nian), Upchurch (K-T), and Barnovsky (Pleistocene) do an especially thorough job, discussing and documenting how cold-water tolerance, dormancy mechanisms, and small body size provided extinction resistance in their respective events. Similarly, the crucial role of biotic interactions is seen in the effect of species deletions. The high loss of phytoplankton in the Devonian and K-T had effects extending upward through the trophic pyramid, such as the preferential loss of filter feeders. Even "species additions" may have played a key role in the past, as Brasier infers that the appearance of biomineralized jaws and other evolutionary innovations may have helped cause extinctions in the late Precambrian. (A more traditional example would be the Great American Faunal Interchange.)

This shift away from description to causal dynamics in mass extinction research is partly just the logical response to ever-accumulating data. It also seems likely, however, that Earth's ongoing biotic depletion and consequent rise of ecological knowledge of extinction dynamics has influenced those of us who study past declines. Indeed, there seems to be a broad general shift of interest in paleontology away from originations to extinctions. Is it a coincidence that this should happen now, just as, to quote Noel Brown from his plenary address at the recent meeting of the American Institute of Biological Sciences, "Darwin's great age of discovery has succumbed to a great era of extinction"?

Ideally, paleontological interest in biotic extinction dynamics will not only improve our understanding of past events, but, by providing a testing ground on grand spatial and temporal scales, help us gain information useful in minimizing ecological disturbances today. As is teasingly intimated by many papers in this book, perhaps the past can be a laboratory for experimenting with the future.

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Physics of the Atmosphere

Atmospheric Radiation. Theoretical Basis. R. M. GOODY and Y. L. YUNG. Second edition. Oxford University Press, New York, 1989. xvi, 519 pp., illus. $95.

The next decade of space science may well be remembered for its emphasis on the earth's atmosphere, in response to increasing concern about global climate change and the integrity of the stratospheric ozone layer. If NASA has its way, up to tens of billions of dollars will be spent by the United States, Europe, and Japan on a suite of sophisticated earth observation platforms in geosynchronous and polar orbits, constituting in sum the Earth Observing System or (in Presidential vernacular) the "Mission to Planet Earth."

Goody and Yung's *Atmospheric Radiation: Theoretical Basis* could not have been produced at a better time. The quantity of data returned by spaceborne platforms will be enormous, and many of the data will concern the composition and radiative state of the atmosphere as a function of altitude, latitude, time of day, and season. The inversion of satellite data to retrieve such information is a complex problem in radiative transfer. Likewise, the modeling of climate evolution, currently being pursued through the use of complex numerical codes, boils down in large part to understanding scattering and absorption of radiation by clouds and a range of spectroscopically active gases.

Though presented as a second edition of Goody's classic work by the same title published in 1961, the book is quite different from the original, reflecting the style of the second author as well as the emphasis on climate modeling and retrieval of information from satellite data appropriate to the present state of the atmospheric sciences. Likewise, the explosion in computational ability necessitated the addition of a chapter on methods for solving scattering problems, a subject on which the first edition deferred to Chandrasekhar's classic *Radiative Transfer*. In sum, this is a much-improved volume that builds on the successful style of the original while presenting an impressive array of new material.

One caution is in order regarding the use of the book. Graduate students who have not yet had an introductory course in radiative transfer will find *Atmospheric Radiation* tough going, in spite of the review of basic radiative transfer it includes. Those who will profit most from the book are advanced graduate students or professional scientists who need to gain entry into the fields covered. This reviewer's only quibble is that the last chapter, on the evolution of an atmospheric thermal disturbance, is rather short and may leave readers thirsting for more details.

Atmospheric Radiation provides an admirable balance between the mathematical techniques of radiative transfer and the physics of line formation by gases of relevance to the terrestrial atmosphere. Though the book is intended to be theoretical, there are thorough connections with current data throughout, as well as a good set of references at the end of each chapter. Some may wish for additional treatment of absorption by molecules appropriate to other planetary atmospheres, particularly those of the outer solar system, but given the length of the book its restriction to the terrestrial atmosphere makes sense. As a rigorous, advanced text this book can be very highly recommended.

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NOTE

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Components of Plants

Plant Cell Wall Polymers. Biogenesis and Biodegradation. NORMAN G. LEWIS and MICHAEL G. PAICE, Eds. American Chemical Society, Washington, DC, 1989. xii, 676 pp., illus. $119.95. ACS Symposium Series, vol. 399. From a symposium, Toronto, ON, June 1988.

This volume offers a much-needed survey of the chemistry, biogenesis, and biodegradation of the major polymers of plant cell walls, a subject sadly neglected until relatively recently. As with many volumes based on symposium talks, it suffers from the brevity of some contributions and from a lack of unity but gains in the variety of opinions and approaches. The emphasis of the book is on the major wall components, cellulose, hemicelluloses, and lignins, but pectins, non-lignin phenolics, lipids, and proteins are considered briefly. The coverage is divided fairly evenly between the biosynthesis and the biodegradation of these constituents. In addition, the relationship of wall polymers to plant-microbe interactions is discussed. An effective overview of biogenesis is given in an introductory chapter. Though most of the volume will be useful mainly to research investigators and advanced graduate students, there are a number of chapters that suffice to provide a broad view of wall biochemistry for the non-specialist.

I was surprised that plant cell walls are described both by D. H. Northcote and by S. C. Fry and J. G. Miller as extracellular, rather than as extracytoplasmic parts of plant cells. Since these authors' highly informative papers indicate that walls in living cells contain enzymes that are active biosynthetically and are dependent on the organized transport of precursors across the plasmalemma or outer cytoplasmic membrane, I would have expected that they would consider walls integral components of plant