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## Review of *Archaea: Molecular and Cellular Biology*

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vanced undergraduates. Because its level of technical detail places it between most other textbooks and review articles, graduate students and research scientists will find it to be a useful reference and guide to subjects outside their immediate areas of research. The third edition has been expanded relative to the second edition, and includes updated material on relatively new topics such as genomics and prokaryotic cell biology. In addition, new material on well-developed experimental models, such as the stringent response, sporulation, and protein secretion, have been added as well.

The book is different from most other current molecular genetics volumes in the amount of space it devotes to several series of classic experiments and the impact they have had on the development of the field. For example, nearly ten pages discuss the bacteriophage T4 rII gene and the role it played in the discovery of mutational hotspots, nonsense mutations, and the logical structure of the genetic code. Although such information may not be of immediate practical value to most readers, its inclusion will broaden their historical knowledge of the field, and will illustrate how complex problems were teased apart using elegant experiments in an era that lacked the powerful tools that are available today.

In summary, this new edition is a significant upgrade from the well-received second edition. Drawing from a wide range of organisms, it presents detailed information, both classical and current, on many aspects of prokaryotic molecular biology. It should find a welcome home on the bookshelves of advanced undergraduate students, graduate students, and established researchers in the field.

DANIEL GAGE, *Molecular & Cell Biology, University of Connecticut, Storrs, Connecticut*

#### PHYSIOLOGY AND BIOCHEMISTRY OF EXTREMOPHILES.

*Edited by Charles Gerday and Nicolas Glansdorff. Washington (DC): ASM Press. \$129.95. xvi + 429 p + 4 pl; ill.; index. ISBN: 1-55581-422-0. 2007.*

Extremophiles are organisms that thrive under environmental conditions that are considered extreme. This book provides an in-depth examination of the physiology and biochemistry of these organisms, while also touching on aspects of their ecology and evolution. The volume contains 28 chapters, each reviewing different aspects of the extremophile literature. These chapters are grouped into sections that deal with extremes of temperature, salinity, pH, and pressure. The thermophile and psychrophile sections have the most chapters, reflecting historical interest in extremes of temperature, as well as a

greater body of research relative to other types of extremophiles. Each section appropriately begins with chapters that focus more on the ecology and biodiversity of each group of organisms (covering what organisms are where) before moving onto chapters that are focused on physiology and biochemistry (how and why organisms thrive in these extremes). Other sections of the book discuss the origins and evolution of life, the search for life elsewhere in the universe, and the biotechnological importance of extremophiles. I found that these latter sections served to place extremophile research into a broader context, while the discussions of specific types of extremophiles explored adaptive mechanisms in greater detail.

This book brings together and will be of relevance to a variety of disciplines in addition to extremophile biochemistry and physiology. I would recommend this volume to any biologist who is interested in understanding how life can adapt to and thrive in "harsh" environmental conditions. It will also serve well as a reference for anyone who is interested in only certain types or aspects of extremophiles. More thorough editing would have captured minor errors or awkward phraseology; this is, however, outweighed by a truly international list of contributors, which reflects a global interest in this fascinating subject.

DEREK MUELLER, *Geophysical Institute, University of Alaska, Fairbanks, Alaska*

#### ARCHAEA: MOLECULAR AND CELLULAR BIOLOGY.

*Edited by Ricardo Cavicchioli. Washington (DC): ASM Press. \$129.95. xii + 523 p + 18 pl; ill.; index. ISBN: 1-55581-391-7. 2007.*

Archaea along with bacteria comprise the two groups of prokaryotes. The discovery of the Archaea, now over 30 years ago, has blossomed into fascinating revelations about the origin of life and the discovery of unique mechanisms that penetrate diverse aspects of biology, biochemistry, and genetics. The field of archaeal biology is growing rapidly. For this reason, we can anticipate a continued need for comprehensive coverage on these organisms that promotes dissemination of relevant information.

The current volume consists of 23 short, edited chapters, ranging from DNA replication to Archaeosome vaccines. The chapters are generally broad with useful figures and tables. Considerable attention is focused on information processing, including DNA, RNA, and protein synthesis and processing. Additional emphasis is placed on general aspects of cell structure, including the unique archaeal envelope and molecular translocation across this structure. The latter third of the book contains chapters on genetic and genomic research strategies, as well as proteins of biotechnological importance. These par-

ticular chapters will help extend the relevance of this volume into the modern microbiology classroom.

