

and Bhutan in Asia, and other nations like Mauritius, Zambia and Algeria.

A recurring subject matter discussed by Pant is India and China's position in the world energy market, and the imminent threat from China's external relations. As two important growth engines within Asia, there is an urgent need for taking cognizance of each other's strengths and affinities, and frame their foreign policies in a suitable manner. Understanding China's energy networks and arrangements can mitigate the threat posed by it to India. Be it within Asia or outside, there is always the scope for considering oil to be a harbinger of conflict and war. Pant is unequivocal in his recommendation of collective action of a group of nations based on a cooperative framework rather than estranged relations through war and conflicts. Contemporary energy diplomacy demands that nations come together and form alliances against hegemonic powers, in contrast to taking individual sides. He goes on to advocate an 'Asian Energy Charter' that can 'promote a coordinated response to the challenges posed by the growing energy needs' (p. 281). It is the paradigm of collective mode that will ensure energy security. In the case of India, which is an 'emerging energy player', the effectiveness of its foreign policy and energy diplomacy lies in 'defending its stakes in the overseas energy site, besides evolving a doctrine that emphasize cooperation over conflict' (p. 287).

What Pant has succeeded in doing in this book is to throw light on the broad contours of the oil market, its stakeholders and India's emerging energy requirements and bargains. However, there is something of a problem that a reader can decipher from the chapters – it is all based on the developments reported in the first half of the first decade of the 21st century. Being a 2008 publication, the book does not lend itself to be excused in using pre-2005 data. One reason for this is that there is no obstacle in accessing data, and the other is that there have been many vital changes that have occurred after 2005 that have significantly altered the energy market and India's place in it. A case in point is the soaring oil prices. The sources used by the author reveal dependence on business reports of daily business papers/reports. This gives the book a highly opinionated tinge, rather than a more nuanced one. A lack of textured analysis of issues like

environmental hazards and stakeholders' predicaments is a reason for not being able to stimulate enough interest in the reader. Moreover, approaching the subject of energy from a policy perspective per se can obliterate issues of social suitability and equity. This book can contribute to the discourse on energy in Asia, albeit in a limited way.

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Plant Respiration: From Cell to Ecosystem. H. Lambers and M. Miquel Ribas-Carbo (eds). *Advances in Photosynthesis and Respiration Series*, Springer, Dordrecht, The Netherlands. 2005. Vol. 18, 250 pp. Price: US\$ 179.

This book is a continuation of the series of the books on 'Photosynthesis and Respiration' (Series Editor: Govindjee). Most of the books have dealt with photosynthesis. It was refreshing to see that respiration began to be covered specifically in the series, when Davide Zannoni edited two volumes (15 and 16) on *Respiration in Bacteria and Archaea*. For plant biologists, volume 17 entitled *Plant Mitochondria: From Genome to Function*, edited by Day *et al.* was the most welcome edition. Volume 18 has been edited by two important workers in the field of plant respiration, Hans Lambers (University of Western Australia) and Miquel Ribas-Carbo (University of Barcelona, Spain).

Respiration, a synonym for life, not only provides metabolic energy but also regulates the carbon budget in plants. It is the process by which the plants release the potential of solar energy trapped by photosynthesis regularly in the form of ATP, the energy currency of the cell. The history of books on plant respiration can be traced to the year 1932, when Walter Stiles and William Leach wrote their book, *Respiration in Plants* (London, Methuen). Books by Harry Beevers, *Respiratory Metabolism in Plants* (Row, Peterson and Company, Evanston, Illinois, 1961); Helgi Opik, *The Respiration of Higher Plants* (E. Arnold, London, 1980), and Roland Douce and David A. Day (eds), *Higher Plant Cell Respiration. Encyclopedia of Plant Physiology, New Series, Volume 18* (Springer-Verlag, Berlin, 1985) have contributed a lot in making us understand the historical evolution of research in plant respiration. This exclusive volume is a sequel to the series of books on understanding the very phenomenon, by throwing light on the current aspects of plant respiration and the response to the environment. This volume has attempted to deliver this knowledge by first providing an introduction to the phenomenon of plant respiration. This is followed by elaborate chapters on current experimental techniques to study its functional aspect, and finally well-illustrated chapters are dedicated to understand the modulatory changes in plant respiratory components in response to different biotic and abiotic stresses.

