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Review of Fluorescing World of Plant Secreting Cells

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Review of Fluorescing World of Plant Secreting Cells

Abstract

The beautiful world of microscopic colors, as seen by autofluorescence, is clearly demonstrated by a variety of plant structures that secrete or are internally composed of many kinds of natural substrates excited by ultraviolet to blue light that emit in the visible spectrum. This phenomenon serves as the basis of this book, which portrays an array of plant cellular and subcellular structures and their products as seen through various types of fluorescence microscopes (such as the luminescence microscope, confocal laser scanning microscope, and microspectrofluorometer).

Disciplines

Cell Biology | Developmental Biology

Comments

This review is from The Quarterly Review of Biology - "Fluorescing World of Plant Secreting Cells" by Victoria V. Roshchina, Science Publishers, Enfield (NH), 338 p. 84(1):110-111. 2009. Posted with permission.

desiccation. We get an indication about genes that are switched on (and off) during dehydration and rehydration. Work in this area is still in its infancy, but readers will get a good outline about gene expression, pathways, and regulation of gene expression in response to desiccation and rehydration.

The second section of the book discusses the desiccation tolerance of seeds, pollens, and spores. The first chapter studies seeds. Desiccation tolerance in seeds is a programmed phase of embryological development and, under natural conditions, desiccation tolerance will certainly occur. The authors consider the aspects that have received attention in recent years, such as the required proteins for desiccation tolerance, the occurrence of different concentrations of carbohydrates, the basis of glass formation, and the roles of ROS and antioxidants. Berjak et al. describe the abscisic acid (ABA)-regulated and ABA-independent control of desiccation tolerance in seeds. The authors emphasize that this is an extremely complex process and additional work is needed to understand it better. The formation and properties of glassy state in dry seeds and pollen is discussed by Leprince and Buitink. Glassy state is the formation of intracellular glasses that is essential for the reproduction organs to survive the dry state. The authors provide details about the definition, formation, detection, properties, and putative composition of intracellular glasses and emphasize how glasses enhance structural stability and life span of dry anhydrobiotes. The following chapter describes the molecular events linked to the maintenance of DNA integrity in seeds at their entry into a desiccation-tolerant state and on early rehydration. Boubriak et al. discuss their chapter in two parts. First, the authors provide an overall study about desiccation and maintaining the integrity of the genome where they show the connection of DNA-binding proteins, DNA repair, and desiccation, as well as talk about the hydration-determined DNA conformation, the DNA repair mechanism in plants and its efficiency on early rehydration. The second part of the chapter summarizes the evolutionary adaptations of seeds and DNA repair to desiccation. In addition, the chapter contains very useful summary figures and tables that will help readers understand this complex subject. Walters and Koster provide a well-constructed chapter about the structural dynamics and desiccation damage in plant reproductive organs. The authors describe the structural and biochemical changes and focus on quantitation of damage in the context of the degree of stress and the time required for damage to occur. The chapter

provides a good description of the quantitative nature of protection and damage within reproductive structures in response to various stresses and kinetics that define desiccation damage. The last section of this chapter provides a broad overview of reactions that occur as a direct consequence of dehydration; volume changes in cells, collapse of matrix and molecule structure, phase changes, structural changes in proteins, and chemical reactions. The authors suggest that it is not the types of reactions, but the slower rates of damaging reactions that occur, which is a distinguishing feature of desiccation tolerance and sensitivity.

The last section of the book discusses the application of desiccation tolerance research and includes only one chapter. Recently, this has become a very topical project in terms of catering, especially in Africa. Iyer et al. summarize the knowledge about *XvSap1*, a desiccation tolerance associated gene, and its role and importance in the initial and late stages of the protective response to abiotic stress (such as dehydration) and, therefore, potential for crop improvement. This chapter identifies an area that offers prospects for further research on desiccation tolerance in plants.

The book includes a good taxonomic and subject index in one block, but it would have been better to publish them separately. We are missing the glossary that could complete the volume and there is some repetition among certain chapters that only occur in the beginning of the book. Despite the above criticisms, we recommend this publication first of all to plant-stress physiologists or plant breeders, as well as to researchers who work on plant biochemistry and molecular biology, plant genetic research, and seed conservation. Agronomical sciences and, in the long term, agronomists in the field would also derive benefit from this book. *Plant Desiccation Tolerance* will be a useful volume for botanists, ecologists, and molecular genetics researchers. We also propose this book to lecturers, postgraduate and undergraduate students, and anyone studying any aspect of desiccation tolerance in plants.

