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Book review

Cancer: The Evolutionary Legacy

M Greaves
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Cancer is an evolutionary problem in three ways. First, and foremost, the process of progression from neoplastic to malignant tissue is a process of natural selection by which mutant clones evolve to escape cell cycle checkpoints, apoptosis, and other host defenses (Nowell, 1976; Hanahan and Weinberg, 2000). This is also the basis for the emergence of resistance and relapse after treatment. Second, cancer is a disease that emerged out of the transition from single-celled organisms to multicellular organisms, half a billion years ago (Maynard Smith and Szathmáry, 1995). Ever since then, evolution at the organismal level has been developing defenses to keep in check the potential for evolution at the cellular level. Third, and most difficult to assess, evolution has spent most of human history tuning our bodies for a set of experiences that most of us, happily, no longer share (Williams and Nesse, 1991). Our modern lifestyles may relieve us from some of that suffering while also imposing new hazards for which our bodies are singularly unprepared. Greaves hits upon all three of these aspects of cancer in his recent book, *Cancer: The Evolutionary Legacy*.

The Evolutionary Legacy is intended for a popular audience. Greaves assumes the reader has some familiarity with biological concepts such as genes and evolution. He avoids both a rehashing of elementary biological knowledge as well as the complex mire of current debates in the field. Greaves does touch lightly on some of these debates, like the recent research into anti-angiogenesis therapies, but typically gives the reader a brief overview and then references for further reading. Throughout the book, Greaves is careful to provide the historical context of the issues. He also connects the issues in cancer to other areas of medicine when they involve the same processes. The book is organised into three parts: progression, epidemiology, and treatment. The first part, on progression, contains the most interesting discussions of the role of evolution in cancer. The evolutionary arguments are weaker in the epidemiological section, perhaps reflecting the difficulty of addressing 'just so' stories in our inferences of human adaptations. The last section on treatment also contains interesting evolutionary ideas but is too short to really develop them.

On the whole, the book is too short. Greaves raises a variety of fascinating topics, whetting our appetites. I only wish he had had more space to serve up the full smorgasbord. Perhaps this is too much to ask for a survey of the entire cuisine of cancer, and one accessible to the general public at that. Biologists reading the book will find themselves more interested in the reference lists than some of the chapters. Greaves occasionally slips up, letting some biological jargon pass by, such as 'phenotypic plasticity' without an explanation of the term. But on the whole, the book is very readable with a sprinkling of metaphors and colloquialisms to lighten the palette. Greaves shows an appreciable mastery of the issues, and does not try to obscure their complexity. He also shows a refreshing willingness to express his personal opinions on these issues, and the intellectual honesty to clearly acknowledge them as such. If you are looking for a thoughtful overview of the issues of evolution in cancer, *The Evolutionary Legacy* is a good place to start.

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