The first chapter, 'Regulation of respiration *in vivo*', is a formal introduction to the very theme of the book. It deals with the general characteristics of the respiratory system, the components, the control points and the alternatives. It somehow, in a diagnostic manner, tries to justify the presence of cyanide-resistance alternative pathway in higher plant systems. We note that one of the editors, Miquel Ribas-Carbo, has dedicated his entire research life to study the regulation of the cyanide-resistance alternative pathway, its role and function. This is reflected in this volume where comparatively less known alternative oxidase pathway, its regulation and ecophysiological function have been properly discussed.

The most unique feature of this book is that it has dedicated two well-descriptive chapters 2 and 3, entitled 'Calorespirometry in plant biology' and 'The application of the oxygen-isotope tech-

nique to assess respiratory pathway partitioning' respectively, for the better understanding of the typical laboratory techniques to study plant respiration as a function of plant response to temperature and other environmental variables. The former is on how calorimetry can be practised further in higher plant systems to study temperature dependence of growth rate, temperature limits for growth, the kinetics of both chilling and higher temperature responses and the effect of toxins and nutrient deficiencies. Vivid description on the method of calorimetry, with illustrative examples, followed by its trouble shooting and different applications make it highly recommendable for students and researchers in this field. The second chapter makes a sincere effort to update the readers on the methods to study oxygen-isotope technique to assess respiratory pathway partitioning. This chapter deals with all aspects of the technique starting with brief history followed by elaborate account of the most advanced oxygen-isotope study with few experimental data. This knowledge is a prerequisite to budding researchers since, this study is currently restricted due to sheer shortage of dedicated laboratory-based isotope systems.

Photosynthesis, respiration and photorespiration are accepted as three major events in photosynthetic cells which actively influence each other in some manner. This aspect of plant physiology has been addressed in chapter 4 entitled 'Respiration in photosynthetic cell: Gas exchange components, interaction with photorespiration and the operation of mitochondria in the light'. The chapter discusses how respiration proceeds, in light, with an emphasis on substrate supply, and considers major events that regulate mitochondrial function and respiration in photosynthetic tissues. With this understanding, the book then guides us into the somewhat interlinked topic in its next chapter entitled 'Effect of light intensity and carbohydrate status on leaf and root respiration'. The first part of this chapter talks of the correlation between carbohydrate status and respiration of leaves and roots taking a wide variety of species into consideration. Carbohydrate status is dependent on the photosynthesis efficiency and the latter in turn is regulated by light intensity. Thus the effect of light intensity via carbohydrate status on the leaf and root respiration is also discussed in this chapter. A brief description on the

effect of excess light intensity on leaf respiration at the end of the chapter gives rise to some ambiguities in the readers' mind.

Environmental stress, encompassing a wide range of biotic and abiotic conditions, can significantly alter plant metabolism, growth and development. The last part of this book starts here, from where a series of individual, well-descriptive chapters are dedicated to the effects of different environmental stresses on plant respiration. A major part has been dedicated to CO₂ concentration and the temperature change effect, which are the major causes and effects of global warming respectively. Chapter 7 entitled 'Response of plant respiration to changes in temperature: Mechanisms and consequences of variations in Q₁₀ values and acclimation', good knowledge on the effect of short- and long-term changes in temperature on plant respiration is available. An illustration of the variability of the acclimation of different plant species with a discussion on the importance of acclimation in determining annual rates of plant respiration as a component of net primary productivity and net ecosystem CO₂ exchange, makes the chapter more understandable. A special chapter at the end entitled 'Integrated effects of atmosphere CO₂ concentration on plant and ecosystem respiration' deals with the future issues of much conflicting ideas on how plant respiration and the processes it supports will respond to elevated CO₂ concentration. With discussions, it gives some concluding remarks on the measurement artefacts, especially due to leaks and memory effects in the gas-exchange systems and also due to leaks through leaf air spaces that may have resulted in misinterpretation of the study on effects of elevated CO₂ concentration on plant respiration.