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FLUORESCING WORLD OF PLANT SECRETING CELLS.
By Victoria V. Roshchina. *Enfield (New Hampshire): Science Publishers*. \$88.00. xviii + 338 p.; ill.; Latin and subject indexes. ISBN: 978-1-57808-515-6. 2008.

The beautiful world of microscopic colors, as seen by autofluorescence, is clearly demonstrated by a variety of plant structures that secrete or are internally composed of many kinds of natural sub-

strates excited by ultraviolet to blue light that emit in the visible spectrum. This phenomenon serves as the basis of this book, which portrays an array of plant cellular and subcellular structures and their products as seen through various types of fluorescence microscopes (such as the luminescence microscope, confocal laser scanning microscope, and microspectrofluorometer).

The author, a highly published and respected researcher, provides many examples of autofluorescence seen throughout the plant kingdom and fungi. Roshchina emphasizes the value of fluorescence observations using living materials that provide many kinds of useful information without having to process specimens and introduce artificial fluorescent dyes. The sum of the fluorescence emitted by various cellular and subcellular structures, substrates, and secretions can be subdivided into narrower spectra often allowing for identification of different molecules and groups of molecules, stages of development, and cell viability as the fluorescence changes.

The beginning chapter will introduce readers to the basic concepts surrounding natural fluorescence in organisms, and the following six chapters deal with various aspects of fluorescence in plant systems. This information is also presented in tabloid form that is organized by plant taxa. There are diagrams and images throughout, as well as many images in Appendix 2 associated with these chapters. In addition, there is a brief Appendix 1, a glossary of biological terms, and an extensive bibliography of recent studies on fluorescence. Both Latin and subject indexes at the end of the book provide easy access to specific taxa and topics covered. This volume can be used as a reference for research, and as a helpful educational source for the classroom.

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PLANT MEMBRANE AND VACUOLAR TRANSPORTERS.

Edited by Pawan K. Jainwal, Rana P. Singh, and Om Parkash Dhankher. Wallingford (United Kingdom) and Cambridge (Massachusetts): CABI Publishing, \$170.00. viii + 384 p.; ill.; subject index. ISBN: 978-1-84593-402-6. 2008.

BIOMASS RECALCITRANCE: DECONSTRUCTING THE PLANT CELL WALL FOR BIOENERGY.

Edited by Michael E. Himmel. Chichester (United Kingdom): Blackwell Publishing, \$180.00. xviii + 505 p. + 29 pl.; ill.; index. ISBN: 978-1-4051-6360-6. 2008.



ZOOLOGY

THE RISE OF ANIMALS: EVOLUTION AND DIVERSIFICATION OF THE KINGDOM ANIMALIA.

By Mikhail A. Fedonkin, James G. Gehling, Kathleen Grey, Guy M. Narbonne, and Patricia Vickers-Rich; foreword by Arthur C. Clarke. Baltimore (Maryland): Johns Hopkins University Press. \$75.00. xvi + 326 p.; ill.; index. ISBN: 978-0-8018-8679-9. 2007.

The Ediacaran Period, the most recently recognized interval of geologic time, has emerged as arguably the most biologically interesting interval of geologic time as well. Bracketed by the last major global glaciation at 635 million years ago and the explosive rise of animal life (the Cambrian explosion) starting at 542 million years ago, this period in Earth history represents a time when the first signs of complex life, including animal life, appeared on this planet. Now, a new book, *The Rise of Animals*, celebrates both the Ediacaran Period and what it represents to biologists and geologists alike—at least in terms of hypothesized animal ancestry.

Separated into four parts, and with a very useful index, this volume attempts to both place the Ediacaran into scientific context and to describe all of the major and minor Ediacaran deposits. The appendix is particularly useful as it documents, with both a short description and photograph, every single taxon generally considered by the paleontological community to be part of the “Ediacaran biota.” Further, the book is richly illustrated with beautifully reproduced photographs of the rocks, fossils, and people who dedicated their professional lives to Ediacaran geology and paleontology. Although the science is not well documented, and the scientific importance of these rocks and fossils does not stray much beyond animal-ancestry worship, some of the chapters that focused on particular sections or locations are nicely described and well illustrated. Strangely, though, each individual figure is not specifically cited in the text in any of the chapters. Often this is not a problem, as when a particular formation or scientist is figured, but it is disconcerting when, for example, detailed carbon isotope curves are lavishly figured without any context provided in the main body of the text.

Although a remarkable coffee-table book and a fantastic resource for anyone looking for photographs of rocks and fossils for their courses, I would not recommend reading too much of the