

monsoonal atmospheric forcing. Largely for these reasons, the Arabian Sea has attracted the attention of the international marine sciences community with recent field studies under the separate auspices of the Joint Global Ocean Flux Study (JGOFS), Global Ocean Ecosystem Dynamics (GLOBEC), and World Ocean Circulation Experiment (WOCE). Naqvi et al. present a largely up-to-date integration of these and previous studies with an emphasis on the "bio" in biogeochemistry, from pelagic bacteria to mesozooplankton to benthic biology.

Chapter 7, by Hammides and Smith, on the north-eastern Pacific abyssal plain probably covers the largest region of any chapter in the book, approximately 10 to 15×10^6 km². The authors produce a majestic summary of biogeochemical processes in this region by reviewing key studies conducted during the past three decades. These deep seafloor ecosystems, although remote and separated in space from the productive surface layer, are inextricably linked to the euphotic zone through the gravitational settling of particulate matter that supplies the carbon and energy to sustain life. By this criterion, the authors divide the abyssal plain into eutrophic, mesotrophic, and oligotrophic ecosystems depending on particulate matter export rates. Consequently, all natural or anthropogenic impacts that affect primary production are likely to also have consequences for even the most remote habitats on Earth.

The next chapter, by L evell e and Juniper, on deep-sea hydrothermal vents and cold seeps compares and contrasts the geomicrobiology, microbial ecology, and biogeochemistry—to the extent known—of these novel deep sea habitats. It presents a largely up-to-date, comprehensive survey of novel microbe-dominated ecosystems, many of which were discovered over the past two to three decades. Because of their remoteness, the difficulty and expense of sampling, and the possibility of novel carbon and energy flow pathways, we should expect new discoveries in the future.

The final chapter, by Tett et al., on the influence of nutrient biogeochemistry on the ecology of northwest European shelf seas is in many ways the most germane of the lot, as nutrient cycling is the *pi e de r esistance* of marine biogeochemistry. The chapter focuses on the concept of ecological stoichiometry using the so-called Redfield ratio as a starting point. A thorough analysis is then made of both macronutrient and micronutrient distributions, as well as discussions of the biogeochemical and ecological controls of phytoplankton community structure. Several comprehensive summaries of relevant data sets are presented, and theoretical considerations based on nutrient cell quotas are discussed.

From the broad title one might consider using this as a textbook for an upper division undergraduate- or graduate-level course of similar scope, but this would not serve the students well in my opinion. Although each chapter of this edited volume is a scholarly work, the book is also notable for its omissions. There is no summary chapter or overall conclusions, and the chapters are not well integrated. Also absent are discussions of the largest oceanic biomes—the global subtropical gyres, the upwelling zones that are key to global photosynthesis, carbon export and fisheries production, and the Southern Ocean or selected high nutrient, low chlorophyll climate sensitive habitats that appear to be iron limited. When used in conjunction with other textbooks on principles of biogeochemistry (e.g., W H Schlesinger. 1997. *Biogeochemistry: An Analysis of Global Change*. Second Edition. San Diego (CA): Academic Press), bioelement cycling (e.g., R W Sterner and J J Elser. 2002. *Ecological Stoichiometry: The Biology of Elements from Molecules to the Biosphere*. Princeton (NJ): Princeton University Press), or marine ecosystems structure and dynamics (e.g., K H Mann and J R N Lazier. 1996. *Dynamics of Marine Ecosystems: Biological-Physical Interactions in the Oceans*. Second Edition. Boston (MA): Blackwell Science), the present edited volume could serve as a useful, partial set of "case studies." This book should be required reading for all students entering the field of marine biogeochemistry as well as current practitioners. Each and every college and university library should have a copy.

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ENVIRONMENTAL SCIENCES

UNDER THE CANOPY: THE ARCHAEOLOGY OF TROPICAL RAIN FORESTS.

Edited by Julio Mercader. New Brunswick (New Jersey): Rutgers University Press. \$60.00. x + 322 p; ill.; index. ISBN: 0-8135-3142-X. 2003.

This fine volume is a compilation of what is known, unknown, and still poorly known about the cultural and associated environmental history of the world's tropical forests. Ten chapters plus an introductory overview by the editor cover a truly comprehensive range of time periods and geographic regions; from the Pleistocene to the latest Holocene, and from Malaysia to Australia and Central

America. The volume provides particularly good examples of how long-term, multidisciplinary research—in the chapters by Ranere and Cooke (Central America) and Mora and Guecco (northern South America)—together with newer investigations in remote and previously unexplored regions (in the chapters by Mercader and Martí dealing with Africa, and Bulbeck on the Malay Peninsula) are throwing substantial light on many old problems. Also noteworthy is the arsenal of methodological and other approaches currently being brought to bear on the issues (e.g., combined pollen, phytolith, and starch grain analysis of subsistence and the environment in the Americas and Africa). It is clear that, once thought to be an inimical place for both ancient human societies and the daily conduct of modern field work, the tropical forest witnessed rich cultural traditions and developments long before any European ever arrived.

