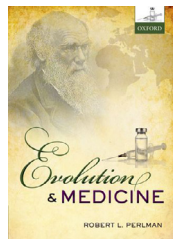


# A primer of Darwinian medicine

**Evolution and Medicine** by Robert L. Perlman, Oxford University Press, 2013. US\$49.50/£27.50/€31.35 pbk (xiii + 162 pp.), ISBN 978-0-19-966171-5

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I have always been interested in how different disciplinary fields are merged and, since Williams and Nesse's landmark article that introduced us to evolutionary medicine [1], I have followed the field with rapt attention. Recently, I teamed up with a physician, Barbara Natterson-Horowitz, and co-founded UCLA's evolutionary medicine program. I spend a lot more time than I ever had before with physicians,

and believe I am getting a boots-on-ground education in how one cultivates interdisciplinary discourse, as well as how one develops a pipeline to generate genuinely interdisciplinary advances. Evolutionary medicine is one of those fields where discourse and advances are sorely needed. In addition, this need is perplexing, if, for no other reason than, as Robert Perlman elegantly reminds us, Darwin studied medicine. However, since Darwin, the field of medicine has focused on individuals, not populations, and teaching new medical advances has edged out the strong comparative training that physicians used to have.

Perlman outlines his view of evolutionary medicine in a crisply written, 11-chapter primer. It is exceptionally accessible (a glossary defines some key terms) and I genuinely enjoyed reading it and believe that it will help students (of biology or medicine) understand why evolution matters for medicine, public health, and biomedical research.

The first few chapters provide background knowledge. Chapter 1 introduces readers to evolution and explains the different foci of most evolutionary biological research versus biomedical research (populations versus individuals). I think Perlman misses an opportunity to outline Niko Tinbergen's framework [2–4] and show how this can guide the integration of proximate and ultimate research, as Nesse and Stearns have done [5]. The chapter does highlight an insight that I had not realized: by explaining to patients the evolutionary explanations of disease, the patients might be less likely to explain them with unhelpful folk beliefs. Chapter 2 introduces readers to the importance of demography, which underlies human and pathogen population biology, and Chapter 3 is a succinct introduction to evolutionary genetics.

The remainder of the book focuses on specific maladies and highlights lessons that emerge from an explicitly evolutionary approach. Chapter 4 focuses on cystic fibrosis and tells us how a proper genetic identification is essential for the correct treatment and that even 'easy' genetic issues

may be complex. Chapter 5 is a wonderful treatment of the evolutionary biology of aging and highlights the importance of understanding life-history tradeoffs. Chapter 6 focuses on cancer. Lessons include how understanding the ecology of the disease, as well as its precise genetic identification, may help. It also reminds us that tradeoffs (e.g., an adaptive immune system) may predispose us for certain cancers (e.g., leukemia). Chapter 7 is an outstanding guide to host–parasite coevolution and explains how virulence may often evolve and the conditions under which it may not. Chapter 8 focuses specifically on sexually transmitted diseases. The thought-provoking comment that a given human heterosexual encounter is more likely to lead to a sexually transmitted disease than a pregnancy should remind us of the important role that these pathogens may have on both fitness and counter-adaptations to reduce these risks! Chapter 8 focuses on malaria, of which 200 million new cases are diagnosed each year and which is responsible for over 1 million deaths. Counter-adaptations to something with this selective force should be expected, but because of their costs in malaria-free areas, such mutations may have net negative effects. Coevolution is raised again in Chapter 7, when the evolutionary history of lactase persistence is dissected. Lessons are that there are different mutations that have been identified to solve this common problem, cultural and genetic evolution are linked, and that the benefits may be greater in sun-deprived northern climates where lactase may assist vitamin D metabolism. Finally, Chapter 11 focuses on man-made diseases, and the key lesson from this chapter is that there is an evolutionary mis-match between adaptations for historical environments and the current environments in which traits persist; a key lesson from evolutionary medicine.

There are several previous books about evolutionary medicine (e.g., [6–8]), but although I thoroughly enjoyed this book, and will likely incorporate some new examples into my lectures, I think that it has some shortcomings. For the field to advance, we must convince physicians and biomedical researchers that both adaptive and historical explanations will generate new clinically relevant treatments. For this, we must illustrate concrete, evidence-based, outcomes. One missing example is the research on how the strength of selection for mutations is increased by treatment designed to eliminate every last pathogen [9]; an essential lesson for clinical practice.

Ultimately, I do not want to be treated by an evolutionary biologist but rather I want to be treated by physicians who both understand evolution and can apply the results from evidence-based evaluations that are generated by

evolutionary medicine research. This book should excite some to think more about evolution and medicine, but it falls short on outlining a path to achieve this.

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