussion on sea-level changes is too short. The author indicates the accuracy of measurement of carbon dioxide, but not the sea level. The last section in this chapter deals with climate of the past derived from tree rings in the continents and ice cores in the Arctic and Antarctic regions. The last sentence in this chapter states: 'An important outcome of the ice core data analyses is the realization that it is the internal dynamics, rather than external forcing'. This sentence is incomplete and hence it is not clear what the author is trying to convey. Does he imply that internal dynamics is more important than external forcing in controlling the earth's climate? The ice-core data show clearly the importance of positive feedback in the earth's climate. This has not been stressed adequately in the book. A book on climate change should have devoted one chapter to the concept of feedback because it highlights how small changes in carbon dioxide can have such large impact on the earth's climate.

In chapter 3 there is a good discussion on the need for climate models to predict the future. There is a detailed discussion about the scenarios used by IPCC regarding the future concentration of greenhouse gases. The inability of the models to predict present and future monsoon precipitation is presented well. Chapter 4 deals with the impact of climate change on glaciers, sea level and tropical cyclones. The author highlights the concern in India about the impact of melting glaciers, rising sea levels, monsoons and cyclones. Concepts such as vulnerability and adaptive capacity are explained well. The interpretation of IPCC terms such as 'very likely' and 'more likely than not' are highlighted nicely. There is a good discussion on uncertainty in climate change science. Section 4.4.2 provides a summary about what we know and do not know about retreat of the Himalayan glaciers. The discussion about sea-level rise in section 4.5 is quite exhaustive. The debate about the impact of global warming on cyclones is presented well in section 4.6. The author has stated clearly that no firm conclusion can be drawn about the influence of global warming on tropical cyclones as there is equal evidence both for and against it. In chapter 5 the impact of climate change on monsoon, agriculture and human health is presented. There is a good exposition of the trends in temperature in different parts of India. There is an exhaustive discussion on the prediction of future monsoon precipitation by 22 different climate models. The author has indicated that most models predict an increase in monsoon precipitation in the future, but has highlighted the large uncertainty in the prediction by these models. The importance of agriculture in India has been argued well in section 5.3. This is followed by a cogent presentation on crop models. The author has indicated that the major weakness in crop models is their inability to account for the effect of pests and diseases accurately. He has pointed out that errors in climate models will have an adverse impact on the prediction by crop models. The impact of climate change on the incidence of malaria in India has been delineated in section 5.4. Chapter 6 deals with politics and economics of climate change. The author states categorically that developed countries have created this problem and hence must take the lead in mitigating climate change. The next two sections discuss the Montreal Protocol and India's role in it. There is a critique of IPCC and some of the mistakes in the last IPCC report. This is followed by a brief discussion on the Kyoto Protocol, carbon trading, and 'clean development mechanism'. The last chapter, 'Preparing for the future' deals with the Copenhagen accord, renewable energy technology, food security and ethics of climate change.

This book will be useful for anyone looking for information about issues related to climate change with a special reference to India. I am, however, not sure if it will be a good textbook for undergraduate courses in atmospheric sciences. The book should have more quantitative information on greenhouse effect, feedback, stability of the earth's climate, and simple climate models to enable students to appreciate subtle issues in climate change science. Any text book should have problems at the end of each chapter to help students understand the concepts. I hope these will be incorporated in the next edition of the book.

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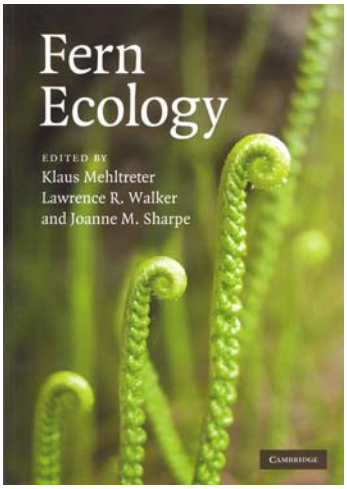

Fern Ecology. Klaus Mehltreter, Lawrence R. Walker and Joanne M. Sharpe (eds). Cambridge University Press, 2010. xvi + 444 pp. Price: $58.99.

Any discussion on ecology, environment-related issues or conservation of biodiversity focuses on higher plants; the lower plant groups are generally neglected. The 'Pteridophyta' is a mystical plant group of lower vascular plants. Despite being the dominant vegetation in the past, little emphasis is laid on how these plants existed and adapted during the long journey of periodical changes in the environment.

The science related to the interaction between living organisms and environ-

ment – ecology – has opened new horizons. Certain burning issues like climate change, global warming, loss of biodiversity, etc. are the outcomes of a changing environmental scenario. Thus, one cannot neglect the importance of any plant group that forms biodiversity, even though it may have little economic importance than other groups of plants. Among the series of books on horticulturally important but neglected plant groups such as ferns and lycophytes by the Cambridge University Press, this book is completely dedicated to the relation of pteridophytes with living and non-living environs. There are 10 multidisciplinary chapters in the book, covering nearly all aspects of fern ecology. Though all the editors have vast experience in the field of fern ecology, every chapter has been reviewed by more than two other fern experts.