The odd chapter out in this excellent collection of papers is the contribution by Meggers and Miller on the Amazon Basin. In the face of a by now convincing and ever-growing corpus of research, the authors believe that areas alongside the main Amazon river channel and some of its major tributaries were not inhabited by people living in large and permanent settlements by the time of the European Contact, and that sections of the upland forest were not appreciably altered from the middle Holocene onward by people engaging in agricultural and other intensive subsistence practices. These views on the Pleistocene climate and vegetation and periodic Holocene arid episodes that are said to cause cultural and linguistic fragmentation also fly in the face of much of the data now available on these subjects. A balanced and informative discussion of this crucial area and its published literature, together with the approaches effectively being used to decipher the environmental and cultural history of this largest, single expanse of tropical forest on the globe, would have been welcome. I would also maintain that an area the size of the continental United States can no longer be covered in a single chapter by any single investigator.

I heartily recommend the book to anyone seriously interested in tropical forest archaeology and environmental history, and to other scholars who want a highly informative, thought-provoking, and readable account of the early human experience in one of our planet's greatest biomes. The editor and authors are to be congratulated for putting together such a good volume. I look forward to the next major synthesis.

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THE HERBACEOUS LAYER IN FORESTS OF EASTERN NORTH AMERICA.

Edited by Frank S Gilliam and Mark R Roberts. Oxford and New York: Oxford University Press. \$85.00. xvi + 408 p; ill.; index. ISBN: 0-19-514088-5. 2003.

As a child, my parents would often tell me I could not see the forest for the trees. That was a few years ago and long before I considered myself a forest ecologist, but this book has convinced me that I am still guilty of only seeing the trees. As the paramount organism, trees often dominate my, and many others, thinking about forests and how they function. This volume serves as an excellent reminder of the fascinating ecology occurring on the forest floor and, in many instances, is convincing in the assertion that the herbaceous layer is intrinsic to maintaining the functional integrity of forest ecosystems. I thoroughly enjoyed reading the book and would recommend it to anyone with an interest in forest ecology, especially to those of us who need reminding that forests are much more than just trees.

This edited volume consists of an introductory chapter, 12 contributed articles, and a concluding synthesis chapter. There is a variation in clarity and quality among the chapters that one might expect in this type of compilation, but the overall usefulness of each chapter is quite high. Unfortunately, the least approachable chapter comes immediately after the introduction (Chapter 2). This is a completely adequate treatment of nutrient relations in the herbaceous layer. But, many readers may have difficulty understanding the principal ideas because they are not developed in a way that nonexperts can easily grasp. My advice is to keep reading, as the following chapter (in particular) and the subsequent chapters (in general) are excellent introductions to multiple aspects of the ecology of the forest understory.

I would especially recommend this book to beginning graduate students interested in studying forest ecology, but it will be useful to forest ecologists at any level. In my case, I am particularly happy to have read this volume. Perhaps now I can start to see the forest instead of the trees.

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THE ATLANTIC FOREST OF SOUTH AMERICA: BIODIVERSITY STATUS, THREATS, AND OUTLOOK. *State of the Hotspots.*

Edited by Carlos Galindo-Leal and Ibsen de Gusmão Câmara. Washington (DC): Island Press. \$70.00 (hardcover); \$35.00 (paper). xxi + 488 p; ill.; index. ISBN: 1-55963-988-1 (hc); 1-55963-989-X (pb). 2003.

It is highly appropriate that the Atlantic Forest is the focus of this inaugural volume in the State of the Hotspots series, compiled by Conservation

Julio Mercader is a Canada Research Chair and Assistant Professor in the Department of Archaeology at the University of Calgary, Canada. He holds a simultaneous appointment as Research Associate in the Department of Anthropology at The George Washington University and at the Smithsonian Institution. Julio's recent publications include the edited book *Under the Canopy: The Archaeology of the Tropical Rain Forests*, published by Rutgers University Press in 2003. In 2003, he received a grant from the Canada Foundation for Innovation and the Canada Research Chairs Program to build the newly created Tropical Archaeology Laboratory at the University of Calgary, which he directs. In *Under the Canopy: The Archaeology of Tropical Rain Forests*, edited by Julio Mercader, pp. 249–270. Rutgers University Press, New Brunswick. Google Scholar. Behling, Hermann and Henry Hooghiemstra, 2000, Holocene Amazon rainforest-savanna dynamics and climatic implications: high-resolution pollen record from Laguna Loma Linda in eastern Colombia. In *Indigenous Peoples and the Future of Amazonia: An Ecological Anthropology of an Endangered World*, edited by Leslie Sponsel, pp. 45–70. University of Arizona Press, Tucson. Google Scholar. Cavelier, I., C. Rodriguez, L. Herrera, G. Morcote and S. Mora, 1995, *No solo de caza vive el hombre: ocupación del bosque Amazónico, Holoceno temprano*. Did our ancestors live in tropical forests? Although we see the rainforest as a bountiful environment teeming with life forms, most anthropologists and archaeologists have long viewed these areas as too harsh for human occupation during the pre-agricultural stages of hominid development. *Under the Canopy* turns conventional wisdom on its head by providing a well-documented, geographically diverse overview of Stone Age sites in the wet tropics. New research indicates that, as humanity and its precursors increased their geographical and ecological ranges, rainforests were settled at a much earlier date. Julio Mercader is a professor of anthropology at the George Washington University.