The effect of other major abiotic factors like water stress, flooding, soil pH and aluminum on plant respiration are described in three elaborate chapters. Chapter 6 entitled 'The effects of water stress on plant respiration' reviews the recent studies of the effect of water stress on plant respiration. By compilation of data from different authors and recent findings, it also discusses different working hypotheses to explain how respiration is regulated under water stress. The effect of soil flooding is discussed in chapter 8 entitled 'Oxygen transport, respiration, and anaerobic carbohydrate catabolism in root in flooded soils'. This chapter deals

with the idea of anaerobic respiration and analyses the internal O₂ transport from shoot to root, crucial for sustaining respiration in submerged organs. Chapter 9 entitled 'Effect of soil pH and aluminium on plant respiration' gives a detailed account of how respiratory metabolism is redirected to meet the needs of organic acid efflux from the root as a consequence of soil acidification. This chapter discusses the effect of change in external pH on cellular pH and consequent effects of this change on respiratory metabolism, particularly through effects on soil aluminium.

The chapter entitled 'Understanding plant respiration: Separating respiratory components versus a process-based approach' offers an overview of the most important basic concepts used to partition respiration into energy-utilizing components from growth, maintenance and ion uptake, both with respect to modelling and for experimental measurements. Two of the biotic factors discussed are on symbiotic nitrogen fixation and mycorrhizal association. These are discussed as two separate chapters 11 and 12, entitled 'Respiratory/carbon cost of symbiotic nitrogen fixation in legumes' and 'Respiratory cost of mycorrhizal association' respectively. Both the chapters review the current literature concerned with plant respiratory requirements for supporting this plant-microbe interaction, making it more knowledge-based for graduate students and research scholars.

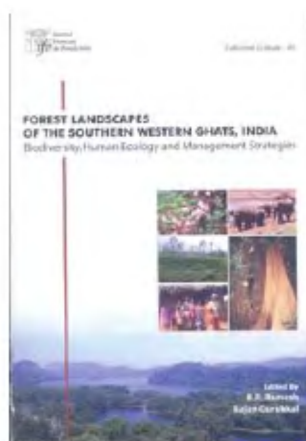
Leaving aside the subject matter of the book, the overall presentation should have been done in a better manner. The whole book is printed in black and white, without the needed colour figures. Use of colour to separate different components and pathways would have made the material conceptually clearer in the readers' mind. Further, additional flow charts and graphical representation of the literature would have been useful to the understanding of the material presented. Despite the above criticism, the level of our appreciation for this book stands high. Most of the chapters are well written. Every chapter is followed by three to four pages of recent references, which will be of help to researchers who are interested in exploring more on the ideas of that chapter. There is an interesting three-page material on a bit of early history and early plant respiration books, contributed by the Series Editor Govindjee, which makes the book more informative.

Overall, it is good knowledge-based volume. Complete reference to all the chapters in this book is available at <http://www.life.uiuc.edu/govindjee/References/Volume%2018%20By%20Chapter.htm>

We recommend this book to graduate students and established scientists working in plant biology, biochemistry, molecular biology and environmental biology. Due to its high price tag (US\$ 179), especially for developing countries, we recommend that major science libraries and research institutions acquire it for the use of their students and teachers. We also recommend this book to members of the International Society of Photosynthesis Research (<http://www.photosynthesisresearch.org/>), since they get 25% discount.