The first chapter, 'Ecological importance of ferns', is an introduction and provides information on fern ecology and its importance, life cycles of ferns, human relations with ferns, morphology, classification, dispersal, evolution, etc. With the help of suitable examples and relevant literature, Michael Kessler, in the second chapter, 'Biogeography of ferns' has described in detail how the ferns are distributed globally and what are the various factors and mechanisms that control the distribution, alfa and beta diversity, richness, dispersal, vicariance and endemism in pteridophytes.

In the chapter 'Ecological insight from fern population dynamics', Sharpe and Mehltreter highlight the importance of long-term studies and growth monitoring in natural habitat on fern demography, various phases of life cycle, phenological variables, effect of seasonal and climatic factors, biomass production, soil spore banks, spore viability, gametophyte germination, role of antheridiogen in sex determination and population dynamics, morphology, and population structure and composition. Here, many interesting but unknown facts about ferns and their relation to the environment are mentioned. We generally do not observe or overlook small changes in plants as they grow, but if documented for a long term they show a great degree of variation. Such studies and documentation of responses of these plants towards climatic variables in their natural habitat may become more important in this changing global scenario for sustenance where climate change, conservation of biodiversity, food security, and conservation and management of natural resources, are the burning issues.

In 'Nutrient ecology of ferns', Richardson and Walker discuss the role of ferns in soil fertility, mechanism of absorption of nutrients, association with endomycorrhizal fungi, nitrogen-fixing cyanobacteria, relation and role of fern vegetation and richness with fertility of soil, relation of fern distribution and cation concentration of soil, colonizing of ferns in infertile soil and litter quality of ferns and its decomposition rate within different habitats or ecosystems.

It is assumed that ferns and lycophytes are the inhabitants of moist and humid conditions where water is plenty for fertilization to take place, but a good percentage of pteridophyte species have adapted themselves to almost all the habitats on earth, except snow and sea. In the chapter 'Fern adaptation to xeric environments', Peter Hietz classifies different types of xerophytic habitats of the world ranging from sea level to alpine harsh conditions and discusses the different mechanisms of drought and desiccation tolerance in different groups of xeric ferns. Different modes of drought tolerance and xeric adaptations such as chemical secretions, modification of organs, morphological and biochemical modifications, crassulacean acid metabolism (CAM), mechanism of water storage and other adaptative mechanisms to these adverse conditions are explained in detail with the help of suitable examples. We believe that many ferns and lycophytes growing in exposed, drought, fire, frost and resurrection habitats can be used as experimental species for studying climate change.

In the chapter, 'Fern disturbances and succession' Walker and Sharpe detail the succession, establishment and colonization of ferns in different types of disturbed land (scoured river bank, mounds, trunks of fallen trees, disturbed habitat, landslide zones, lava flow, dunes, flood plains, burned forests, areas disturbed by hurricanes, logged area, etc.). The mechanisms of succession and establishment via spores (both short and long-range dispersal) and with the help of fast-growing creeping rhizomes are also discussed along with secondary succession and changes in fern vegetation of any particular area due to certain natural and man-made factors. Examples are given from different research projects carried out across the world; these show that the ferns are primary colonizing plants in low nutrient, exposed, new soil or disturbed localities. No research in this field has been carried out earlier, but from our experience during the last 25 years we have found that ferns are the primary colonizing plants in landslide zones, lands deforested due to fire and other disturbed lands throughout the Himalayas. These primary successors and colonizing species, including *Equisetum*, *Lycopodium japonicum*, *Pteris vittata*, *Pteridium revolutum*, *Thelypteris* spp., *Matteuccia intermedia*, *Dennstaedtia appendiculata*, *Pityrogramma calomelanos*, *Nephrolepis auriculata*, *Dicranopteris* spp, *Gleichenia gigantea*, *Osmunda claytoniana*, *Onychium cryptogrammoides*, etc. can be planted at landslide zones of the Himalayas as soil binders.

Ferns and lycophytes play an active role in the structure and function of ecosystems, but little is known about the interactions of the ferns with fungi and animals. A chapter on the interactions by Mehltreter highlights different aspects of antagonistic and mutualistic relationships with the help of his observations and the available literature. Here the author describes various types of mycorrhizal associations (endomycorrhizal, ectomycorrhizal, fern–ericoid mycorrhizae). Interactions with fungi, insects, ants and animals, herbivory and defence mechanisms are also discussed in detail.

