Ebola outbreak. The virus descriptions are not limited to human viruses. Inclusion of many categories of viruses outside of human pathogens (vertebrate and invertebrate animal viruses, plant viruses, fungal and protist viruses, and bacterial and archaeal viruses) show the astounding variety of viral structures and life cycles. The section on phage is particularly interesting, given growing attention to phage therapies for antibiotic-resistant bacteria.

This volume is a beautiful and entertaining illustration of the viral world. Its accessibility will make it appropriate for lovers of biology at all levels; the illustrations and breadth of coverage will make it enjoyable for expert virologists to read and share.

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DEEP LIFE: THE HUNT FOR THE HIDDEN BIOLOGY OF EARTH, MARS, AND BEYOND.

By Tullis C. Onstott. Princeton (New Jersey): Princeton University Press. $35.00. xix + 486 p.; ill.; index. ISBN: 978-0-691-09644-5. 2017.

The deep terrestrial biosphere contains a large amount of microbial life on Earth, possibly comprising half of all its microbial cells, and much of its biodiversity. In this volume, Tullis C. Onstott describes nearly a half-century of research in the terrestrial deep subsurface biosphere, providing the backstories for many of the key discoveries in this field. He provides in exceptional detail how samples were collected from the first deep subsurface drilling campaign in the Taylorsville Basin (U.S.), as well as South African gold mines, Colorado mines, the South Dakota Homestake gold mine, New Mexico caves, Canadian Arctic permafrost, and other locations. In this way, Onstott documents the geographical and geopolitical variations in the mining industry and science funding from the Department of Energy (DOE), the National Science Foundation (NSF), and the National Aeronautics and Space Administration (NASA).

The author clearly has a deep fascination with the sticky and complicated feats of engineering required to obtain sterile biological samples from caves, permafrost, rock, and aquifers deep underneath Earth's surface. A novice deep subsurface researcher could quickly glean effective sampling methods from this book, as well as get to know the personalities of Onstott's wide range of collaborators and colleagues. Reading this volume gives one a true sense of the camaraderie often felt among the women and men going into uncertain, exciting, and sometimes dangerous field campaigns. The stakes are always high, since researchers commonly get only one or two opportunities to obtain a pristine sample. This account is refreshingly devoid of the reality TV-style backstabbing one might expect from a fictional account of such a situation. The reality in this book appears to be much more congenial.

Many of the researchers Onstott highlights are still active today, so this volume does not feel dated, despite the fact that it begins at the very dawn of deep subsurface biosphere research. Since much of the author's research and, consequently, much of the total terrestrial deep subsurface microbiological research has taken place in South African gold mines, this work additionally serves as an anecdotal chronicle of the post-apartheid transitions in the scientific and mining communities in South Africa. The increase of women and black South Africans in positions of power in the mining industry was mirrored by Onstott's own efforts to help train the next generation of black South African scientists. But, the real strength of this book is an almost encyclopedic description of field work in some of the most difficult sampling environments in the world. Reading this volume gives one a real appreciation how much hard work, ingenuity, and optimism went into the significant body of research that the author and his colleagues have produced, as well as its implications for our understanding of life on Earth and possible life on Mars.

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BOTANY

PLANT CELLS AND THEIR ORGANELLES.

Edited by William V. Dashek and Gurbachan S. Miglani. Hoboken (New Jersey): Wiley-Blackwell. $100.00. xii + 414 p.; ill.; index. ISBN: 9780470976869 (hc); 9781118924754 (eb). 2017.

This volume is designed as an advanced textbook for upper-level undergraduates and graduate students who are interested in plant cell biology, biotechnology, biochemistry, and evolution. It contains micrographs, clear diagrams, and tables that summarize and elaborate upon the text is a succinct manner. The volume also has an up-to-date bibliography that guides students to the research literature. *Plant Cells and Their Organelles* extends the relationship from cells to organisms by introducing readers to a little bit of plant anatomy, physiology, and evolution. This integration is accomplished particularly well in the following chapters: An Introduction to Cells and Their Organs, Plant Cell Walls, and Photosynthesis. The chapter Plastid Structure and Genomics is particularly good for students interested in plant biotech-

nology. The chapter Isolation and Characterization of Subcellular Organelles From Plant Cells is illuminating as it explains the workings of each technique used to understand the biochemical functioning of the organelles discussed in the rest of the book. It also describes the value and limitations of each technique.