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Forest Landscapes of the Southern Western Ghats, India: Biodiversity, Human Ecology and Management Strategies. B. R. Ramesh and Rajan Gurukul (eds). French Institute of Pondichery, 11 St. Louis Street, P.B. 33, Puducherry 605 001. 2007. 304 pp. Price: Rs 550.

This book represents an interdisciplinary study by a team of ten ecologists and social scientists belonging to the French Institute, Puducherry and the School of Social Sciences at M.G. University, Kottayam. It is an unusual and a valuable book, a serious technical case study of forest and wildlife management focused

on a specific locality, namely the western Anamalais. Normally, such studies are only produced in the form of grey literature, as official documents that are not widely available to the public and never subjected to scrutiny as in case of scientific literature. As a result they often contain serious errors of fact as well as interpretation. Indeed, it is notable that this book does not refer to any such official documents at all. Its fairly long list of references does not include a single working plan, management plan or publication from the forestry research establishment of India. In fact, it refers to just one paper published in *Indian Forester*. Even this paper seems to be a product of an independent research study, and not an output of the forest and wildlife management establishment.

The focus of this book is on a new paradigm, that of landscape-level management and self-regulatory forest community development. Its important strengths include adoption of the broader landscape approach, a human ecological approach, and an assessment of the participatory paradigm. This new paradigm has, in theory, been accepted by the forest and wildlife management establishment. But this has been the result of societal pressures and the establishment has neither internalized nor operationalized it. This is why an independent group like this one from the French Institute and M.G. University had to step in; it has performed a most valuable service in bringing out this careful piece of work.

The French Institute has made seminal contributions to the mapping of India's vegetation. In this, it has complemented Champion's work on forest types of India, by recognizing the impact of various levels and kinds of disturbances. The French Institute has also been producing over the last 40 years maps of Indian vegetation on a 1 : 1 million scale, followed by more detailed maps of the vegetation of the Western Ghats on a 1 : 250 thousand scale. The senior editor of this book (B. R. Ramesh) has himself made an important contribution in this field. It is a field that has now been greatly enriched by the availability of ever more detailed remote-sensing imagery. The book under review takes full advantage of this background. It begins with a broad look at the landscapes of Kerala, placing the study sites in west Anamalais in the broader context. It goes on to document in detail the physical, bioclimatic, vegetational,

floristic, faunistic and human ecological features of selected landscapes based on extensive field work. This provides us, for instance, with an excellent analysis of the distribution of forest types in relation to bioclimate, topography and human activities, floristic composition of the various forest types, and factors governing the occurrence of major vertebrate species such as elephant or lion-tailed macaque.

This contribution by the ecologists from the French Institute is followed by an assessment of the spatiality of subsistence and human ecology of the landscape by social scientists of M.G. University. They too have undertaken extensive field work in human settlements in the selected landscapes, involving an appraisal of livelihood options, means of subsistence and availability of facilities. On this basis they distinguish the tribal as well as other settler settlements into different types of functional groups. This is followed by a detailed study of the availability and management of non-wood forest produce. In this carefully worked out context, they look at the various resource-management institutions. The realistic, though gloomy, conclusion that follows is that the management plan of forests cannot, under the current system, be oriented to equity and ecological sustainability. Furthermore, the poor and exploited in the forests and fringes are incapable of fighting against their conditions of oppression due to a lack of social capital.

I agree, but believe that the reason that the book fails to shed more light on these issues is because of its failure to subject the management system and practices to careful scrutiny. It seems to accept at face value, the claims of forestry to be a scientific practice. For instance, in describing the history of forest management the book states that 'the emergence of working plans as the effective tools of planning and management in the forestry sector have been a major breakthrough'. I would like to submit that this assertion does not stand scrutiny. The modern scientific method has been termed as the 'hypothetico-deductive' method. Hence, a truly scientific enterprise would treat documents such as 'working plans' as scientific documents to be made available for peer review by all interested parties, not as official secrets. The yields expected to be realized, and the stocks expected to be left behind after the harvests would be treated as hypotheses to