This book will benefit most researchers and, with supplementation, graduate-level microbiology education efforts. It provides a useful expansion of other recent works on the Archaea, notably *Archaea: Evolution, Physiology, and Molecular Biology* (R Garrett and H-P Klenk. 2007. Malden (MA): Blackwell Publishing). Both are useful textbooks that expand the secondary literature and are worth having.

PAUL BLUM, *Beadle Center for Genetics, University of Nebraska, Lincoln, Nebraska*

#### BACILLUS: CELLULAR AND MOLECULAR BIOLOGY.

*Edited by Peter Graumann. Norfolk (United Kingdom): Caister Academic Press. \$300.00. xv + 454 p; ill.; index. ISBN: 978-1-904455-12-7. 2007.*

This volume is comprised of 12 chapters, and most of the authors are from European laboratories with the exception of two from the U.S. and one each from Brazil and Australia. The quality of the chapters is uniformly high. Together they provide a review of significant progress toward a better and deeper understanding of the physical structure and molecular biological organization and function in *Bacillus subtilis*. As a consequence, a truly intimate grasp of this bacterium is achieved. Other bacteria are only mentioned in passing.

Fascinating lines of discovery crisscross the chapters. Many of these discoveries come as a result of diverse applications of fluorescence microscopy using green fluorescent protein (GFP) as a reporter for structural, regulatory, or signaling molecules. One striking example is discovery of the actin-like cytoskeleton that, along with the cell wall, creates the rod shape of these bacteria. This cytoskeleton also establishes internal compartments that separate different functions, such as the differential positioning of transcription and translation. Another interesting finding is the inhibition of Z-ring formation in a new daughter cell and then its release and formation later in the cell cycle to cause segregation of the nucleoid prior to cell division. Many GFP fusions provide abundant evidence of the positions of specific proteins near or in the cell membrane. Clearer pictures of chromosomal replication and DNA repair emerge, as is also the case with the elaborate process of endospore formation. The final chapter investigates unique genetic pathways in *B. subtilis* isolated from soil, as opposed to cells from long-held laboratory cultures, pathways that lead to the formation of multicellular aggregations, or biofilms, of flagellated cells that move about en masse as "swarmers." Wild isolates also form complex, upright, multicellular structures associated with sporulation. In these structures, there is "cannibalism" (lysis) of other cells not engaged in sporulation.

CONRAD A STOCK, *Ecology & Evolutionary Biology, Cornell University, Ithaca, New York*



#### PLANT SCIENCES

##### THE EMERALD PLANET: HOW PLANTS CHANGED EARTH'S HISTORY.

*By David Beerling. Oxford and New York: Oxford University Press. \$29.95. xvi + 288 p + 16 pl; ill.; index. ISBN: 978-0-19-280602-4. 2007.*

As a paleobotanist, it is nice to see a book that essentially says, do not undervalue the contribution of plants to Earth's environment, past and present. From this basic theme—"to understand how the environment shapes plants, and how plants shape the environment, over . . . geological time" (p 3)—David Beerling goes further, presenting a synthesis of current hypotheses about plant/climate/Earth interactions based on models, experiments, and results from biology, geology, chemistry, physics, and paleontology for understanding causes of environmental change over the past 500 million years (mostly). Each section begins with a brief history of questions and early discoveries in that topic, including profiles of some of the scientists (or explorers) involved. Aspects of recent discoveries, questions where data do not fit existing hypotheses, and new ways to address these problems are well presented, most especially those that have been developed through studies in the Beerling laboratory. The author also ties these discoveries to questions and prospects in predicting consequences of current global climate change, providing substantive, relevant food for thought on what an increase in CO<sub>2</sub>, methane and, thus, temperature might cause to happen.

Possible causes for a lag in leaf evolution in early plant diversification, the cause of mutated spores (more data needed here) and end-Permian extinction, and plants' contribution to high O<sub>2</sub> and gigantism in animals demonstrate ways fossil plants record previously unrealized facets of Earth history. Old ideas on why polar regions could support forests of warmer climate plants in the past are refuted. Possible consequences of past and current global warming are discussed, based on new experiments. In all of these sections, interactions among plants, Earth processes, climate, and other organisms are well documented, and show that it may not take much (past or present) to generate a cascade of changes that will alter the balance of life and climate on Earth.

Although very readable, the chapters that deal with polar forests could have been condensed. The references and comments in the footnotes