

manipulate at the nanolevel, we can start to replicate nature's nanotechnologies as we discover them.

The chapters of **The Gecko's Foot** are organized around a wide range of specific examples of current bio-inspiration. Forbes discusses, among other things, the self-cleaning properties of the lotus, the clinging feet of lizards, the potential for photonic crystals to replace the silicon chip, beetle-inspired origami techniques, and shell-inspired architecture. And he manages throughout to seamlessly tie these examples together, explaining what they have in common, where they differ, and the lessons we learn by comparing them.

Sometimes bio-inspiration works because we can exactly copy what we see in nature—Lotus-Effect® coating repels dirt because it very closely duplicates the surface of the lotus leaf at the nanolevel—but one of the early lessons of bio-inspiration is that exact duplication is neither always possible nor always necessary. Often, Forbes tells us, a bio-inspired technology comes from understanding the general concept, not from exact duplication. The engineers trying to reproduce the seeming impossibility of insect flight are finding that they can improve on some aspects (computing power of robotic insects vs. live insect “brain” power) but have trouble equaling some very precise mechanisms (the hinge where an insect's wing meets the body).

Forbes' writing is a pleasure to read: Everything is clearly explained in simple language, yet nothing feels dumbed-down. More importantly, he conveys a sense that bio-inspiration is a new frontier with many mysteries yet to be revealed. This book is perfect inspiration for the budding young scientist in high school or college. The tone is inspirational—the most exciting discoveries of science, he seems to enthusiastically shout, are out there waiting to be discovered by the next generation of scientists!



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## MICROBIOLOGY

**Revenge of the Microbes: How Bacterial Resistance Is Undermining the Antibiotic Miracle.** By Abigail A. Salyers and Dixie

D. Whitt. 2005. ASM Press. (ISBN 1555812988). 186 pp. Paperback. \$29.95.

Salyers' and Whitt's **Revenge of the Microbes** is an extremely thorough, well-organized book that offers detailed answers to nearly any question imaginable about bacterial resistance to antibiotics. As the authors state in the preface, it even goes “beyond the scientific facts and [tries] to deal with the social, economic, and political aspects of the topic” (p. X).

Beginning chapters cover the history of antibiotics and a primer on the structure and function of bacteria (which allows the reader to understand bacterial adaptability to antibiotic-rich environments), while later chapters focus on specific types of antibiotics and the mechanisms that allow them to disrupt the life functions of bacteria.

Every example is explained in-depth with excellent diagrams and/or references to Appendix I, which houses figures of the structures of each anti-microbial agent mentioned in the text. Meanwhile, Salyers and Whitt painstakingly offer details describing the mechanism of action that occurs inside bacteria which allows them to become resistant over time to specific antibiotics. For example, some bacteria produce enzymes that bind and neutralize antibiotics (such as streptomycin and other aminoglycosides) used against them.

If an educator is seeking a book to guide advanced high school students or university students to specific information about how each family of antibiotics works on bacteria and how bacteria, in turn, work their way out of this process, then **Revenge of the Microbes** is an excellent resource.

Each “real world” example of how bacteria manipulate basic cellular processes in order to become resistant is an excellent review of the structures and functions of cell biology and great insight into the complexity and diversity of bacterial resistance. Any student using this book as a resource will walk away with a depth and breadth of understanding much greater than before.

The end of the book focuses on resistance mechanisms that bacteria use against antiseptics and disinfectants. Also, the few antibacterial compounds effective against viral, fungal, and protozoal compounds are mentioned. This chapter, of course, also includes a good basic review of the life cycle of viruses, fungi, and protozoa and a few specific examples of antibiotics use to fight diseases caused by these agents. The authors are careful to explain how antiviral therapies work to destroy proteins associated with the virus itself, because they want to ensure that all readers walk away

understanding that the use of antibiotics for most viral infections is unnecessary, unhelpful, and, really, part of the problem that leads to resistance.

In specific chapters, Salyers and Whitt touch on the overuse of prescription antibiotics in humans, the widespread use of antibiotics in the American meat and poultry industry, and the prohibitive cost and politics of developing new antibiotics, showing how each may contribute to a time in the near future where we no longer have the antibiotics we need to fight bacterial infections. The authors state, “the fact that we are currently in the fourth generation of most antibiotics, after only 60 years of antibiotic use, should be warning enough that the race between us and microbes is a hotly contested one” (p. 31).

**Revenge of the Microbes** is an excellently worded book that manages a touch of humor as the personalities of the authors come through at times. However, it is not a light or an easy read by any stretch of the imagination. It is a book for those deeply interested in the subject and an excellent resource that answers specific questions about the relationship between bacterial resistance and antibiotics.



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## HUMAN EVOLUTION

**Human Evolution: A Very Short Introduction.** Bernard Wood. Oxford University Press (ISBN 0192803603). 131 pp. Paperback. \$9.95.

**Human Evolution: A Very Short Introduction** is one in a series of books (Very Short Introduction Series) published by Oxford University Press on a wide variety of subjects. This particular book contains eight chapters. Really, only four of them are on human ancestors. The other four chapters offer information that may be required by a person trying to understand human evolution. This is fine, but in a very short introduction the pages may have been better utilized going over the human ancestors and the path to our current evolutionary state. Wood also spends a great deal of time explaining what he will be explaining. This has no place in a very short introduction. He devotes time to this at the beginning of most chapters: “In this chapter [3] I discuss what the hominin fossil record consists of, how it is