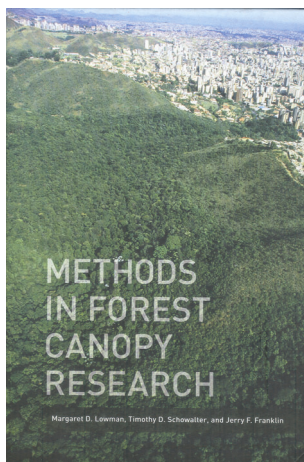


to an uninitiated reader to gain an understanding, appreciation, and perhaps in the end admiration for one of the greatest problems in mathematics.

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Methods in Forest Canopy Research. Margaret D. Lowman, Timothy D. Schowalter and Jerry F. Franklin. University of California Press, Berkeley and Los Angeles, CA, USA, 2012. xviii + 221 pp. ISBN: 978-0-520-27371-9. Price: Rs 3600/US\$ 60.

A few forest trees were also in blossom; and it was a truly magnificent sight to behold a great tree covered with one mass of flowers, and to hear the distant hum of millions of insects gathering together to enjoy the honeyed feast. But all is out of reach of the curious and admiring naturalist. It is only over the outside of the great dome of verdure exposed to the vertical rays of the sun that flowers are produced, and on many of these trees there is not a single blossom to be found at a less height than a hundred feet. The whole glory of these forests could only be seen by sailing gently in a balloon over the undulating flowery surface above: such a treat is perhaps reserved for the traveller of a future age.

– Alfred Russel Wallace, 4 July 1842

The forest canopy, an eighth continent in plain sight, has been looked up to in awe since time immemorial. As we descended from the trees and evolved into terrestrial bipeds, the lure of the trees has been irresistible. For the resources that they harbour which often times were out of reach and for safety that they provided from the dangers of a terrestrial life.

But only recently, has scientific curiosity been the motivation to ‘reach up’. Canopy access was perceived as too perilous and difficult in the early days. From the use of native climbers and monkeys for collecting samples to using canopy cranes and LiDAR, canopy research has come a long way in the past five decades. The authors of this book are pioneers, being among the first to initiate quantitative and experimental research on the forest canopies. Using their collective experience and contributions from scientists from around the world, they present a compendium of tried and tested techniques as well as new methods in canopy research.

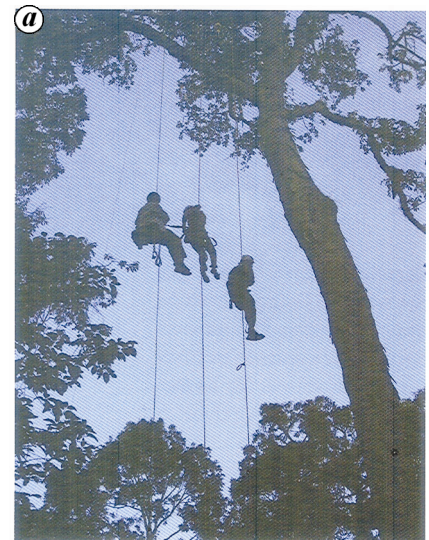
The book begins by tracing the history and development of canopy research, defining the canopy layer. It looks at why research in the ‘high frontier’ has lagged behind its terrestrial counterparts and how the role of the canopy researcher has changed from being an explorer to answering critical questions about the forest canopies under the spectre of climate change. Chapter 2 deals with describing forest types and sites. Older ground-based methods as well as hi-tech techniques using MODIS and LiDAR are discussed in the context of describing site characteristics and forest types. These methods are particularly important in a south Asian context, as we have only recently adopted them for research. Forest development models such as BIOME-BCG that predict effects of climate change on distribution of forest types are touched upon and would be useful to explore in the Indian context.

The subsequent chapter deals with the history of canopy access and helps with choosing appropriate techniques with the research target in mind. There is a description of canopy walkways and cranes and how their adoption has significantly improved our ability to perform replicable science in the canopy.

Chapters 4 through 7 can be regarded as prescriptive and provide guidelines on how research in the canopies can be conducted. These chapters describe the

planning of canopy research, measuring the physical attributes of the canopy such as vertical stratification, foliage distribution, crown spacing, etc. The methods and sampling units for these measurements are touched upon. The sampling of the biotic components of the canopy makes for fascinating reading and is an exhaustive compilation of studies and techniques on various biota in the canopies from tardigrades (water bears) to mammals. The section on statistical considerations here, is particularly well written and should be made compulsory reading for students and scientists considering canopy work so as to avoid potential pitfalls such as pseudo-replication.

The book concludes with espousing the relevance of canopy research in conservation, policy and science outreach with case studies that successfully engaged multiple stakeholders. There are informative green boxes as topic inserts within the chapters. These are invited contributions from canopy scientists



Methods used to study treetop biodiversity, physical attributes and biological processes. **a**, Single rope technique (India); **b**, Construction crane used for canopy access (Venezuela).

BOOK REVIEWS

from around the world that describe novel techniques and brief results and it is heartening to see one from the Western Ghats featured here.

