

Reviews and Resources

BOOK

Life in Our Phage World

Forest Rohwer, Merry Youle, Heather Maughan, and Nao Hisakawa. Wholon Press, 2014, 404 p., \$82.50 (hardcover).

If I could return to my Ph.D. days, I would seek a postdoc in the Rohwer lab, including studies in his exploration territories. This was my first thought upon reading *Life in Our Phage World*. I can't think of a more exciting adventure than to be an explorer in this newly discovered biological world. It would be as if I had landed on a distant planet with exotic life forms. This book appears at the appropriate celebration at San Diego State University (SDSU) of the discovery of the Twort-d'Herelle phenomenon. The icing on the cake would be for SDSU to establish a phage museum room with historic books, documents, photos, and other phage-related artifacts.

The authors refer to this book as field guide. In some ways, it is partially encyclopedic, choosing 30 examples of different phage with bizarrely different lifestyles and structures. The authors also wrestle with phage nomenclature and classification. While classification has been based on differences in phage physical structure, the debate is now open to broader consideration as a result of inexpensive genomic sequencing and bioinformatics techniques.

But it is the phage creatures themselves that are so exciting! The book describes ubiquitous habitats inside and outside of host organisms, the earth and air and in all parts of the seas, including below the ocean floor. Also the degree of phage participation in the biome is astounding, accounting for a large portion of total biological mass.

The book is loaded with additional

Ripley-type, "Believe-it-or-not" items. Assuming 10 phage for each of the 10^{30} microbes on earth, the total phage population is estimated at 10,000,000,000,000,000,000,000,000,000,000. Phage are found in all shapes and sizes, with single- or double-stranded DNA, RNA, or mix of the two genomes. They are found in all environments, extreme hot and cold, including acidic hot springs. They are with us in humans from birth to death; 10^{13} phages are in each of our guts. Yes, truth is stranger than fiction.

Overall, *Life in Our Phage World* is a treasure trove, not only of phage information presented in a scholarly fashion, but also of amusing tales of their various roles in the vast living world, including personal stories and biographical sketches of scientists that make it fun to read.

But there were a few disappointments. The bare mention in the book of transduction belittles its role in the living world as well as a tool for genomic mapping developed by Sanderson and Demerec at Cold Spring Harbor. Another example, filamentous phage, such as f1 and M13, can carry guest peptides and nanoparticles to designated depots for a variety of activities (Smith and Scott, 1985). True, some of these engineered particles are for industrial purposes, but the biologically unique activities of these filamentous designer phage are worthy of inclusion. Good examples are those of engineered phage (Angela Belcher, 2014, and Segun Fagbohun, 2013), via phage display technology by inserting selected genes into M13 phage as a vector to bind to tumor cells, and also to carry genes that lead to therapeutic agents.

The formatting of the book has some strange features. It appears to consist of a series of essays by the authors of the book

and guest contributors. While the book is well organized, it differs in style from the standard science book. Each essay has its own set of page numbers and its own set of references.

One role of a reviewer is to lure casual bookcover-scanners into page-turning readers. These tales (of tails, etc.) will certainly entice ecologists, environmentalists, bioinformaticists, and evolutionists, but also biology scholars in many other fields. And perhaps also architects and engineers with interest in strong structural assemblies. The book is loaded with numerous additional fun-reading gems, such as: filamentous phages (e.g., f1 and M13) do not lyse their hosts. They replicate perpetually as episomes, and their progeny depart without cell lysis.

This phage book has some unique features that distinguish it from the traditional formal presentations that are found in the standard science book. It diagrams the genome maps of its 30 selected phages. For newcomer scientists, the book's Appendices, especially the extensive glossary, are very valuable tools. The numerous cartoonish diagrams clarify complex structures and functions.

This book is a reminder of a scientist's Eureka moment, upon observing an experiment's result, "I now know something that no one else in the world knows" (attributed to Linus Pauling). This book is dedicated to the next century of phage explorers. Regretfully, the time has passed for me to be among them.

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