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[Review of] *Stable Isotopes and Biosphere–Atmosphere Interactions: Processes and Biological Controls*

Mark S. Coyne
University of Kentucky, mark.coyne@uky.edu

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BOOK REVIEW

Stable Isotopes and Biosphere–Atmosphere Interactions: Processes and Biological Controls

Edited by L. Flanagan, J.R. Ehleringer, and D.E. Pataki, Elsevier Academic Press, San Diego, CA. 2005. 318 p. $99.95. ISBN 0-12-088447-X.

Nothing is as simple as it seems. It is commonly understood that biological systems preferentially use lighter isotopes of C, N, and O, which leads to ^{13}C, ^{15}N, and ^{18}O enrichment in dissimilative environments and depletion in atmospheric gases. However, the present text makes a persuasive case that fully understanding ^{13}C, ^{15}N, and ^{18}O interactions in the biosphere requires appreciating the complexity of those interactions at mechanistic, organismal, and landscape scales.

The current volume in the physiological ecology series published by Elsevier is the product of research presented at a conference in Banff, Canada, in 2002. This meeting "focused on biosphere–atmosphere interactions and the role that stable isotope measurements play in providing mechanistic insights about physiological processes operating at large spatial scales." To that end the text is organized into three parts. Part 1, consisting of five chapters, addresses how stable isotopes affect and are affected by the mechanisms of photosynthesis, hydrolysis, and organic matter decomposition. Part 2, consisting of six chapters, examines the application of stable isotopes and models to understanding how processes of C, N, and O exchange can occur at ecosystem scales. Part 3, consisting of four chapters, examines stable isotope use in explaining global-scale processes for atmospheric CO_2, CH_4, and N_2O.

The organization of the book into three parts to reflect different scales of investigation lends itself to broad appeal—there is something of value for most readers—and significant portions of the book should be useful for most readers depending on their focus. Chapter 3 ("Stable Isotope Composition of Soil Organic Matter"), for example, was a useful update on the state of this science. Likewise, Chapter 8 ("Partitioning Ecosystem Respiration Using Stable Carbon Isotope Analysis of CO_2") provided practical guidance on the "what," "when," and "how" to measure issues of using stable isotopes to determine source signatures.

The book is not easy reading by any means. To appreciate the text fully requires substantial familiarity with basic concepts of organic chemistry and biology (Part 1), mathematics and modeling (Part 2), and global biogeochemistry (Part 3). This level of complexity makes the text unsuitable for most undergraduates and beginning graduate students. It is, however, quite suitable for reference and background information for individuals with advanced training and an interest in this topic.

Unlike many multiple-author books of meeting proceedings, this text has excelled in uniformity of style and length. It is well edited, and the quality of illustrations is quite good. The price ($99.95) makes it unreasonable to purchase on an individual basis except for those specifically working with stable isotopes and global biosphere processes. However, it would be a useful addition to most libraries and to most laboratories working with stable isotopes in the environment.

MARK COYNE
Department of Plant and Soil Science
University of Kentucky
Lexington, KY 40546-0091
(mark.coyne@uky.edu)

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