Some 60 species of ferns are identified as problem ferns by Robinson, Sheffield and Sharpe. These invasive and weedy species disrupt natural ecosystems such as water ecosystems, grasslands and forests, and agriculture. They reduce crop production, diminish or eliminate natural flora and change the structure of vegetation and plant community, some blocking our natural water reservoirs and causing other harmful environmental effects, including negative impacts on human and animal health. The socio-economic effects of these problem ferns along with the possible management strategies and control measures (physical, chemical, biological and mechanical) are also discussed. Useful features of some of the problem ferns like *Pteridium* (Bracken), scrambling ferns, *Lygodium* (creeping fern), *Salvinia* (aquatic weed), *Azolla* (mosquito fern), *Marsilea* (clover fern) and *Ceratopteris*, are also covered.

After colonization and the industrial revolution, the land use pattern has changed throughout the globe, resulting in loss of biodiversity and natural resources, and affecting the global climate. To highlight the means of overcoming these threats, a chapter on 'Fern conservation' by Mehltreter has been included here. The author has emphasized on different threats, methods for risk assessment, IUCN Red List criteria and category, CITES and both *ex situ* and *in situ* strategies for fern and lycophyte conservation.

The last chapter by the editors on 'Current and future directions in fern ecology', summarizes the types of ecological work being carried out by researchers in different parts of the world. Future areas for expansion of fern ecology research are also emphasized upon. A summary of recent classification of ferns is given in Appendix A with key characters of the Pteridophyta families and in Appendix B all the genera of ferns and lycophytes are enumerated and the number of species within each genera is given. Appendix C contains the geological timescale and a glossary of terms used in the book.

The efforts made by the editors and Cambridge University Press are commendable. This book will be certainly useful for botanists, university teachers and students of ecology and botany. It will open new horizons for fern researchers in India, where the area of research is in its infant stage. Some topics of the book should be included in the curricula of botany and ecology in universities and colleges to explain the importance of these neglected plants in the natural system.

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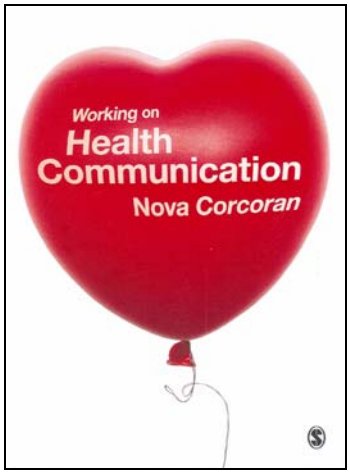

Working on Health Communication. Nora Corcoran. Sage Publications Ltd, 1 Oliver's Yard, 55 City Road, London EC1Y1SP. 2011. xiii + 186 pp. Price not mentioned.

Health communication has developed over the past 25 years as an art and technique of disseminating information about important health issues. With the rising number of lifestyle-related diseases and other endemic problems, health campaigns have become inevitable in a medically advanced era. Today, the health communication process is multi-directional as the general public actively seeks information from immediate accessible sources. Therefore, the design of an effective health campaign plays a vital role.

Moreover, health communication has diversified into two interdependent branches – health promotion and healthcare delivery campaigns. This book is a practical guide explaining effective ways of penetrating the clutter, using the right mix of designing elements.

Starting with a brief introduction on how campaigns are central to the development of public health interventions, Nora Corcoran elaborates on various stages of a campaign design. The book, within its 186 pages divided into 8 chapters, is laced with numerous theoretical models and examples, along with case studies or activities at the end of each chapter.

Identification of a suitable model to formulate aims and objectives, stakeholders and establishing the role of theoretical models in planning campaigns comprises the content of the first two chapters. Chapter 2 also highlights the role of public–private partnerships, especially in the developing countries where shortage of resources, health personnel and funding is a concern. Discussion on such aspects in the book helps in understanding the limitations of implementing a health campaign on a limited budget.

Keeping in mind that health professionals are not communicators, chapter 3 on data collection methods is useful. Prior to initiating any campaign, it is essential to prioritize the health issue providing a rationale for the programme. Evidence collected through a variety of means – of why a campaign has a high chance of success – is presented. The chapter also discusses the primary and secondary methods of data collection. Basic primary data-collection methods such as field observations, focus groups, rapid appraisal or community participation through interviews, surveys and questionnaires or other visual and oral methods have been discussed in this chapter. Similarly, sources of secondary data include databases, electronic or paper journals, documentation by governments or other organizations, and grey literature. Also, the validity and reliability of the collected data have been explained using 'triangulation of methods', a process by which data from one source are validated when compared with data from at least two other sources or data-collection methods.

Chapter 4 primarily discusses the social and psychological factors that characterize target groups. Understanding the target audience helps in understanding the psyche based on age, sex, ethnicity, religion and spiritual beliefs, which interlink with structural factors such as location, occupation, housing and environment. It has been explained using sufficient examples. This step enables in deciding which communication channel would be best in the facilitation of health messages.

With changing notions of communication, it has become important for campaign designers to propagate messages using the right channel and learn to use the new media with maximum effect. An entire chapter has been dedicated explaining different methods of communication like interpersonal, organizational and community channels. Also, mass media – television, magazine or newspapers, radio and others, referred to as community channels helps reach a large number of people. Chapter 5 addresses 'new media' – use of information technology in the process of communication