There are a few typos and a picture of the common langur has been described as a 'macaque from the Western Ghats'. Apart from these, the book is well edited and has useful illustrations and photographs that help in visualizing and describing the techniques detailed in the text.

The 5th International Canopy Conference held in India in 2009 was a shot in the arm for canopy research in India, providing a platform for researchers from across the world to share their work with peers in front of an Indian audience. Many scientists and students from the Asian region also participated and will find this book a valuable addition to their libraries. This book would serve not only as an introduction to research on canopies, but as an inspiration for students and researchers looking to reach new heights.

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Annual Review of Physiology, 2014. David Julius and David E. Clapham (eds). Annual Reviews, 4139 El Camino Way, PO Box 10139, Palo Alto, CA 94303-0139, USA. Vol. 76. ix + 620 pp. Price: US\$ 101.00.

This Annual Review starts with 'A conversation with Leonard and Leonore Herzenberg' and once again emphasizes the very porous boundaries for the subject of Physiology. Some of us would argue that there is, indeed, no need to define boundaries at all. I was riveted while reading this article. The Herzenbergs are best known for developing fluorescence flow cytometry and the technology of hybridomas, but the free flowing conversation that they have with one of their former students, Mario Roederer, a senior investigator at the Vaccine Research Centre at the National

Institutes of Health, provides many more insights. It is a conversation that reveals the difficulties faced by women in science and the prejudices that they have to overcome. It is a story of the intersecting circles of science and politics, and the difficult choices that scientists have to make. It is a revelation of the changes in the funding environment, not only in quantum but in emphasis, and how this impacts the progress of science. It is about the value of informal learning, the open sharing of great minds around a coffee table or a glass of wine – of advice and knowledge freely given and shared without restriction. It is also a story of using disadvantage as a stepping stone to success. While this is a story of a different place and perhaps for young people in science, a different time, the themes of the 'conversation' seem ever-enduring and worthy of quiet reflection. This is definitely a part of the annual review that I would recommend everyone reads regardless of their specialization.

As it often happens when I first see the Annual Review, my attention then shifts to the 'Special Topic' which in the current volume focuses on the 'Role of gut hormones in nutrient homeostasis'. The thought that immediately came to mind is the seminal work of Bayliss and Starling who discovered the first hormone 'Secretin' in 1902, and then opened the flood gates for a whole new area of study. It was, however, only in the 1970s and 1980s that the study and discovery of new gut hormones really took off. I remember as a post-graduate student being completely fascinated by the work of Stephen Bloom at the Royal Post-graduate Medical School at Hammsmith Hospital where he pioneered the discovery of several gut hormones, carefully elucidating their physiology. The special topic in this volume is a reminder of the time and continued research required to translate early physiological findings into clinical practice. This is, in fact, the focus of the introduction to the section by Patricia Brubaker entitled 'Gut hormones fulfill their destiny: from basic physiology to the clinic'. The specific hormones that are discussed include ghrelin, glucagon-like peptide-1, glucagon-like peptide-2 and the gut hormone peptide YY and their role in appetite control and weight maintenance, glucose homeostasis and diabetes, as well as mucosal integrity and nutritional support of patients. All these are clinical issues of

current concern and I can see this section having a particular appeal to basic scientists working in the area, nutritional physiologists and clinicians.

It is many decades since Bernard Katz won the Nobel Prize for his work on neuromuscular and synaptic transmission. The quantal release of acetylcholine by exocytosis at the neuromuscular junction which gives rise to the end plate potential is part of standard teaching in physiology. Over the years, however, a more nuanced understanding of the molecular events related to exocytosis at the neuromuscular junction has emerged. The section on Neurophysiology has three articles which help us better understand the variations in the mechanisms of exocytosis and endocytosis, and the regulatory implications; the molecular mechanisms of neurotransmitter release; and the plasticity of dendritic spines.

Students of physiology will all be aware of the counter-current mechanisms involved in the concentration and regulation of urine production. The Loops of Henle with their differential permeability at different segments help to generate the medullary concentration gradient while the hair-pin loops of the blood vessels (the vasa recta) help to maintain the concentration gradient. The present section of renal physiology has an outstanding chapter on the changing concepts of the urine-concentrating mechanism. The article focuses on three key advances in our understanding: first, a better resolution of the anatomic relationships in the medulla; second, a better understanding of the regulation of water, urea and sodium transport proteins, key to the generation of the medullary osmotic gradient, and finally, improvements in the mathematical modelling of the urine concentrating mechanism. This chapter is a 'must-read' for all postgraduate students of medical and general physiology.

Brown adipose tissue (BAT) plays an essential role in the newborn in protecting the baby from hypothermia and is also abundant in hibernating animals. Brown fat persists into adulthood in humans, in smaller quantities in the inter-scapular area and around the kidneys, and is regulated by $\beta 3$ adrenergic receptors. Brown fat differs from white adipose tissue in many ways but importantly in a protein called the uncoupling protein which allows for the enhanced generation of heat. Work aimed at eluci-