The organelles are discussed in alphabetical order, with no separate chapter for the plasma membrane. The primary level of focus of the majority of chapters is a description of the enzymes and other proteins of each organelle. Together, the ordering of chapters and the focus of the presentation provide a useful way to do *visual proteomics* at the cellular level. That is, this volume can be used as a visual dictionary so that students see where a given gene product, protein, or macromolecular structure is located in an organelle and in the whole cell, and also learn what the protein does in that location. As such this book serves as a ready reference. However, the tradeoff in designing *Plant Cells and Their Organelles* like a dictionary is that it does not build an overarching coherent lesson about the cell as the basic unit of life.

In choosing a textbook for a plant cell biology class, consider that *Plant Cells and Their Organelles* has a greater cellular focus than *Molecular Biology of the Cell* by Alberts et al. (2015. Sixth Edition. New York: Garland Science) and a greater molecular focus than *Plant Cell Biology: From Astronomy to Zoology* (R. Wayne. 2018. Second Edition. Amsterdam (The Netherlands): Elsevier). There is a caveat to the usefulness of this volume as a dictionary. Although much of the information is accurate, there are some mistakes, such as caveolae give rise to clathrin-coated vesicles (p. 10) should read clathrin-independent vesicles, the V-ATPase is found on the plasmalemma of plants (p. 14) should read P-type ATPase, and polymerization requires α-tubulin (p. 110) should read γ-tubulin.

The chapter Systems Biology in Plant Cells and Their Organelles predicts that the "future of cell biology of organelles will definitely benefit with systems biology approaches" (p. 371). It presents systems biology as "a seamless and logical integration of 'wet experimentation,' computational modeling, technological advances, ideas, and theory" (p. 372). This is definitely the majority position, but for me, who may be a minority of one, this is an overstatement if not a misstatement. I use this chapter to make my case. This chapter presents a complete and lucid description of the cleverly developed techniques used to analyze genomes, lipidomes, metabolomes, proteomes, and transcriptomes, yet is does not present any significant fundamental knowledge gained from their application. This chapter lacks any support of the thesis: "The future of cell biology of organelles will definitely benefit with systems biology approaches" (p. 371) as well as anything that could serve as a rebuttal to the claim that a knowledge of the -omics of plants is only of importance to the systems biologist: for all others it as a pastime, if not a waste of time—a paraphrase of Matthias Schleiden of cell theory fame (1849. *Principles of Scientific Botany; or Botany as an Inductive Science*. London (UK): Longman, Brown, Green, and Longmans).

The chapter on microbodies, written by Robert Donaldson, a pioneer in microbody research, is especially illuminating. This colorfully written and inspiring chapter includes peroxisomal facts and mysteries, personal insights, unpublished photographs, thought-provoking questions, and suggestions for further work. Whereas the other chapters provide a comprehensive and useful knowledge of organelles, this chapter will inspire developing plant cell biologists.

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The Phytochemical Landscape: Linking Trophic Interactions and Nutrient Dynamics. *Monographs in Population Biology, Volume 56.*

By Mark D. Hunter. Princeton (New Jersey): Princeton University Press. $65.00. xi + 360 p.; ill.; index. ISBN: 978-0-691-15845-7. 2016.

Since all life is "complex chemistry in a semipermeable bag" (p. 24), as Mark Hunter asserts in *The Phytochemical Landscape*, then natural history should often include a strong dose of chemical ecology or basic natural products chemistry. In fact, great natural history has often included the discovery of natural products from plants and animals, yielding fascinating stories and helpful insight into our surroundings. But has it also led to associated theoretical advances? Unfortunately, in chemical ecology, research has not put natural history into any broad theoretical context that sticks. Thus the field is left with assemblages of papers on disparate themes with an unjustified focus on descriptive research topics such as induced defenses, fungal endophyte-mediated chemistry, roles of cuticular hydrocarbons, importance of volatiles for interspecific signaling, and characterization of new natural products. Even plant defense theory consists of a mix of competing hypotheses that have been synthesized numerous times but have not yet been cemented together into a unifying theory. In contrast, *The Phytochemical Landscape* provides an important roadmap for ecologists and chemists to develop useful theory that can bring together much of the research in chemical ecology. This thorough volume clearly lays out mechanisms by which nutrient dynamics, chemistry of autotrophs, and trophic