

A powerful framework for understanding how natural selection shapes adaptation and biological design

Design and diversity are the two great challenges in the study of life. *Microbial Life History* draws on the latest advances in microbiology to describe the fundamental forces of biological design and apply these evolutionary processes to a broad diversity of traits in microbial metabolism and biochemistry.

Emphasizing how to formulate and test hypotheses of adaptation, Steven Frank provides a new foundation for exploring the evolutionary forces of design. He discusses the economic principles of marginal valuations, tradeoffs, and payoffs in risky and random environments; the social aspects of conflict and cooperation; the demographic aspects of age and spatial heterogeneity; and the engineering control theory principles by which systems adjust to environments. Frank then applies these evolutionary principles to the biochemistry of microbial metabolism, providing the first comprehensive link between the forces that shape biological design and cellular energetics.

Tracing how natural selection sculpts metabolism, *Microbial Life History* provides new perspectives on the life histories of organisms, from growth rate and survival to dispersal and defense against attack. Along the way, this incisive book addresses the conceptual and philosophical challenges confronting evolutionary biologists and other practitioners who study biological design and seek to apply its lessons.

“An important book. Reading Steven Frank is like sitting down to the most sumptuous feast imaginable. His writing is a delicious repast, one that compels you to think in new ways and puzzle over things you thought you understood.”

—Joan Strassmann, Washington University in St. Louis

“A powerful tool to tackle questions of microbial design.”

—Rolf Kümmerli, University of Zurich

“Frank provides a brilliant guide for how to think in terms of biological design, which has diverse and profound applications in fields ranging from microbiology to macroevolution. *Microbial Life History* is destined to be a classic in evolutionary biology and ecology.”—Bernard J. Crespi, Simon Fraser University

Steven A. Frank is Donald Bren Professor of Biological Sciences at the University of California, Irvine. His books include *Dynamics of Cancer*, *Immunology and Evolution of Infectious Disease*, and *Foundations of Social Evolution* (all Princeton).

Cover design: Heather Hansen

 **PRINCETON**
press.princeton.edu

BIOLOGY
ISBN: 978-0-691-23119-8
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